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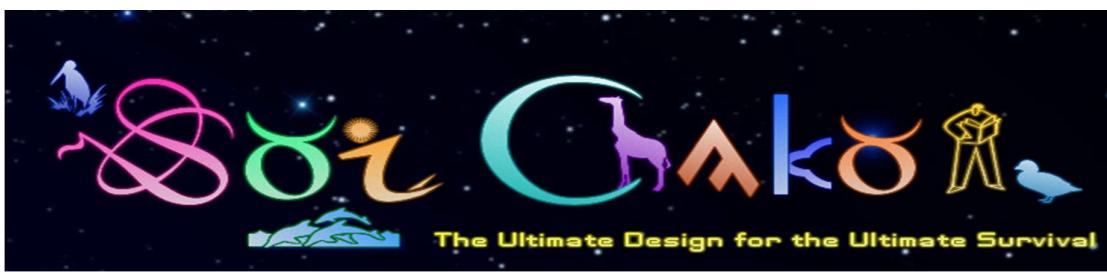
Acknowledgement

Sri Chakra - Our dream project would never have been accomplished without the support of so many personalities. We hereby take this opportunity to evince our gratitude to all those personalities. First of all we would like to thank the Almighty God who created us, loved us and blessed us due to which we worked hard and successfully completed our project.

Secondly, we are very much grateful to NASA/NSS for their idea of building a space settlement in the hostile space which saves our future generations and mother planet Earth and also providing a good platform to all the students worldwide in the form of "Space Settlement Design Competition". This changed our outlook towards space and made us challenge our talent and bring out our hidden creativity. This project helped us learn worthful lessons and we ourselves feel very much lucky to take part in this precious project.

We are very much thankful to our guide, Professor Rakesh Roshan, Rajiv Gandhi University, IIIT Basar, who suggested us to participate in this competition and clarified our doubts regarding space and engineering and also helped us with references. Thanks to professor Balakrishna, Telugu mentor, Rajiv Gandhi University, IIIT Basar, he solved our doubts regarding the structure. Thanks to Mr. Saidaa, who helped us in providing sufficient requirements of our Project.

We also thank our parents who motivated us and provided support in all ways from starting to ending. And we also thankful to our seniors and friends who encouraged us. This project will be impossible without the support of all these personalities.



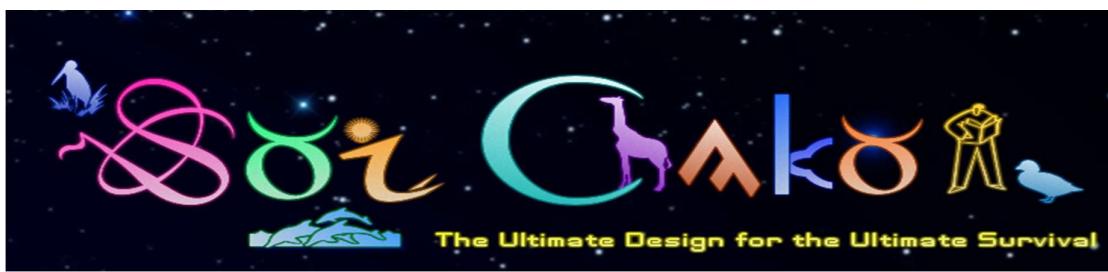
Executive summary

Sri Chakra stands as a unique settlement with new structural sections. We made a big step of designing our settlement with unlike shapes that no other projects have ever used. We modified this unlike shape to be a suitable structure for space survival. We have worked on every aspect and made our settlement the best.

Light which is basic and ultimate source for all life matter can be used over a great extent. We will equip all the infrastructure well-furnished and well made. We will use wide applications and make use of tremendous solar energy and make profitable. We will create a new space era, a higher mankind evolution, which was once regarded as far-fetch dream and turn into reality. We need to provide potentially rich environment to our coming generation we will completely obtain from this.

Advantages of our settlement:

First and foremost benefit shall be saving human race from extinction. Our settlement provides base for further deep unforgettable sights of space. As expected, the space around going to be filled with space debris completely in coming 20 years. Our settlement will clean and make use of them. It's completely Eco free as we made everything biodegradable and reusing the refuse and even converting all toxic pollutants into useful fuels. Through this we can expand human habitat and our influence into solar system. We are blessed with tremendous uninterrupted solar energy since whole human life needs energy indeed all the time. We need to spend a lot of material and fill large fuel to send any satellite into space. Instead our settlement serves as a launch pad. As our settlement stands in hostile space, which human wish to explore, tourism can be brought up in our settlement. If earth is going to be have any danger from asteroids or any other bodies, our settlement helps and saves our home earth by using its influence. Making use of microgravity we can produce and manufacture the materials which cannot be done on earth.



Introduction

“This is one small step for man, one giant leap for mankind”.

- NEIL ARMSTRONG.

Why do we need space settlement?

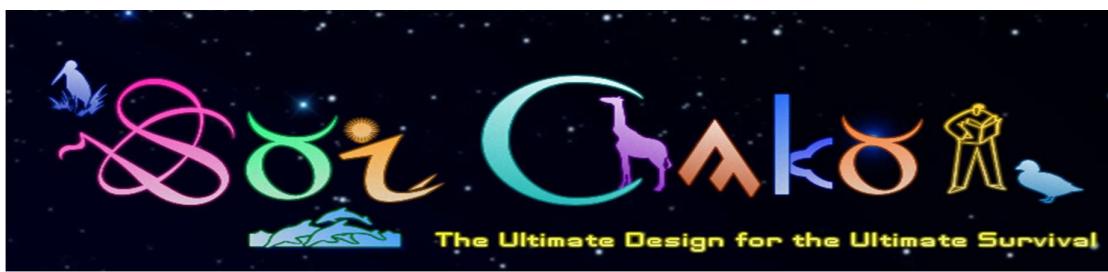
A space settlement is the center of attention at present. By designing this habitat, we will demonstrate the probability of human shelter, which becomes a hospitable environment.

It is known that someday our earth will be no longer any more to accommodate such a numerous population. Besides energy crisis occurs a lot followed by endanger of other species extinction. Ultimately human race, had to extinct. This led us explore search beyond the earth with a curious approach. So this is the right choice for us to exhibit ourinnovate, unique knowledge and wisdom to create an independent biosphere integrated with all sort of facilities.

The goal isn't just scientific exploration, besides extending the range of human habit out from earth to solar system.

The finest and dangerous creator human is leading the world by which his influence that led us earth to be over populated. Finally we have met running out of resources. Therefore energy crisis occurs in a large scale left with nothing except concrete jungles and numerous crews of people.

So we conclude the way to invade other planets and create space settlement. The day will come when more people live off earth than on earth.



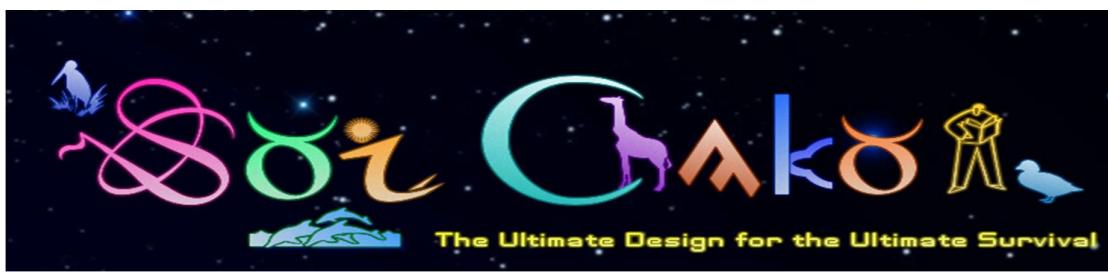
Why the name “Sri Chakra”?

Sri Chakra – A design which belongs to Hindu mythology is originated from the concept of nature. As we committed our settlement to be eco-friendly. This resembles all the life forms with a healthy integrated eco-system. Sri Chakra consists of the triangle like structures which are attached adjacently with one another making a completely potential Sri Chakra yantram. So in our Sri Chakra the solar and cosmic rays which are absorbed by the sharp edges of this chakra gets amplified by reflecting inside and the complete energy (shakti) is concentrated at the center. This makes “shatkonashakti” which makes our inhabitants to be high energetic all the time.

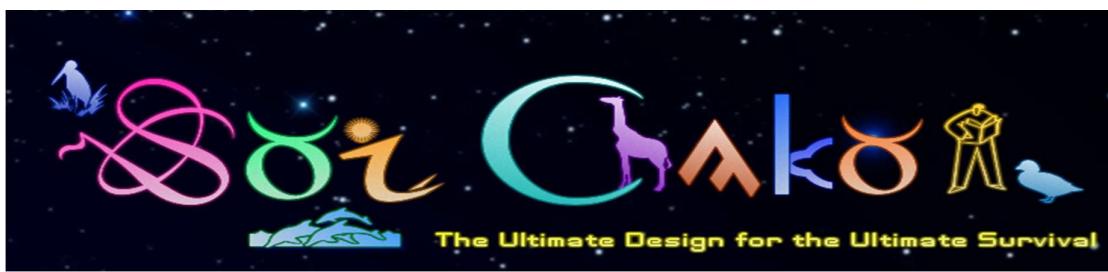
The pronouncing sound of Sri Chakra has many benefits regarding our health. In Sanskrit language Sri Chakra is written as “**श्रीचक्रा**”. The letter Sri (श्री) contains “Sha”-(श्), “Ra” – (र) and “ii” – (ई). The sound “sha” helps to increase knowledge, “Ra” digestion disorders and sound “ii” enhances our concentration. The sound “Ra” present in Sri Chakra has a strong significance. The moment we pronounce letter “Ra” all the nerves move at once creating an impulse. This aspect has a healthy benefit.

Considering all the above factors, we named our settlement as **“Sri Chakra”**, the best.

In this settlement the word-Chakra is referred to be shape of a star.



EMPLACEMENT



“A person needs a good platform or locality for his existence, if not his degradation starts. In the similar way our settlement also needs a good location for its existence.”

The location at which our settlement is to be placed resembles the stability of the settlement. Moreover it has to be placed in a stable and predictable orbit or trajectory that can allow for human, scientific and domestic objectives of the mission to be met.

Objectives to be considered:

➤ Accessibility of raw materials :-

The Earth and Moon are the key sources of the raw materials and supplies. These raw materials and supplies are needed for the building and development of the colony. If the accessibility of required materials is near to the colony, it will speed up the process and make it more economical.

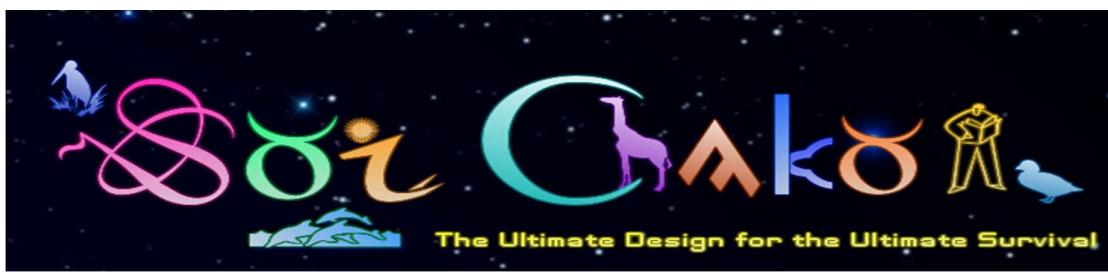
➤ Trips should be shorter :-

It will be advantageous to have a short transit time between the settlement and the Earth and Moon. We can communicate in due time and exchange our complete data if the trips are shorter. Obviously it helps a lot in cases of emergencies where assistance or supplies would be needed from Earth.

➤ Safe zone:-

Our settlement has to be placed in a home such that it should be safe from interplanetary dust and celestial bodies. We can figure out that present communication system demands an enormous increase in number of satellites which result in increase of junk objects in space.

Hence we have to make sure that our settlement is completely protected from junk objects.



The above discussion led us to think over these probabilities:

- LEO
- GEO
- HEO
- On another planets
- Lunar orbit courtesy: Google Images
- Free space and beyond
- Liberation points



LEO – Lower Earth Orbit:-

LEO lies 200-2000km above the Earth. Although it makes quick communication and transportation, there are also lot of defects in choosing this orbit such as huge gravity which attracts our settlement towards the earth. Also it has greater angular velocity compared to the Earth which results several dawns and sunsets per day, which halts on adequate utilization of solar energy.

This orbit also contains scattered and dismantled metal pieces of satellites. Placing our settlement in this orbit make us to depend completely on Earth for the raw materials and also selection of this orbit results in huge economical expenditure.

The above mentioned defects are the reason for rejection of LEO.

GEO – Geostationary orbit (or) Geosynchronous orbit:-

This is a circular orbit which is 35,786kms (22,236 miles) above the Earth's equator. GEO has same benefits and defects as that of LEO. This orbit is in the orbiting spacecraft or satellite rotates around the Earth with the same angular velocity as the Earth, as a result it will remain in constant longitude with respect to Earth. One

More noticeable point is GEO located in the middle of the Van Allen radiation belt. This is the main reason for the rejection of GEO.



HEO – Higher Earth Orbit:-

HEO is an Elliptic orbit with perigee distance of 1000 kms (540 miles) and with apogee 35,800kms (19,323 miles). Since the shape of this orbit is ellipse, there is a high range of difference in distance from the Earth (Elliptical orbit), Influence of gravity differs, and this also affects smooth communication system of the colony. Hence this orbit is also not applicable for the settlement of our colony.

On other planets:-

The main privileges of placing on other planets are abundant accessibility of mineral resources and enough space for space research centers. But we know that survival on mars is being researching now. Beyond mars settlement on remaining planets is hardly possible with present technology. It may be possible in future generations.

Lunar orbit:-

This is an orbit around the moon. Lunar orbit refers to the orbit of an object revolves around the moon. The main advantage of this orbit is this enables us to utilize the resources of moon sufficiently. But the revolutionary orbit of our colony in this orbit doesn't cover equal distances all the time this influences the days and nights of the colony.

Free Space and Beyond:-

We also thought about placing our settlement in deep space, but we don't have a perfect view of that. Moreover present research doesn't have any clues of space exploration beyond mars. As it is far away from home earth it becomes complicated to communicate and operate it. Perhaps we can do it in next epoch from our Sri Chakra.

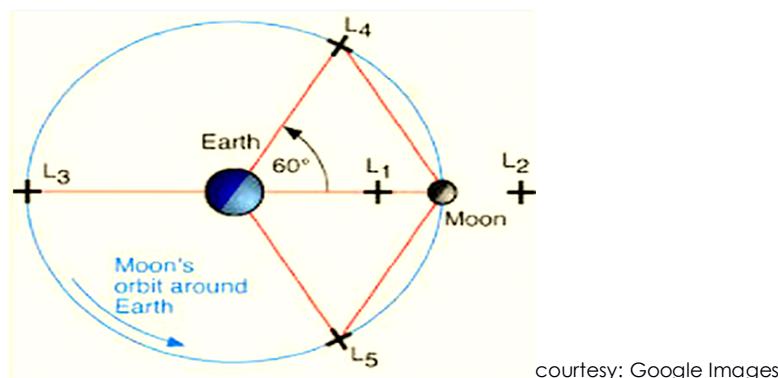
Liberation points (or) Lagrangian points:-

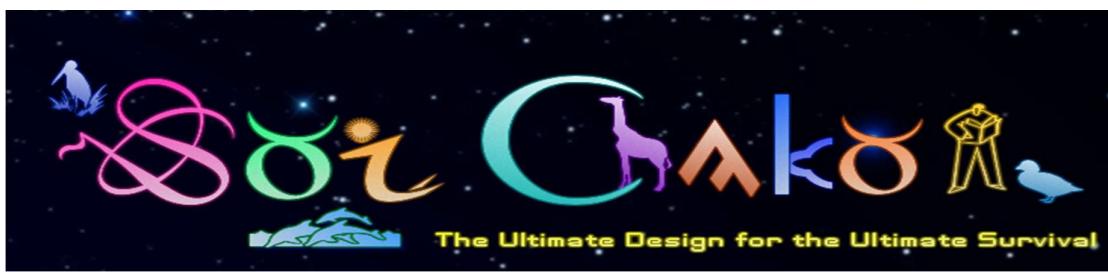
The necessity of being near to the Earth revealed the concept of liberation points (or) Lagrangian points. These three-body liberation points are discovered by Louis Lagrange a French mathematician in the year 1772. We have chosen Earth-Moon system for two main reasons, first one is that our colony has to be near to the Earth and another one is ease accessibility of minerals from Moon.

There are five liberation points likely L1, L2, L3, L4 and L5. L1, L2 are lunar stationary orbits (or) lunar synchronous orbits. L1, L2, L3 are collinear in which L1 lies between Earth and moon, L2 lies behind the moon and L3 lies beyond Earth.

The main requirement of locating our colony is that it needs to be stable in the orbit where it has been located. This means our settlement needs a stable equilibrium position. The advantage of placing in L1 and L2 is availability of plenty of lunar resources, but these points are unstable because they are like that of a marble perched top of a bowling ball. Hence we require a huge amount of energy to make settlement stand stable in these points. As L3 is present in between Earth and Sun, it becomes very far for the lunar resources and L3 orbit is smaller when compared with the Earth's orbit, as its orbit is near to the Sun the gravitational pull of planet Venus will be very high and this may inculcate the stability of our settlement. And also placement in this point needs larger amount of energy same as that of L1 and L2.

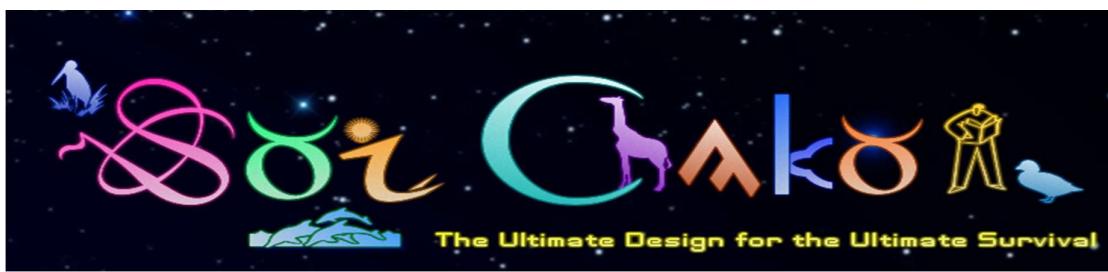
L4 and L5 are the points which are located symmetrically adjacently extending along with Moon and Earth. These points forms 60 degrees equilateral triangles with the Earth and Moon, these offers us a stable equilibrium.



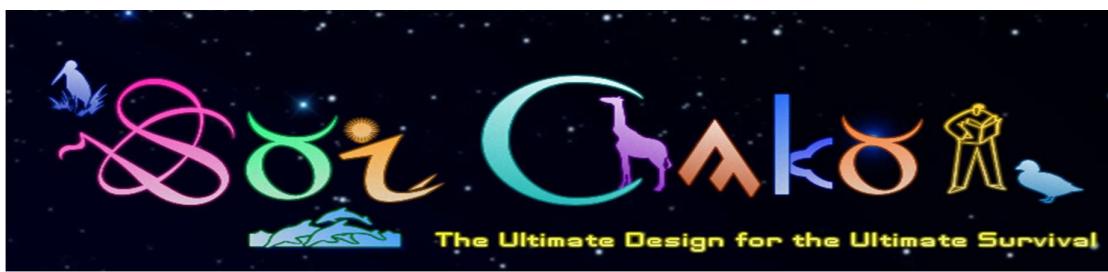


As we see the L4 and L5 are situated in kidney bean shaped Valleys. Even If small departures occurs L4 and L5 will have an effective restoring force which will bring back the settlement to original stable position and moreover both the points are equidistant from Earth and Moon, this makes our transportation and communication easy and also as these points are continuously exposed to sun, the uninterrupted solar energy is required as the whole settlement without this isinconceivable. Lunar base helps us to initiate the construction of our colony. And moreover L4 and L5 regions are favorable for placing industries which are needed forProcessing asteroids and lunar materials and also transit can be made in few days and even faster with a propulsion system as it is close to the Earth.

The one and only defect in L4 and L5 is presence of interplanetary dust which may abstract our colony. This problem can be solved by placing space cleaners. But L5 has huge amount of interplanetary dust compared to L4. So, this discussion brought us to conclude to place our settlement in L4.



STRUCTURAL ENGINEERING



EXTERNAL ENGINEERING

The external structure must be well engineered so that it could tolerate all adverse space conditions. It should be flawless and our symmetry shows stability. As we know the worthy (suitable) shapes for designing our colony are sphere, torus, cylinder and dumbbell.

Now we are here with "SriChakra" to construct such a settlement which residents could feel perfectly deserved for them. This also offers us wonder full natural views of space (Mars, Moon and beyond).

Our "Sri Chakra" comprises of principal axle (or) central cylinder, hemisphere, three equal radius tori and three chakras placed on top and one triangle.

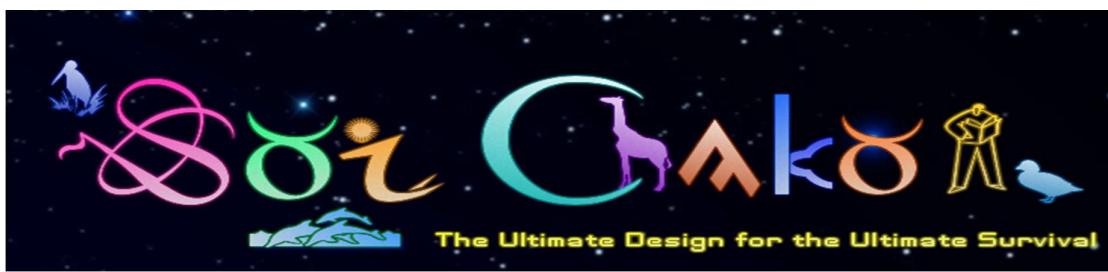
Sri Chakra has 8 levels of construction:-

LEVEL-1:-

SriChakra's construction begins with this principal axle. Firstly a cylinder is built in which (1/7) top part of cylinder is kept hollow for the purpose of '0'-gravity amusement. And rest of 6/7 part of cylinder is completely hollow which gives a perfect mechanical support for our Sri Chakra.

Five of spaceships assisted with pre auto programmed robots along with lunar sources reaches the construction spot and starts building up. The top most part of principal axle is incubated with hemisphere and used for docking system called Dochere. The next stage in level-1 is construction of spokes. This is done in six steps.

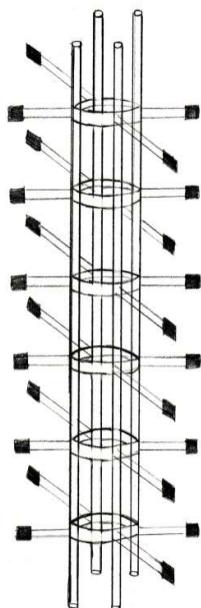




Four spokes are conjoined to the cylinder in such a way that they appear in cross mark. These spokes serve as a link between this principal axle and the torus. We are introducing maglev trains in these spokes for transportation.

With these steps the construction of our first level successfully completes providing major support for the furthermost construction.

LEVEL-2:



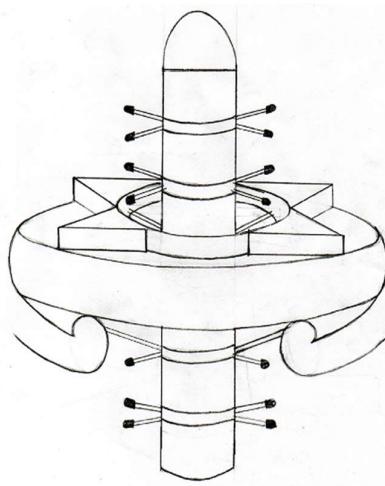
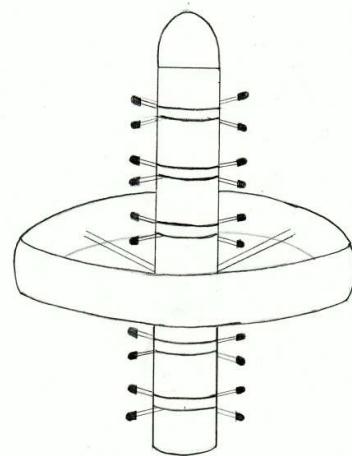
Here we need a mode of transport for carrying the material from Diochere to processing unit and then to construction spot. So we planned to lay a cage like structure (inner skeleton) inside the cylinder. And we will construct long elevation tubes which arise from underneath the dock and extend till bottom of cylinder.

These four tubes are laid in such a way that one is equidistant from its adjacent tube. As mentioned in level-1, six levels of spoke intersection points will be there from top to bottom of the principal axle. At these six intersection

points there will be six railway stations where the elevator and maglev trains meet. After this following step would be to extend the spokes at 4th intersection point.

LEVEL-3:-

This level consists of completion of industrial torus. The 4 spokes which are elongated in previous level need to be joined with a torus. This industrial torus serves as base in sort of processing all the material essential for further complete construction of our SriChakra.

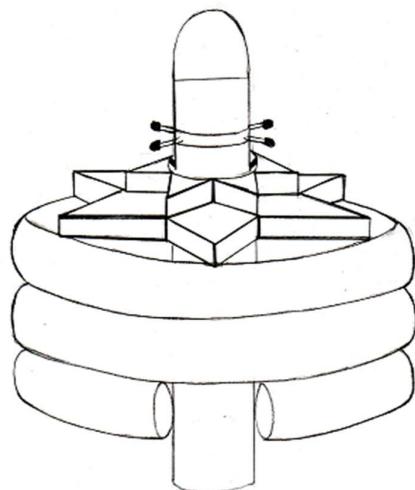
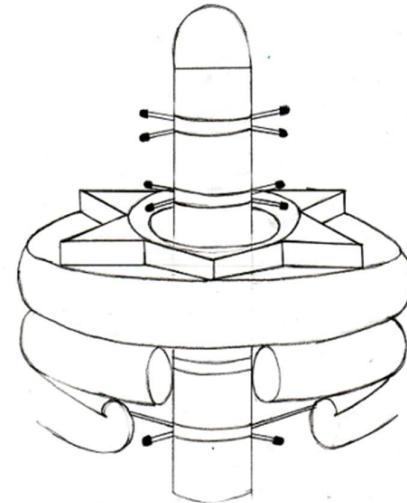


LEVEL-4:-

In this level the 4 spokes of 3rd intersection point and 2 spokes of 5th intersection point are elongated completely and construction of Chakra-A (C-A) and residential torus-A (RT-A) begins. As shown in figure this level ends with 2/3rd of completion of chakra-C and 25% completion of residential torus-A(RT-A).

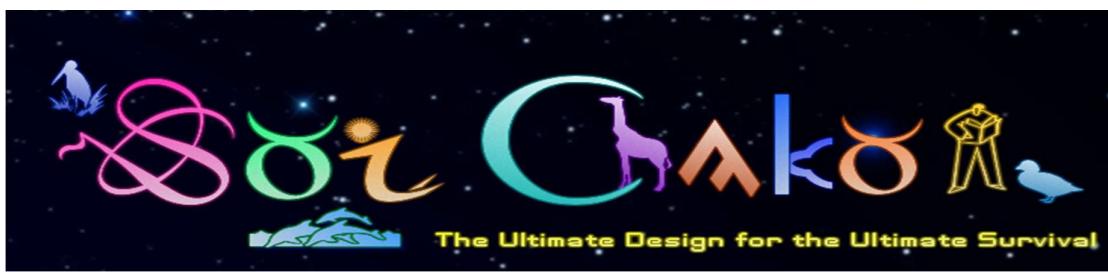
LEVEL-5:-

In this level another two spokes of residential torus-A (RT-A) will be elongated and along with that two spokes of 6th intersection point are also be elongated {as shown in figure}. This level completes 50% completion of residential torus-A (RT-A), 25% completion of residential torus-B (RT-B) and total completion of chakra-C.



LEVEL-6:-

In this level the elongation of another two spokes of residential torus-B (RT-B) and 4 spokes of chakra-B(C-B) will be done. As shown in figure this level completes the construction of residential torus-A (75%), residential torus-B (50%) and also of chakra B (100%).

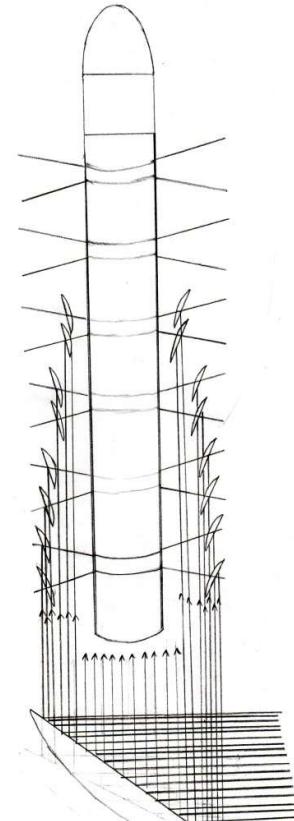


LEVEL-7

This level completes the construction of left over chakra-C (upper chakra).

Level - 8:-

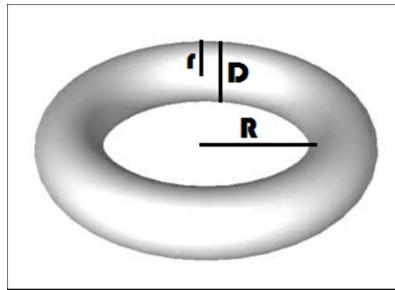
This phase includes placing of mirrors which provide us sunlight there by illuminating our whole colony. First & foremost thing we do is placing a giant mirror below our settlement at an inclination of 45° facing towards sun's side such that it reflects all the lights to our habitat. Internally mirrors are placed on every spoke. So the top planetarium directly gets sunlight as its walls are made of transparent material. By this we can completely illuminate natural sunlight.



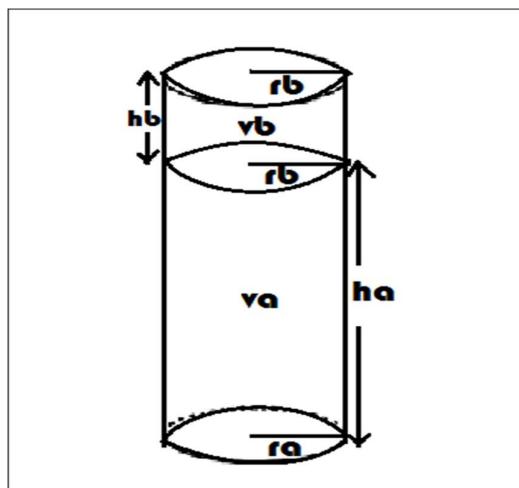
Brobdingnagian Dimensions

Torus:-

S.No	Factor	Symbol	Value	Unit
1	Major Radius	R	936	M
2	Diameter	D	528	M
3	Minor Radius	r	264	M
4	Total Area	A	9755270	m^2
5	Volume	V	1287700000	m^3
6	Total living Area (Lateral Surface)	A'	3121686.4	m^2



Central cylinder (or) principal axle:-



Hollow Cylinder:-

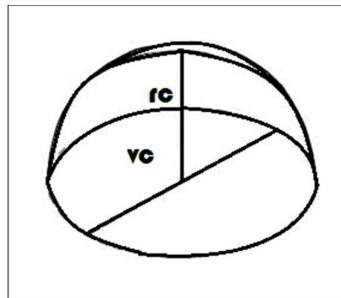
S.No	Factor	Symbol	Value	Unit
1.	Height	h_a	3168	M
2.	Radius	r_a	50	M
3.	Volume	v_a	24881400	m^3

Zero gravity chamber:-

S.No	Factor	Symbol	Value	Unit
1.	Height	h_b	528	M
2.	Radius	r_b	50	M

Hemisphere:-

S.No	Factor	Symbol	Value	Unit
1.	Radius	r_c	80	M
2.	Volume	v_c	7748266	m^3



Inner skeleton:-

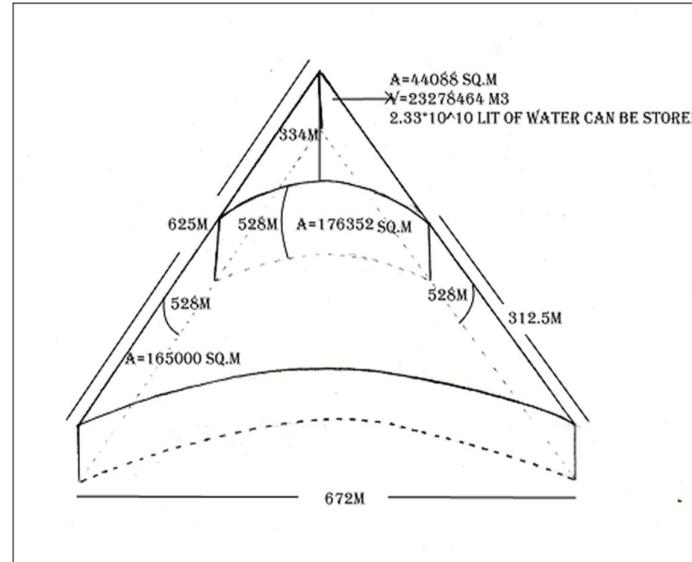
S.No	Factor	Symbol	Value	Unit
1.	Height	h_d	3696	M
2.	Distance between adjacent elevator	r_d	80	M

Chakras:-

i. Chakra-A (lower chakra)

Living area in one triangle = 506352 sq.

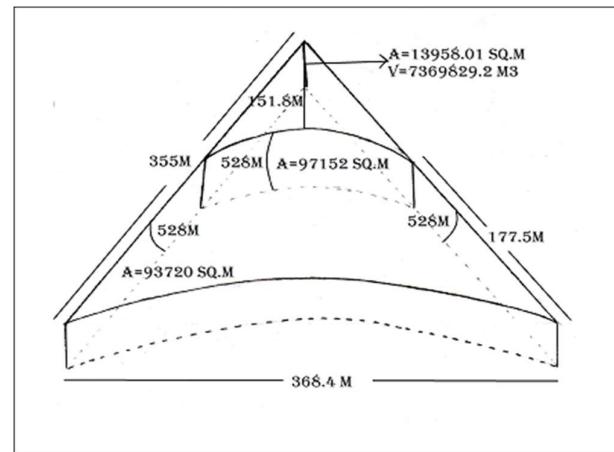
Total living area of Chakra-A
 $= 506352 \times 6$
 $= 3038112$ sq.



ii. Chakra-B (middle chakra)

Living area of one triangle = 284592 sq.

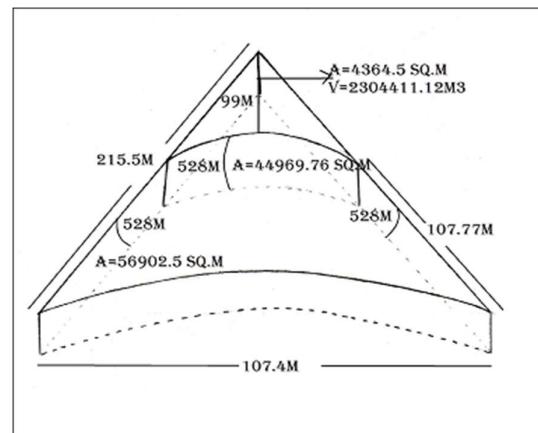
Total living area of Chakra-B
 $= 284592 \times 6 = 1707552$ sq.m

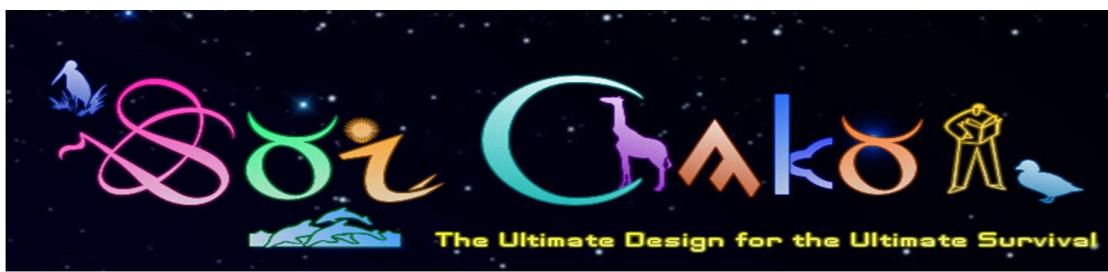


iii. Chakra -C (upper chakra)

Living area of one triangle = 158774 sq.m

Total living area of Chakra-C
 $= 158774 \times 6$
 $= 952644$ sq.m





Internal Engineering

“SriChakra”- as name depicts ours is a very interesting structure with huge mythological importance. Above calculation can show you that our colony provides a very large living area in which the inhabitants can survive comfortably even compared to Earth.

SriChakra will be built with applicating present advance science methods using our own way of style. A wonderful stream which passes through the midriff of the torus will become best way for means of transport and becomes an incredible ornament of our torus. This will make best natural views and create a fresh homely environment. We will also make fishing in small scale and maintains internal ecosystem flora and fauna. A well connected network of roads also makes our destiny reach more safe and secure. Coming to house design first and foremost thing we planned to do is providing the unique and best residence for our inhabitants.

Our rooms are well furnished and equipped will all domestic appliances needed. Well furnishing of our rooms will make it smart as we can use it multi purposely as desired. In this way we can accomodate more people in a small area.

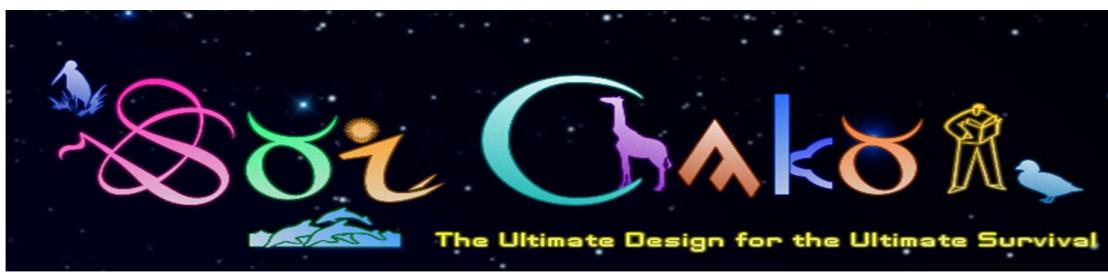
Allocation:-

As we mentioned earlier “SriChakra” comprises of one cylinder, one hemisphere, three chakras, three tori and one triangle.

- **Cylinder :-**

1/7th top part of cylinder is for '0' gravity amusement, whereas inner skeleton is for transportation.

- **Hemisphere: -** Hemisphere is for docking.



- **Chakras:-**

- i. **Chakra-A**

Chakra-A is totally allotted for research laboratories.

- ii. **Chakra-B**

Chakra-B is totally allotted for entertainment purpose. We are including six-unique picnic spots namely Ocean world, Bird sanctuary, Zoo, snow world, Forest resorts, and sports hub in six triangles in which the inhabitants can enjoy a lot like that on Earth.

- iii. **Chakra-C**

Chakra C is for Agriculture and Life stock, 4 triangles are for agriculture purpose and 2 triangles are for life stock.

- iv. **Upper triangle**

Upper is totally allotted for planetarium and micro-gravity amusement.

- **Industrial torus:-**This torus is completely allotted for industries.

- **Residential torus-A and residential torus-B:-**

These two tori are totally for the purpose of living. There are three types of houses in our colony. Private residences, dynamic towers and apartments.

Next step is to calculate the population of "SriChakra". We thought that construction of house in 225 sq. meters of area is enough for a family. Taking this as a base,

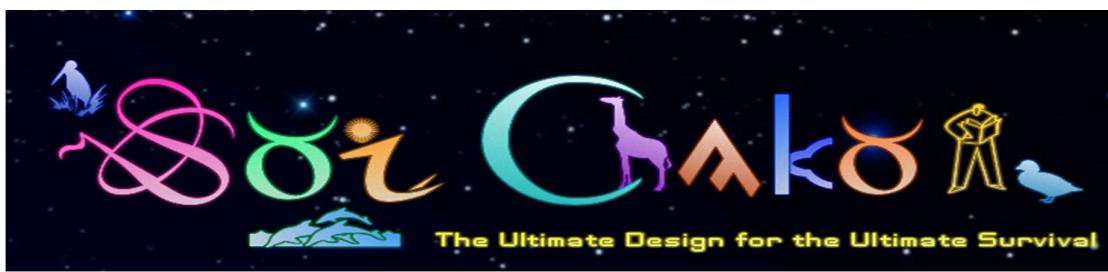
Calculation for single residential torus:

Total living area in single residential torus = 3121686 sq.m

- ◆ Area for main roads = 75360 sq.m
- ◆ Area for internal roads = 392892 sq.m
- ◆ Length of main water stream which passes through the center of the torus = 7500m

Width of main water stream = 15m

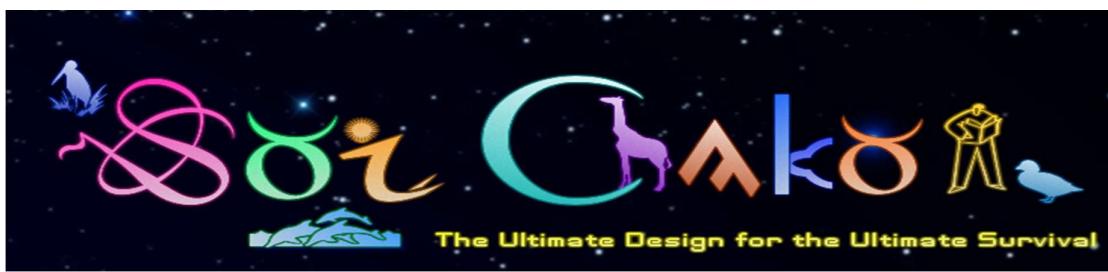
Area of main stream = 112500 sq.m



- ◆ Area for human life designing (schools, hospitals, shopping malls, parks, hotels, restaurants etc.,) = 663358 sq.
Remaining living are (for houses, dynamic towers and apartments) = 1877575 sq. m
- ◆ Total number of houses (as per remaining living area) = 8344

Hence, there will be 8344 houses. Exact half of these houses will be dynamic towers and apartments. i.e. 4172 dynamic towers and apartments. Each dynamic tower (or) apartment has 10 floors. One floor is for one family.

- ◆ Population in dynamic towers (or) apartments is
$$= 4172 \times 10 \times 4 = 166880$$
- ◆ Population in single residents = 4172×4
$$= 16688$$
- ◆ Population in one residential torus = $166880 + 16688$
$$= 183568$$
- ◆ Total population of "Sri Chakra" = 183568×2
$$= \mathbf{367136.}$$



CONSTRUCTION MATERIAL

We consider this as a very important part of the whole project. Without good construction material, the settlement would not stand strong for generations. Hence we have seriously searched for the construction materials, at last we found these materials which will make Srihakra even stronger and safer settlement.

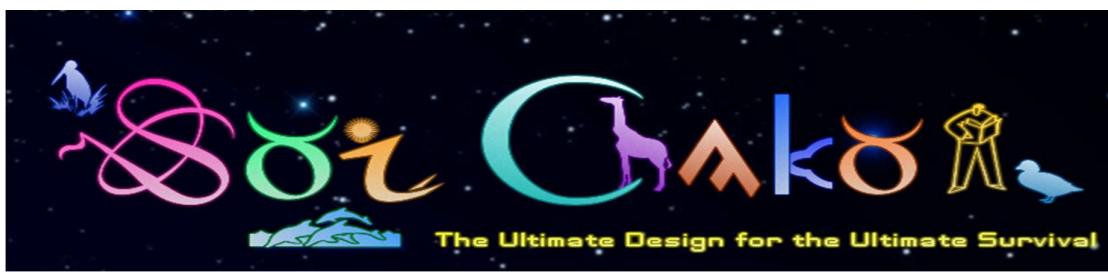
Hydrophobic Material

This material is made up of carbon nanotube array, silicon carbide and titanium carbide. Carbon nanotube array is a good water resistant material and combining these three materials will form a hydroscopic material. We can use this material in manufacturing pipes which can be useful for the underwater pipe line system. This material is also dust and water resistant.

Nafion

Nafion is a sulfonated tetrafluoride ethylene based fluoropolymer-copolymer discovered in the late 1960s by Walther Grot of DuPont. We can construct micro pellets out of this material, then it will function same as earth soil. More information about this material has been described in the chapter agriculture.

Remaining raw materials which are used in the construction of Sri Chakra are:



Material list

MATERIAL NAME	PROPERTY	TENSILE STRENGTH
Titanium	Stronger Lighter Corrosive resistant	-
Carbon nanotube	Huge tensile strength Very strong Resists huge temperature	64 Gpa
Boron nitride Nanotube	Very strong Resists huge temperature	33 Gpa
Polystyrene-polydimethylsiloxane-diblock-copolymer (PPSDC)	Provides protection against micro meteorites	10-50 Gpa
PICA-X	Heat protection	10 Gpa
Carbon tube array	Water resistant	325 Gpa
Silicon carbide & titanium carbide	Useful in making hydrophobic material	10Gpa & 60 Gpa
Aerogels	Very light material Good thermal insulator	-
Micro melt tough treated steel	Good strength	5.25 Gpa
Nafion	Serves as artificial soil	-
Super adobe	Very low thermal conductor High tensile strength Airlock security Resistant to solar radiation	-



Material application

1. Central cylinder or principal axle

First level in the construction of Sri Chakra involves central cylinder or principal axle. This is made up of carbon nanotubes, boron nitride nanotubes which are ultimately strong and tough and also PICA-X which protects from heat of sun rays. The spokes are also made up of these materials. Flowingly the hemisphere or the docking chamber is also constructed same as that of principal axle.

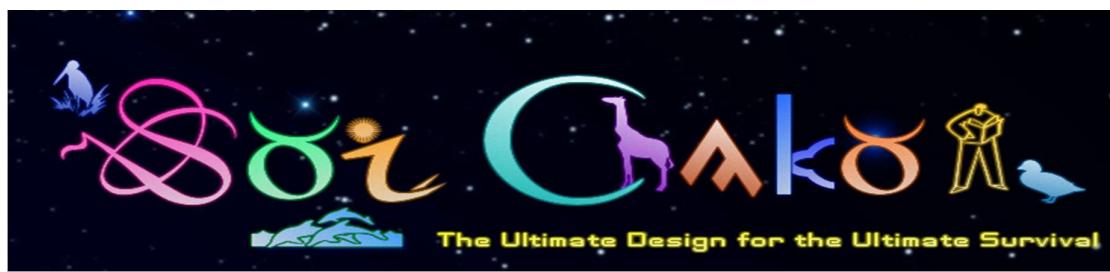
2. Torus

Half part of the outer torus is covered with solar panels whereas remaining half part which exposes to the sunlight that is reflected by the mirror placed below the settlement is covered with radiation protected windows. These windows stop the harmful radiation of sun and allow useful sunlight in to the torus which is very essential for the human survival.

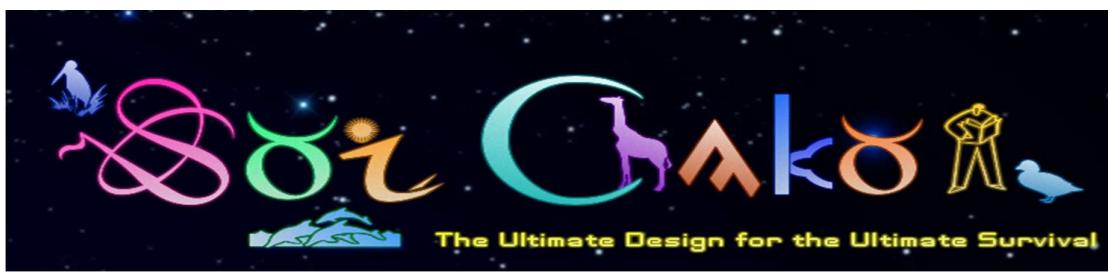
Next step in constructing the torus is floor base. Floor base has different layers of materials. Those layers are as follows

3. Chakra

The construction method of Chakra would be same as that of torus except that part of the triangles which is being used for water storage. This part of the triangles is made up of the transparent aluminum and quartz modules this is because uv-sunlight is useful to kill the bacteria in water so that healthy and fresh water is supplied all over the colony.



GRAVITY



Without gravity life cannot be sustainable. It is what holding us to our mother earth. Survival in less gravity area leads to many metabolic disorders like bone decalcification, harmonic imbalances, hypoglycemia, decrease in efficiency of immune system etc., Hence Sri Chakra must and should need artificial gravity (pseudo gravity) for the wellbeing of inhabitants.

For the generation of this pseudo gravity our settlement will be rotated around the principle axle. The centrifugal force stimulated by spinning of our settlement acts here as artificial (or) pseudo gravity which makes our settlement environment similar to Earth.

Calculation of gravity:-

Calculation of angular velocity (w):-

- Radius of the torus =1200m
- Required gravity =9.8 m/s²

$$9.8 = rw^2$$

$$w^2 = 9.8/1200$$

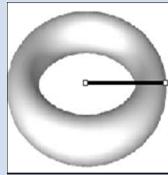
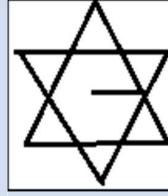
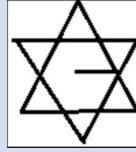
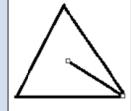
$$w^2 = 8.17 \times 10^{-3}$$

$$w = 8.17 \times 10^{-3}$$
$$= 0.00817$$

$$W = 0.091 \text{ rad/sec}$$

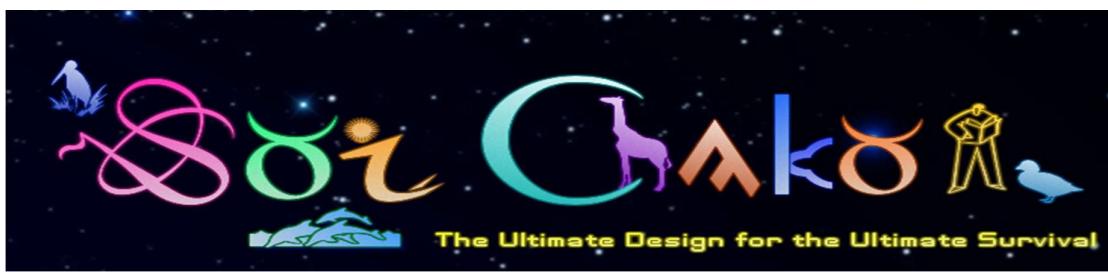
The formula used to change 'w' from 'rad/sec' to revolution per minute is

$$W = 60 \times w / 2 \pi$$
$$= 60 \times 0.091 / (2 \times 3.14)$$
$$= 0.869 \text{ rev/min}$$
$$= 0.87$$
$$W = 0.87 \text{ rpm}$$

NAME	VALUES	CALCULATION	USAGE
1.TORUS	 The distance from principal axle to end of torus is 1200m.	$a = rw^2$ $w = 0.091 \text{ rad/sec}$ $r = 1200 \text{ m}$ $a = 1200 * (0.91)^2$ $= 9.94 \text{ m/sec}^2$	This gravity is very much suitable for the inhabitants.
2. Chakra -A	 The distance from principal axle to center of chakra-c is 936m.	$a = rw^2$ $w = 0.091 \text{ rad/sec}$ $r = 936$ $a = 936 * (0.91)^2$ $= 7.75 \text{ m/sec}^2$	As crops are grown faster in less gravity, this gravity condition is suitable for agriculture.
3. Chakra -B	 The distance from principal axle to center of chakra-B is 520m.	$a = rw^2$ $w = 0.091 \text{ rad/sec}$ $r = 520$ $a = 520 * (0.91)^2$ $= 4.31 \text{ m/sec}^2$	Entertainment needs additional gravity for this gravity bars will be placed.
4. chakra -C	 The distance from principal axle to center of chakra-C is 269.4m.	$a = rw^2$ $w = 0.091 \text{ rad/sec}$ $r = 269.4$ $a = 269.4 * (0.91)^2$ $= 2.23 \text{ m/sec}^2$	Chakra-C also contains gravity bars.
5. Upper triangle	 The distance from principal axle and corner of triangle is 171.4.	The gravity in this triangle value for 1.4 to 0	This gravity is suitable for 'o'-gravity amusement and planetarium.



SCIENCE & TECHNOLOGY



“Technology should be like oxygen, ubiquitous, necessary and invisible”

- CHRIS LEHMANN

Mineral extraction:

The idea of constructing the space settlement originated from the problem of insufficient living area, reducing mineral resources, insufficient agriculture area on Earth. Construction of space settlement gave a better solution of providing living area and agriculture area, but the settlement also needs sources of minerals which continuously supplies adequate mineral resources to the colony.

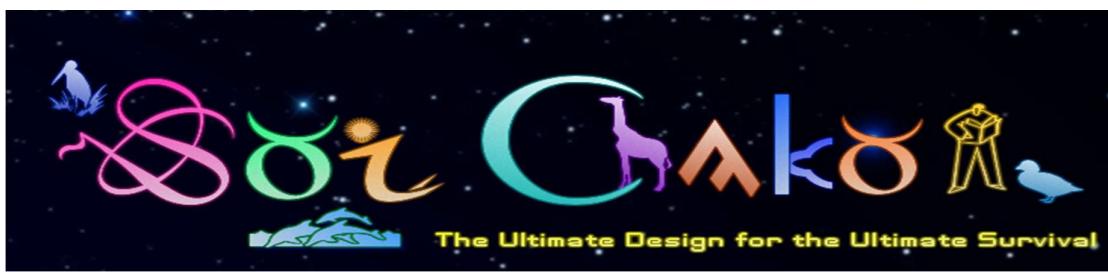
There are three sources which supply minerals resources in an adequate manner. They are:

- 1) The Earth
- 2) The Moon and
- 3) The Asteroids

Because of the problem of expensive transportation from Earth, in these three possibilities, we majorly concentrated upon lunar minerals and asteroidal minerals.

Lunar minerals:-

Moon is a significant reservoir of various untouched mineral resources. The highlands of moon consist of mineral “Anorthite” which is similar to the ore of bauxite from which aluminum can be produced. “Anorthite” is a mineral consisting of aluminum (Al), calcium (Ca), silicon (Si) and oxygen (O). The chemical formula of Anorthite is CaAl₂Si₂O₈. Aluminum is a particularly interesting lunar resource. It is a light weight material which can be used in building large structures rotating for artificial gravity. It acts as a good electrical conductor.



Aluminum mirrors are good reflectors. When atomized aluminum is burned in presence of oxygen it acts as a good fuel for the space shuttle solid boosters. Calcium is the fourth most abundant element in the lunar highlands. Calcium oxides and calcium silicates are useful for ceramics. Calcium metal is easily shaped and molded,

Machined, extruded into wire, pressed and hammered. In vacuum environment calcium becomes attractive. Lunar soil contains major composition of silicon and oxygen which are tremendously useful for the human existence. Silicon is used to make glass, solar panels, windows, photo voltaic cells, power plants, aerogels and oxygen is useful in life existence and also for the preparation of water we need oxygen.

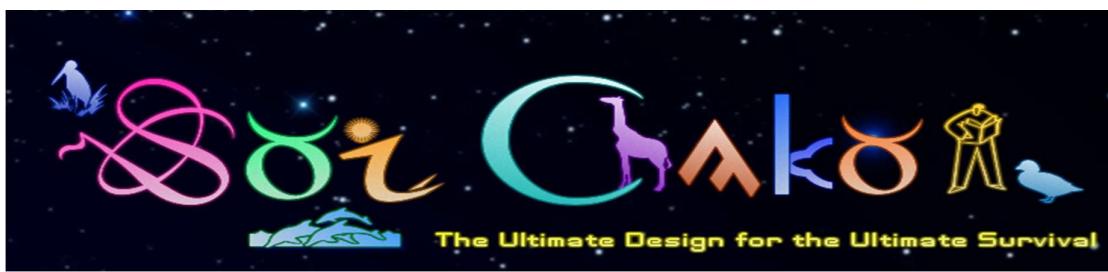
Construction of Sri Chakra also needs "Titanium", happily moon is a good reservoir of titanium. "Ilmenite" is considered to be a commercial ore for producing titanium. Titanium is a high strength metal offering more strength per unit weight than aluminum. Ilmenite minerals trap solar wind hydrogen from which we can produce hydrogen a rare element on moon.



Extraction:-

There are six methods in extracting lunar resources. They are:

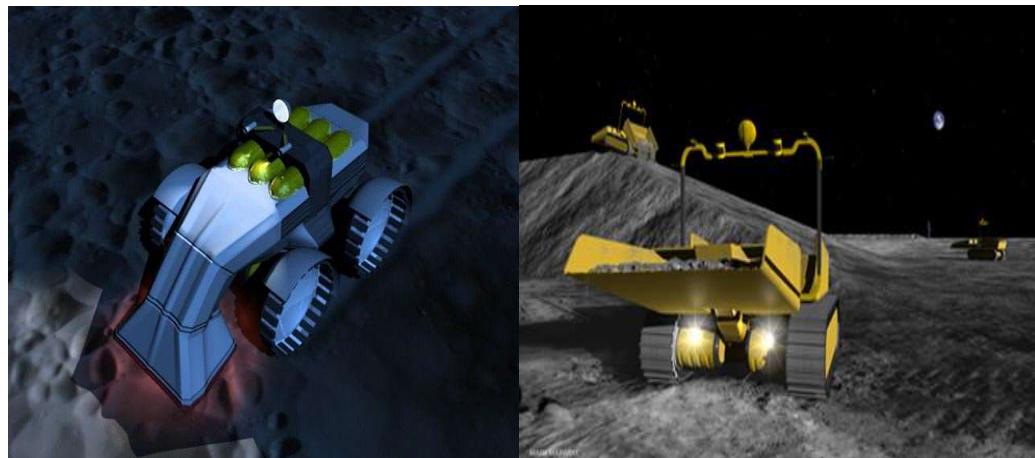
- Electrophoresis
- Electrolysis
- Pyro-Metallurgy
- Melt-quench-leach-process
- Thermal extraction and
- Magnetic separation

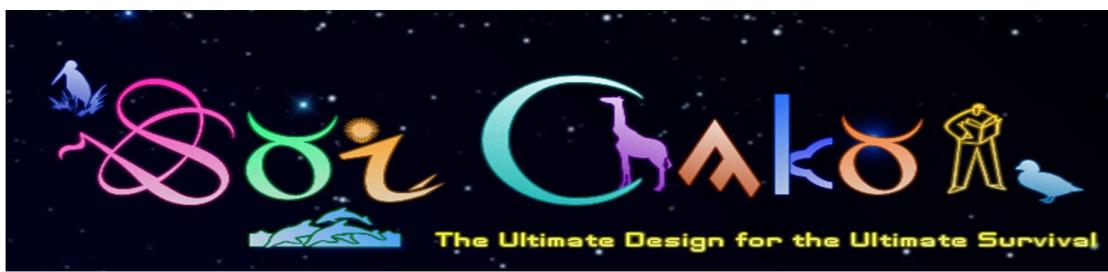


We use this six extraction methods in extracting the lunar minerals.

At first an industry will be constructed on the moon which includes research laboratory and material processing infrastructure. The engineers study about the lunar soil and order the excavation robots about mining. Robots are used for mining and also for transportation then the processed material is sent to the docking chamber then after it is sent to the industrial torus for further usage.

The advantages of selecting moon for mineral extraction are, it is very near to our colony for transportation and in combination with its small diameter it takes less than five percent as much energy to boost materials from the lunar surface, electromagnetic mass drivers powered by solar energy could provide low-cost transportation of lunar material to space construction sites, transporting material from the moon requires just 1/4th to 1/20th of the fuel need to loft material up from Earth's surface.





Asteroidal Minerals:-

"An Asteroid half the size of a football field could be worth more than a super bowl."

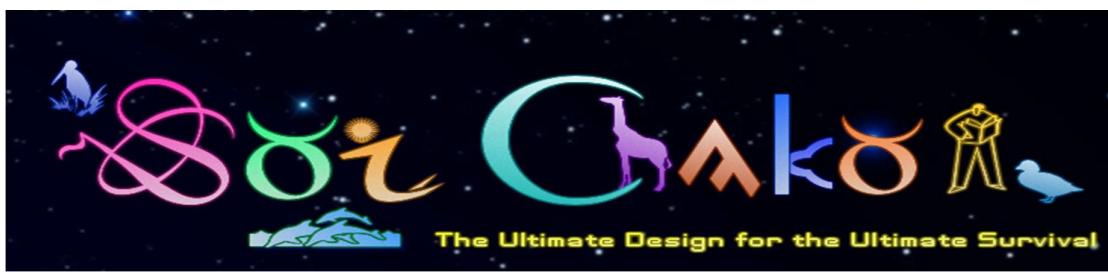
Asteroid mining refers to the possibility of exploiting raw materials from asteroids and other minor planets. Minerals and volatiles could be mined from an asteroid then taken back to our colony and use it for our necessity. This process of space exploration, using resources gathered while on a journey is referred to as In-Situ-Resource-Utilization. The idea of processing of asteroidal minerals in Space for the construction of high orbital habitats was first proposed by "O'Neil".

More than four billion years ago an incident of asteroid rains on earth has happened, these asteroids are huge reservoirs of precious materials like gold, platinum, titanium, cobalt, iron, manganese, molybdenum, nickel, osmium, palladium, rhenium, rhodium, ruthenium and tungsten. Earth's relatively stronger gravity pulled all heavy siderophilic elements into its crust. This incident serves as a good evidence that asteroids contain various types of minerals that are essential for economic and technological process.

Minerals like carbon, hydrogen, nitrogen and free metals which are scarcely available on moon can be abundantly available on some asteroids. Materials that could be mined are extracted include iron, nickel, titanium, water and oxygen. Titanium is used in construction whereas water and oxygen are the basic necessities of inhabitants. Not only water can be used for household purpose but also water contains building blocks for rocket fuel, we can be used for running space shuttles, mining vehiclesetc..

The asteroids mainly are of three types

- C-type
- S-type
- M-type



C-type asteroids:-

These asteroids contains minerals like organic carbon, phosphorous and some ingredients for fertilizer which could be used to grow food. C-type asteroids also have high abundance of water.

S-type asteroids:-

Minerals like nickel, cobalt, gold, platinum and rhodium are abundantly available on s-type asteroids.

M-type asteroids:-

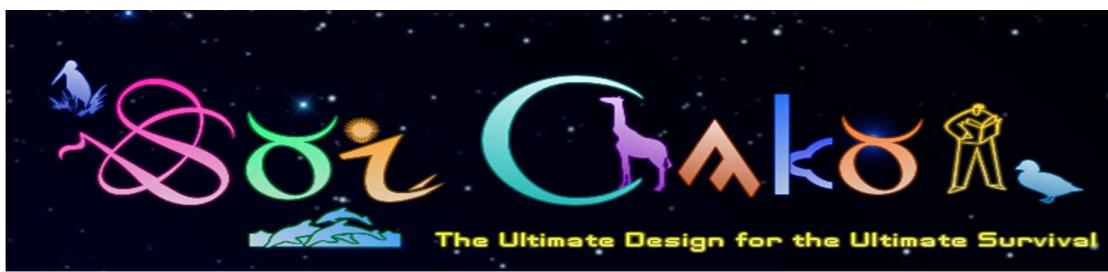
These asteroids contain up to ten times more metal than s-type. M-type asteroids are very rare.

Extraction:-

There are five methods of extracting minerals from asteroids. They are:

- Surface mining
- Shaft mining
- Magnetic rakes
- Heating
- Self-replicated machines

Research engineers work on the subject of mining on asteroids, selection of asteroids etc., And order the representative robots as a result asteroid mining vehicles are sent from the docking chamber to the asteroids on which mining has to be done. Another way of extracting the minerals is small telescopes called "Arkyd's" which will survey the field of asteroids and self-propelled Alkyd's fly out for a closer look at the best resource reservoirs, once we figure out which one to mine, landers set down and begin operations at the site. Once the asteroid is mined into small enough to capture, they are brought to the docking chamber then to the industrial torus for processing.



courtesy :Google images

There are some scientists who believe that an asteroid only an 150 feet wide could contain up to 130 billion dollars' worth of platinum group metals. This shows that asteroid mining is not only useful for the mineral extraction but also for the economic development of "SriChakra".

Research Laboratories

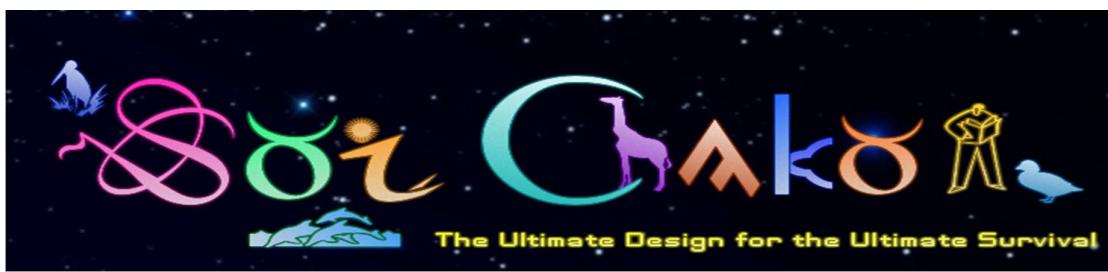
There are many scientists on Earth whose minds are filled with so many brilliant thoughts which can give rise to different inventions and discoveries. But many of them cannot fulfill their goals due to lack of good research platforms or research laboratories.

"Sri Chakra" offers a good platform to all these brilliant minds. "SriChakra" will provide unique research opportunities which will boost them up to the new inventions and discoveries on space survival.

These research opportunities will be in the fields of all sciences those are space-study, biology, chemistry, physics and mathematics.

Space research laboratory:

This laboratory is for space scientists who are interested in space study and space exploration. A gigantic telescope will be arranged which will take the exposures of celestial bodies of space. This telescope will be connected to the computers in the laboratory so that the scientists can look at the pictures that are taken from the gigantic telescope and study about them carefully.



This research laboratory is also useful in finding out the secrets in existence of Aliens on other planets, stars, heavenly bodies etc., and we can detect the dangers of our colony caused by other celestial bodies so that precautionary measures will be taken to protect the colony before danger befalls.

Bio Laboratory:-

Here in this laboratory the bio scientist research on the biological matter like plants, animals, environment etc., discovering new species of plants, flowers by the use of cross breeding method discovering new species of animals etc., is being done in this laboratory. Here scientists researches on human sustainability.

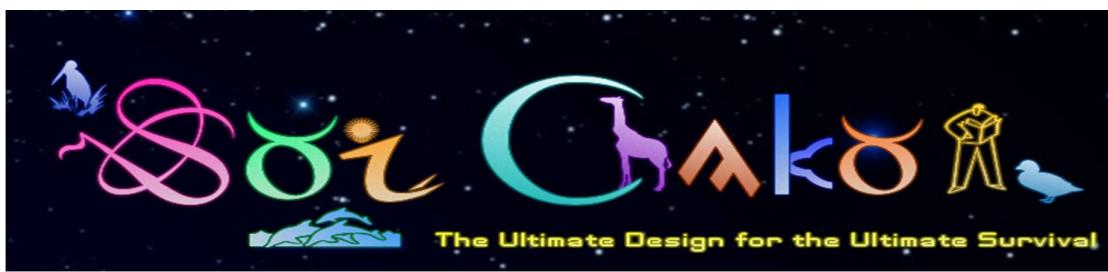
Now-a-days bio-technology occupied a crucial role in wars. Bio wars became even more powerful compared to nuclear wars. That's why bio-laboratory is very much important for the self-protection of "SriChakra".

Chemical laboratory:-

This laboratory deals with the study of all the chemicals. Invention of new materials or things relating to chemistry which will make the space survival more comfortable is being done in this laboratory. Not only this but also if any new diseases or health problems rises in our colony , a documentary is sent to the laboratory , scientists work on the problems and invent medicines which will cure the diseases. This laboratory also serves as a good platform for inventing new elements, gases etc.

Physical laboratory:-

Physics is the king of sciences. Inventions and discoveries relating to machines and engineering will be encouraged in this laboratory. Scientists study about the gravity, motion of other planetary objects, motion of our colony etc., and update all the information time to time in the computers. This will help in the future development of "Sri Chakra".



Mathematical laboratory:-

Solving problems, proofs for important theorems, creating new mathematical methods for solving problems, creating puzzles, games with numbers etc., will be encouraged in this laboratory.

Investigation laboratory:-

Cases which are not solved by the cops in the police stations are sent to this laboratory. Detectives study the crime cases and reveals the history behind them and they will send a documentary on each case to the cops so that no criminal can't escape from the hands of law.

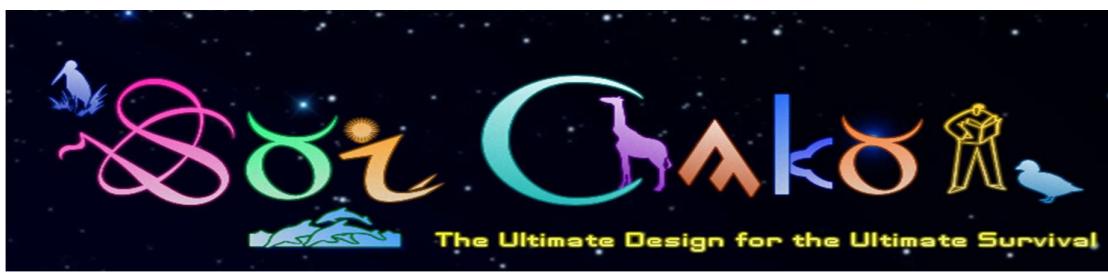
Students are allowed to all these laboratories so that they can inspire by looking at the scientists and their inventions in different fields of science and this will also push their limits of understanding all the things which give rise to unimaginable thoughts.

ROBOTS

“Man can make mistakes but a machine cannot”.

“Robots are physical agents that perform tasks by manipulating the physical world. They are equipped with sensors to perceive their environment and effectors to assert physical forces on it.

As we already mentioned that space survival is not an easy task to do, life in space is very machinery and ordered. But to reduce this insecure feeling we are creating an earthly environment in our colony. All the inhabitants in this colony has their own work to complete, in this situation no inhabitant wish to waste his/her time in doing purposeless works. This is where robots have to interfere. If once they are programmed with these works robots can efficiently and enthusiastically complete their works more accurately than human beings.



This is the list of various types of robots which are being used in "Sri Chakra".

- Construction robots
- Household robots
- Agriculture robots
- Transport robots
- Medical robots
- Lunar mining robots
- Asteroid mining robots
- Repairing robots

Construction robots:-

Construction of buildings, roads, bridges etc., Needs lot of time and labor intensive. Bringing labors from Earth to space for the purpose of construction is a stupid idea and this is also waste of time and expensive too. Placing robots here can save two most valuable things-time and money.

These robots have the capacity to carry heavy materials, windows, delicate glasses, pipes and other construction material without breaking any one of them. And also using human beings for construction is also very dangerous, some of them can lose their lives during construction of buildings. To eradicate this, robot mechanization is very important.

Household robots:-

This robots make ease the efforts of inhabitants and provide enough time for recreation and relaxation. These robots are programmed with different types of domestic works like cooking, cleaning, washing, carrying things, looking after the old ones in the house, babysitting, and garbage chuck out, gardening, giving first-aid, entertaining and for security purpose.

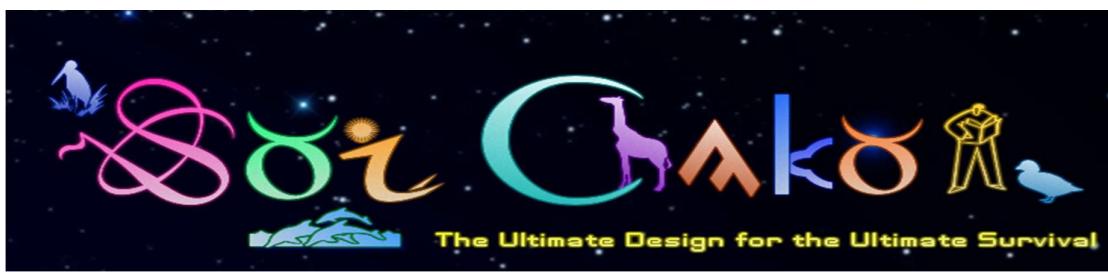


- Every member in the family has a unique taste of food. No two members wish to eat same kind of food. To satisfy their needs these robots are programmed with all the popular dishes on earth. Inhabitants can choose their required dish then the robot starts cooking and serves hotly. As the settlement is pollution free, in the place of LPG stoves induction stoves play their role in cooking food.
- Cleaning involves cleaning utensils, floors, roofs, furniture, windows, infrastructure etc.,
- Washing clothes is one of the works that most of the people don't like to do. These robots collect the used clothes from house and separate them according to their fabrics then rinse the clothes. After drying they iron all the clothes and set them up in the cupboards.
- Carrying things like vegetables, groceries, home furniture and other heavy matter is being executed by these robots.
- Looking after the old ones in the house, babysitting, garbage chuck out, gardening, giving first-aid, entertaining and security are the additional functions programmed in these robots.

Each family is provided with one household robot.

Agriculture robots:-

These robots are placed in the agriculture torus, and these are controlled manually. Gravity in agriculture torus is somewhat different compared to the residential torus, this is an advantage that less gravity atmosphere is very much suitable for the speed and healthy crop yield. That's why robots accomplish the agriculture tasks in this torus.



Medical robots:-

These robots are of different types. The large ones in the operation theatres are used to make surgeries. The robots in the hospitals follow doctor's orders like dressing the wounds, checking B.P and temperature of the patient, injecting saline and other. Last ones are the first-aid robots which hurry to the accident prone areas and treat the person who met with an accident. This one's save the life of the inhabitants before losing their lives.

Transport robots:-

Transport system involves space shuttles, trains, buses, taxis, two wheelers etc., drivers are required to run these vehicles in 24/7 manner. This is the reason for the interference of robots in transport system. These robots are programmed with all the traffic rules and GPS service.

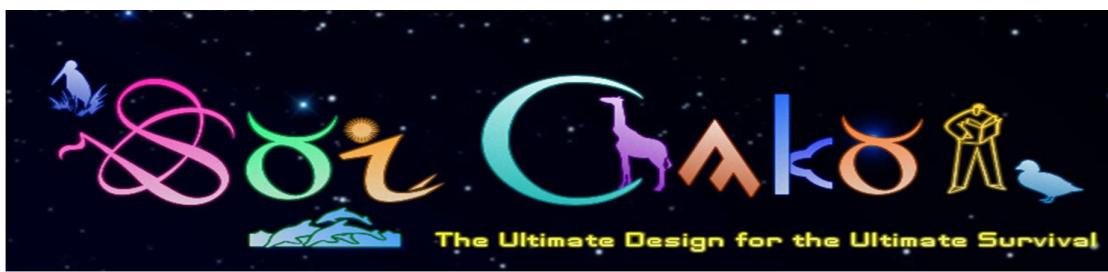
Lunar mining robots:-

Lunar mining is the major source in obtaining minerals for the construction and industrial purpose. Mining on moon cannot be done manually. These robots have the capacity to mine in adverse gravity conditions and also to carry the heavy loads from mining place to the factory. Their work is explained in the chapter mineral extraction-lunar mining.

Asteroid mining robots:-

These robots have the capacity to mine the moving asteroids and getting valuable minerals.





Gadgets – Nanotechnology

Nanotechnology is the manipulation of matter on an atomic, molecular and super molecular scale. The earliest, wide spread description of nanotechnology referred to the particular technological goal of precisely manipulating atoms and molecules for fabrication of macro scale products, also now referred to as molecular nanotechnology. A more generalized description of nanotechnology was subsequently established by the national nanotechnology initiative, which defines nanotechnology as the manipulation of matter with at least one dimension sized from 1 to 100 nanometers.

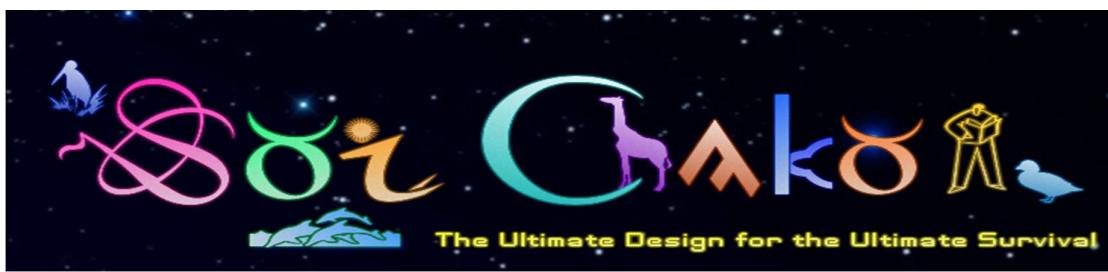
Gadget refers to a device or control that is very useful for a particular job or work. Now, in this modern era nanotechnology is playing a major role in the working of these gadgets. Over the past few decades, the scientists and engineers are seeking to develop this technology in order to produce the gadgets or things which conserve the energy, work smartly and also in other aspects.

People in the fields of science and engineering have already begun developing ways of utilizing nanotechnology for the development of consumer products. Benefits already observed from the design of these products are an increased efficiency of lighting capacity, and a decrease in the amount of pollution from the use of energy benefits such as these will give the research in nanotechnology a top priority.

Applications of Nanotechnology

There are so many gadgets in which applications of nanotechnology are included. But describing each of them doesn't make any sense, hence we decided to concentrate on some gadgets which conserve energy and also separate our settlement.

In order to make the next leap forward from the current generation of technology, scientists and engineers have been developing energy applications of nanotechnology.



These are some energy applications of nanotechnology.

Conserve-Nano water cooling cycle

This is a product which uses Nanoscale polymer membranes to increase the efficiency of heating and cooling systems. This product is being developed by the Dais Analytic Corporation, and this design is proved to be a remunerative design. The polymer membranes are specially engineered like pores which doesn't allow air to pass through them, but allow moisture to pass.

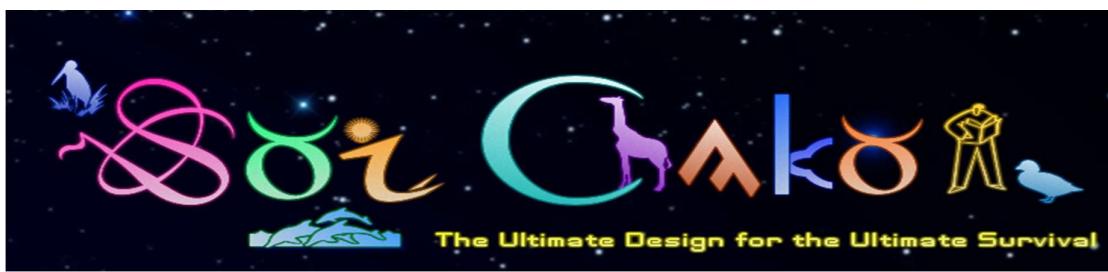
This device pretreats the incoming fresh air to a building using the energy found in the exhaust air steam using no moving parts to lower the energy. Nano air uses only water and this specially engineered membrane helps to cool and dehumidify the air. Any of the chlorofluoro-carbon producing gases are not used in this device, this is totally pollution free and energy consumption of this device is also very less.

Nano air is a completely new cooling cycle which replaces the refrigerant based cooling system the world has known for the past 100 years. This device can be used in all markets- consumer, commercial, industrial and government products.

LED Bulbs

These bulbs uses LED technology to generate light. LEDs use only 10% energy compared to the energy utilization of incandescent or fluorescent bulb. And these bulbs also lasts much longer.

White LEDs consist of semi conducting organic layers that are only about 100nm in distance with each other. These organic layers are placed between two electrodes, which create an anode and a cathode. When voltage is given to this system that means when electricity is passed through these layers it emits light. This process is called electroluminescence. This system allow only minimum amount of energy to generate light, this is because of the semi conducting properties of the organic layers.



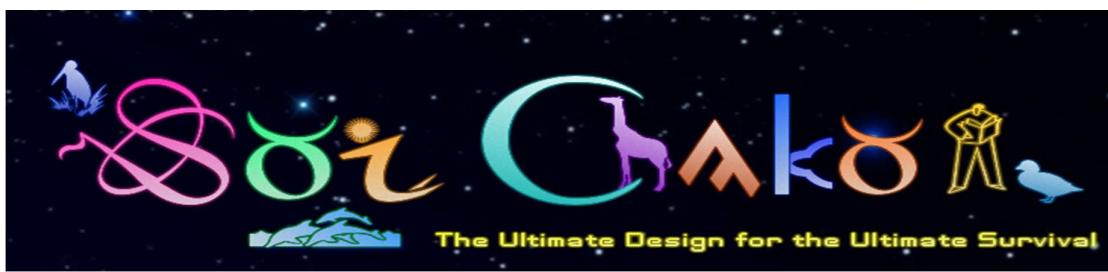
Scientists are striving to create new batteries which lasts much longer and also conserves energy in an appreciable manner.

These are some of the special energy conserving gadgets which are given to the inhabitants of our settlement. And another gadget which we mostly concentrated upon is the **“Electronic Display Bucky Paper”**

Electronic Display Bucky Paper

Bucky paper is an arrangement of carbon nanotubes. The nanotubes are approximately 50,000 times thinner than a human hair. Originally, it was fabricated as a way to handle carbon nanotubes. Bucky paper is one tenth the weight yet potentially 500 times stronger than steel. These carbon nanotubes can be arranged to enhance specific properties like ultimate strength and flexibility, electro conductivity, heat dissipation and water resistant. This paper can be used in various purposes. This one paper can play the role of a super tab. We can watch videos, listen music, make calls or receive calls, send messages or receive messages, take photos, watch weather report and news and also we can see calendar.





Each inhabitant is provided with one Bucky paper in our colony. This paper saves the valuable time of the inhabitants and easy to carry also.

These special smart gadgets separate Sri Chakra from other colonies and give it a special name in science and technology.

Protection:-

Not only building a settlement with most advanced engineering and providing survival facilities, is important but also its protection also has huge priority for its stability and validity.

Protection involves external and internal.

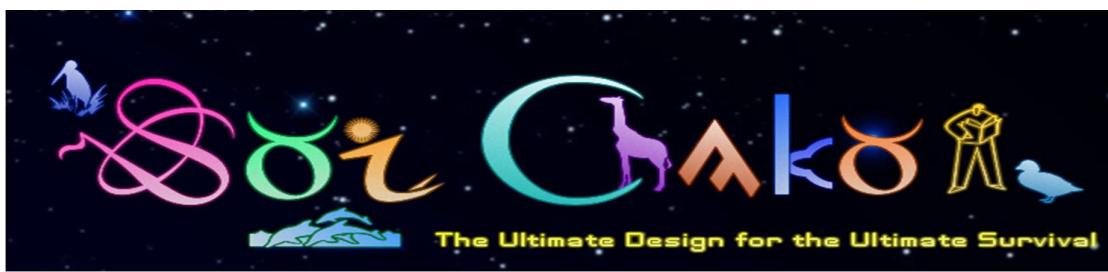
External protection:-

The problems we came across in external protection are

- From solar radiation
- From celestial bodies like asteroids and meteoroids and also very small sized particles.

From solar radiation:-

Even though sun light is very important for the survival of human beings, animals and plants, it also contains harmful rays like x-rays, gamma rays, UV-rays all together known as cosmic rays. These rays consists of very high energy particles which can interact with metals and generate a storm of secondary radiation particles scattered out of metal atoms. Metal shield like aluminum can themselves turn lethal when hit by this cosmic rays. The only way to protect settlement from this harmful rays is to provide a sufficient thickness of matter for them to be solved down. This can be done either by using soil (or) water. That's why we are using eight layers of materials namely nafion, aerogel, electrical wiring, again aerogel layer, hydrophobic water pipes, PUCA-X, polystyrene-polydimethyl-siloxane-diblock-copolymer(PPSDC), and titanium. At last this titanium layer is covered with solar panels.



This effective radiation shield will definitely protect our inhabitants from cosmic rays.

But sunlight is the major need for natural light, plant growth, vitamin-D, killing bacteria etc., Hence we are allowing some sort of sunlight by placing a big mirror at the down of our settlement and radiation protected windows will be placed at the areas which are exposed by this reflected sunlight. These windows are made up of different layers of glasses which stop harmful rays and allow useful rays.





From asteroids, micro meteoroids and other small sized celestial bodies:-

Earth has magnetic field around it which redirects and removes most of the celestial bodies like small asteroids and meteoroids which enters into its atmosphere. In the same way our settlement also needs amagnetic field to protect it from the asteroids, micro-Metroid and other small bodies. This can be created by using electromagnetic property in which electric current is passed through a wire and this wire is rolled to a rod. This system creates magnetic field. The rods are spread all over the boundary walls of the settlement in such a way that they do not interfere the communication system.

This electromagnetic field protects "Sri Chakra" from the attack of these bodies and also from the harmful cosmic rays.

Addition to this the sensors and radars will detect if any asteroid approaches near to our settlement and the information is sent to the chief control system and after emergency measures will be taken whether to move inhabitants to safe places or to change the orbit of the settlement until the asteroid passes away. If asteroid mining is successfully implemented there will be no need to worry about this problem of asteroid attack. And the material which we have used in the construction of floor base namely PPSDC will provide safe protection against micro-meteoroid. This is because of unique property of this material that is it will break the incoming particles into smaller corpuscles which will reduce the damage.

Internal protection:-

As mentioned earlier each house is provided with a robot and this robot also guards the house. So there is no need to worry about thieves. Locking and unlocking the doors will be totally computerized, fingerprint and eye recognition is compulsory. Sri Chakra cops will be in duty all the time. Day and night they will guard the settlement.

The main circuit boards of each house are also computerized. If short circuit takes place the power supply will be automatically cut off in that area. And also if any fire accident takes place the fire alarms signal, the information is sent to the fire station. Fire extinguishers will be provided to reduce the damage.

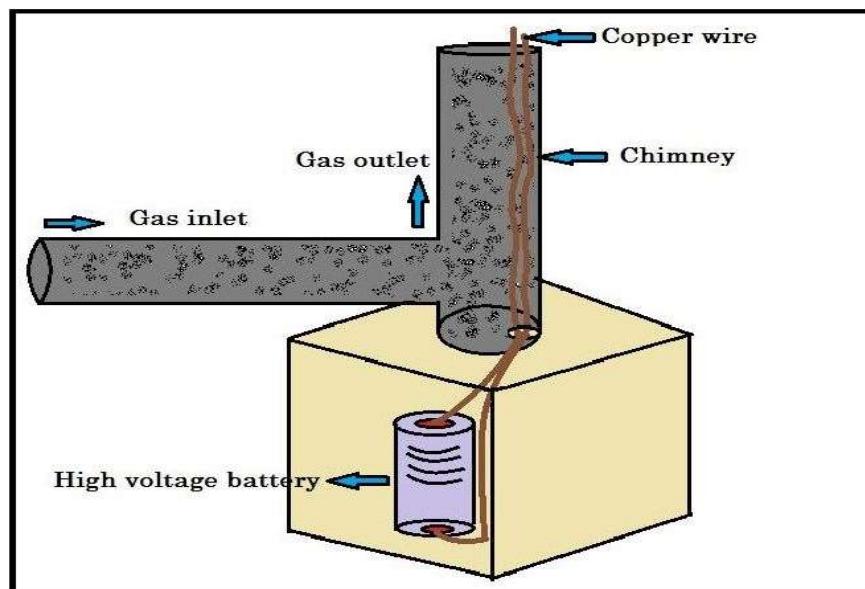
We have mentioned that Sri Chakra is a pollution free settlement. The inhabitants in our settlement will not be affected by any pollution. Fresh air, fresh water and fresh food is being supplied all over the colony.

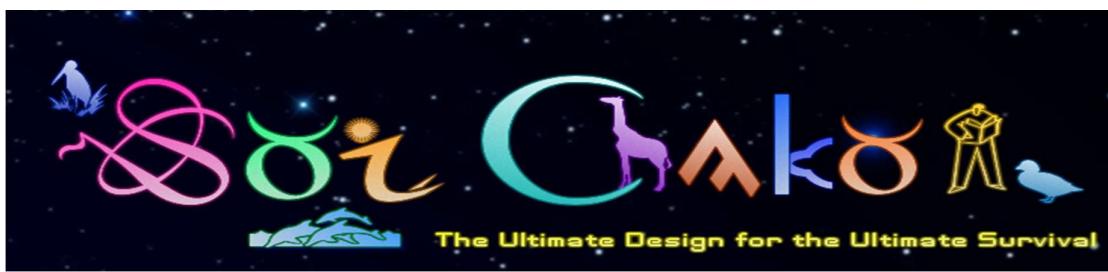
Carbon dioxide releasing vehicles are not being used in our settlement and for cooking purpose we are using electric stoves in the place of gas stoves. But the only problem is with industries. Harmful gases are being released by the chimneys and this gases will pollute the air. To prevent this we are introducing a new device. That is pollution controlling chimney.

Pollution controlling chimney:-

This chimney works on a principle that is, when copper wire is provided with high voltage it acquires a unique property of absorbing carbon dioxide gas. Basing on this property pollution controlling chimney has created. The apparatus required to create this system is copper wire and high voltage facility. Based on the proportion of gas released by the industry the bulkiness of the copper wire will be decided. If the gas release is more copper wire will be more bulky. This copper wire is inserted into the chimney and high voltage of electricity is supplied to the wire then it absorbs the pollution causing gas. It will help in preventing air pollution caused by the industrial chimneys.

This device will be introduced in all the industries of "Sri Chakra".





LIFE SUPPORTING FACTORS



AGRICULTURE

In order to maintain the balancing level of oxygen and carbon-di-oxide in our settlement and to create a well-developed eco-system for "SriChakra" we need a stabilized and optimal life support system that depending on composing of wastages in environment and by using harmful rays (UV-radiation) from sunlight that is Agriculture which can maintain easily we desired atmosphere in our settlement.

Agriculture system have more advantages in our settlement:-

- Releasing of renewed oxygen
- Decrement of carbon-di-oxide and
- Leading to make better medicines

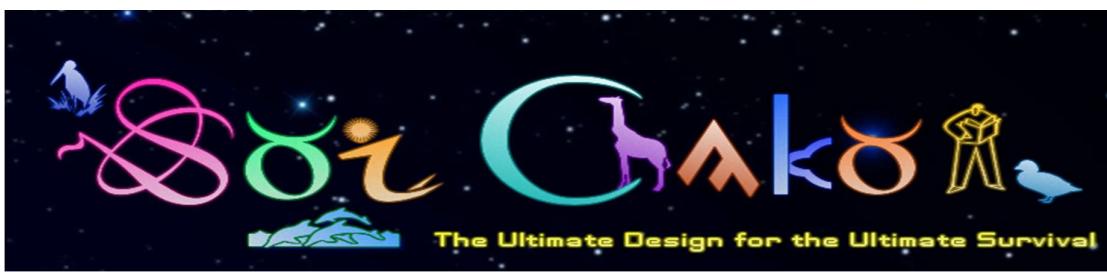
The present agriculture techniques are inefficient as crops require a lot of space to grow, also need lot of soil that is fertile and rich in nutrients, and also needs continuous supply of large amount of water. Bringing soil from Earth or recreating it as a chamber on the space settlement is expensive, so another system of growing plants needed to be devised.

After participating in the "Plants in space" project organized by NASA we became aware of the way plants grow in microgravity, therefore we know that the crops on Sri Chakra will be placed in a 1 g area of triangle in order to provide conditions similar to those on earth.

Placement:-

As mentioned already the total agriculture will be done in four triangles of chakra-A.

Four techniques (or) methods are being used in Sri Chakra for growing plants, namely



1. Genetic Engineering
2. Hydroponics
3. Aeroponics
4. Geponics

Genetic Engineering:-

Genetic engineering has expanded the genes available to breeders to utilize in creating desired gremlins for new crops. Increased durability, nutritional content, insect and virus resistance and herbicide tolerance are a few of the attributes bred into crops through genetic engineering.

Advantages:-

Applications of genetic engineering is the creation and use of genetically modified crops or genetically modified organisms, which are used to produce genetically modified food and materials with diverse uses.

The genetic engineering of agricultural crops can increase the growth rates and resistance to different diseases caused by pathogens and parasites. This is beneficial as it can greatly increase the production of food sources with the usage of fewer resources that would be required to host the Sri Chakra's growing populations. These modified crops would also reduce the usage of chemicals, such as fertilizers and pesticides, and therefore decrease the severity and frequency of the damages produced by these chemical pollutions.

Process:

The form of genetic engineering involves inserting new genetic material randomly within the host genome plant. This technique allows new genetic material to be inserted at a specific location in the host genome or generate mutations at desired genomic loci capable of knocking out endogenous genes. The technique of gene targeting uses homologous recombination to Target desired changes to a specific endogenous gene. This tends to occur at a



relatively low frequency in plants and animals and generally requires the use of selectable markers. The frequency of gene targeting can be greatly enhanced with the use of engineered nucleases such as zinc finger nucleases, engineered homing endonucleases, or nucleases created from TAL (Transcription Activator-Like) effectors. In addition to enhancing gene targeting, engineered nucleases can also be used to introduce mutations at endogenous genes that generate a gene knockout.

Hydroponics:-

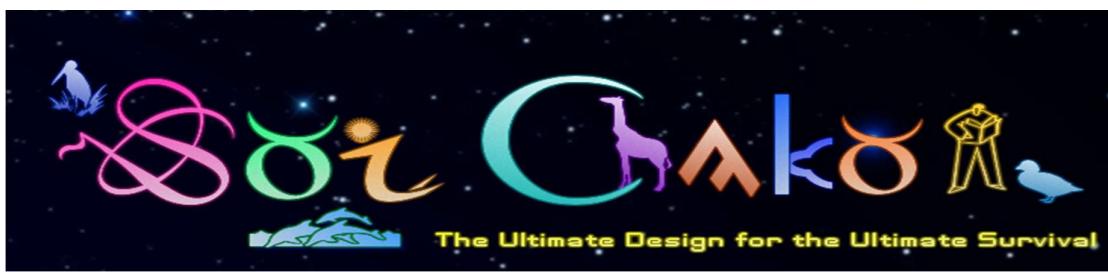
The term hydroponics originates from the ancient Greek "hydros," meaning water, and "pones," meaning work. Hydroponics is a branch of agriculture where plants are grown without the use of soil and only by using in the limit of 1 kg of water and 8 mg of air for a plant clip.

If we've ever placed a plant clipping into a glass of water in the hopes that it will develop roots, and grow as a plant. The nutrients that the plants normally derive from the soil are simply dissolved into water instead, and depending on the type of hydroponic system used, the plant's roots are suspended in, flooded with or misted with the nutrient solution so that the plant can derive the elements it needs for growth.

Hydroponics offers some significant benefits over traditional farming:

Hydroponics could be key to the future of space exploration. The benefits of hydroponics in space are two-fold: It offers the potential for a larger variety of food, and it provides a biological aspect, called a bio regenerative life support system. This simply means that as the plants grow, they will absorb carbon dioxide and stale air and provide renewed oxygen through the plant's natural growing process.

- First, hydroponics offers people the ability to grow food in places where traditional agriculture simply isn't possible.
- Hydroponic systems allow recycling and reuse of water and nutrient solutions, and the fact that no water is wasted.



Requirements:-

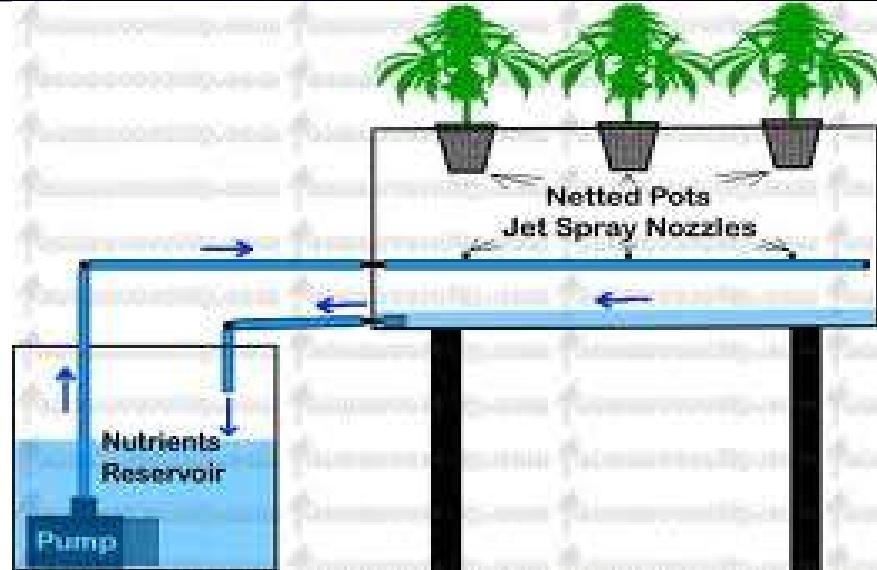
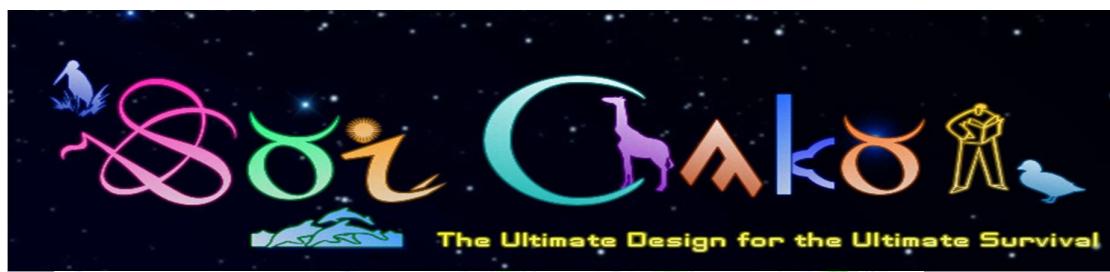
Hydroponics systems require only around 10% of the water that soil-based agriculture requires. This is due to the fact that this can have quite an impact on areas where water is scarce. Similarly, hydroponics requires little or no pesticides and only around 25 percent of the nutrients and fertilizers required of soil-based plants.

One of the most important and often overlooked elements to creating a successful hydroponic growing system is the lighting. Naturally, Plants require a constant supply of energy to grow and this energy comes from light (the plants receive from the sun) by the process photosynthesis. The light from the sun also influences other processes in the plant such as flowering, seed germination, certain growth stages and pigment production.

Nutrients:-

Plants also required micro-nutrients to grow in this process are:

Nitrogen, Iron, Magnesium(Mg^{2+}), Potassium(K^{+}), Phosphorus, Sulphur, Chlorine, Calcium(Ca^{2+}), Zinc, Copper, Manganese, Boron, Nickel and NO_3^- (nitrate), SO_4^{2-} (sulfate), and $H_2PO_4^-$ (di-hydrogen phosphate) etc..



Courtesy: Google images

Process:

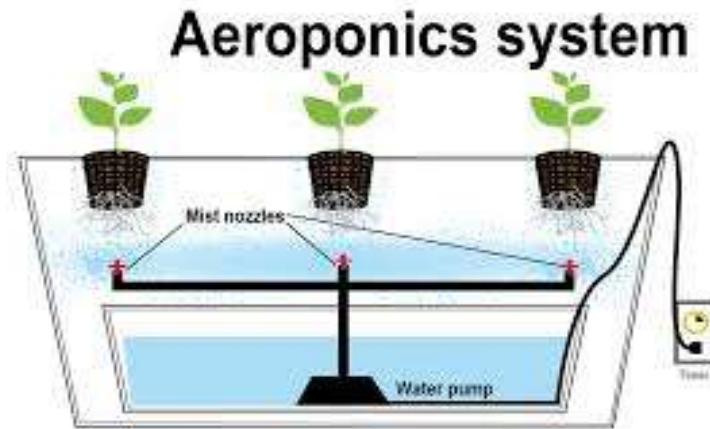
The plants are purely grown in water based solution which contains essential minerals for development of crops. The plants are half kept in water inside the tank and the floating platform will hold the basket within the plants. Plants produce roots themselves in water by utilizing the nutrients and grow successfully. We are arranging the air pump in bottom of the tank to oxygenate required minerals into nutrient solution.

Hydroponics method can be used to grow any vegetables, fruits, flowering plants and herbs which are useful for seasoning and health purposes.

Aeroponics:-

The word "aeroponic" is derived from the Greek meanings of aero air and pones working. Aeroponic culture differs from both conventional hydroponics, aquaponics, and in-vitro (plant tissue culture) growing.

This is the one of the most technical methods in agriculture system that the process of growing plants in an air or mist environment without the use of soil or an aggregate medium (known as geoponics). Unlike hydroponics, which uses a liquid nutrient solution as a growing medium and essential minerals to sustain plant growth; aeroponics is conducted without a growing medium. Because water is used in aeroponics to transmit nutrients, it is sometimes considered a type of hydroponics.

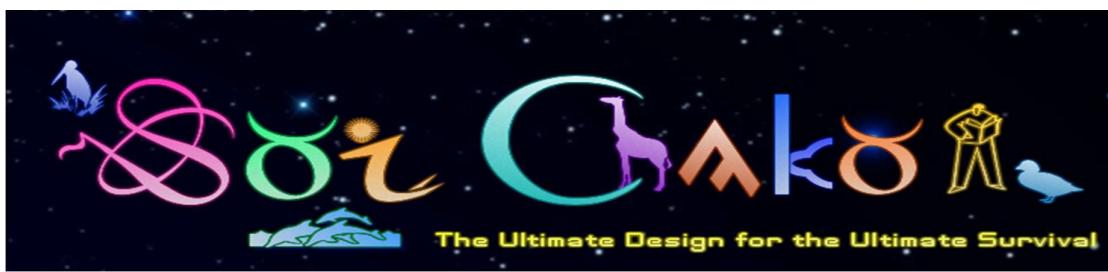


Courtesy: Google images

Advantages:-

Excellent aeration is the main advantage of aeroponics. The advantage of aeroponics is that suspended aeroponic plants receive 100% of the available oxygen and carbon dioxide to the roots zone, stems, and leaves, thus accelerating biomass growth and reducing rooting times.

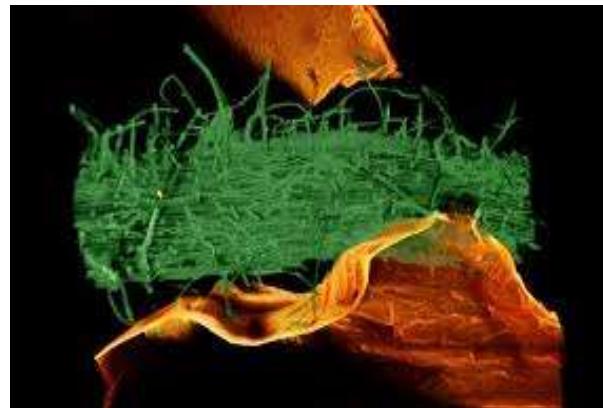
Aeroponics uses 65% less water than hydroponics. Aeroponics proved that the grown plants require $\frac{1}{4}$ the nutrient input compared to hydroponics. Unlike hydroponically grown plants, aeroponically grown plants will not suffer transplant shock when transplanted to soil, and offers growers the ability to reduce the spread of disease and pathogens.



Geponics:-

Cultivation of plants using artificial soil that is made out of naftion referred to be Geponics. This artificial soil is composed of naftion along with non-toxic polymeric gel, formed by mixing polyacrylamide co-polymer and water. And also zeolites would be additionally added to these components.

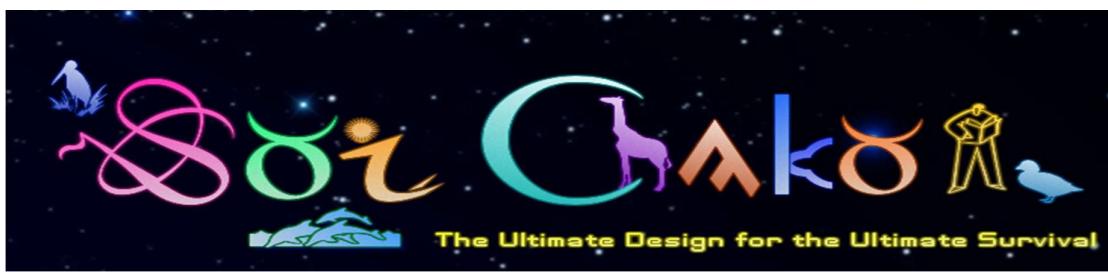
Plants which can be grown using this method are wheat, nuts, and maize, pulses and fruit trees.



Livestock, Poultry & Fish

As mentioned above, almost all the nutrient rich foods are being cultivated in Sri Chakra in order to provide a healthy diet, but human body also needs proteins which we gain by consuming meat. For this maintenance of poultry and fish is required. Not only meat but also we need so many products in our daily life that are coming from animals like milk, eggs, wool, leather and even dung of animals can be used as manure.

The animals that are included in poultry are cows, buffaloes, sheep's, goats, pigs, hens and other poultry birds. And fishes will be salmon and tuna. The gametes of these animals are



being brought from earth and they will be fused to develop the number of animals. Fresh grass and health food will be cultivated by aeroponics and hydroponics methods and grazed to the animals.

Robots will take care of these animals under the surveillance of human control. The remaining two triangles in the agriculture torus will be allotted for poultry and fish.

Additional to these Sri Chakra also needs animals in the forest resorts and zoo parks. These animals serve to be good profit for our settlement in tourism same as in poultry the number of these animals will be controlled by fusing their gametes another most important aspect is that all these animals should be balanced in both the animal existing areas if not their number may increases enormously which effects the balancing system of the settlement. Hence they will be under surveillance all the time.

Environment Control

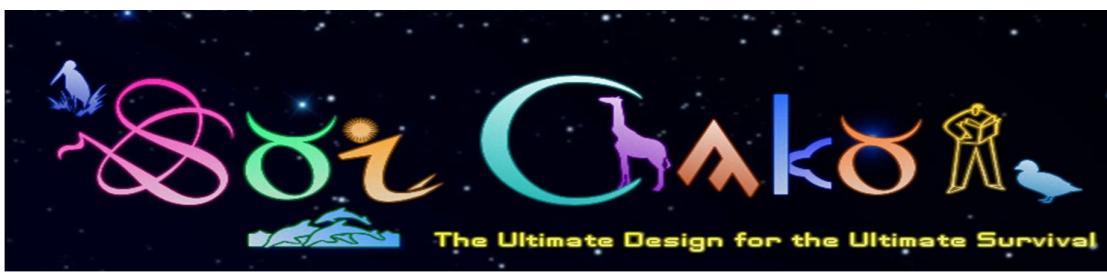
Introduction

Our settlement will be largely self-sufficient, and will have a simplified self-sustaining biosphere. Its economy mostly depends on mining, potential trade between the Earth and the Moon, the construction, maintenance, and operation of satellites, the manufacture of special materials, and possibly the construction of other orbital colonies. We will create the natural biological cycles in atmosphere to make it like homely earth, biosphere.

Three major sources of raw materials were considered: the Moon, the Earth, and nearby asteroids.

The moon is main potential source of raw materials.

Lunar regolith contains some useful ores, in particularly TiO_2 and FeO . However, the ore quality is not as high as that of some



Asteroids, and the moon is almost totally without volatiles. Recently, water ice has been discovered on the moon, but its precise quantity is unknown, and the moon is still without any known good supplies of Carbon, nitrogen, and helium. With an inert anode and suitable cathode, direct electrolysis (no supporting electrolyte) of the molten silicate is carried out, resulting in production of molten metallic products at the cathode and oxygen gas at the anode.

Building a self-sustained orbital colony is a great challenge that requires the combined knowledge of physics, engineering, math, chemistry, and biology. The biology involved in the construction of the colony is one of the major factors that would impact the design and functioning of the station.

This biological problem is anything but easy. So many things in space are different from that on earth. So much hypothesizing was made to derive a general formula for surviving in a space colony. Unfortunately, due to the fact that there are many things in biology that we do not understand fully even on earth, many of the hypotheses may be wrong since many aspects of the problem are overlooked.

The topics that we decided to look into are the atmosphere, O₂ production, water production, water and waste management including the environment of the colony and the maintenance of our self-sufficient biosphere.

ATMOSPHERE

As we see space astronauts maintain perfect atmospheric parameters before conducting any short term trip. We will create bio atmospheric cycle in particular bio regenerative system. We need meticulous parameters of atmospheric pressure, composition and perfect ratios. We need to create all essential requirement as we are building a permanent habitat. Changing composition of atmosphere affects both regional air quality and global climate Oxygen is vital for our existence. And also how important is atmospheric nitrogen? Organic or 'fixed' nitrogen is a vital micro nutrient for plants and prevents fire accidents. Ofcourse this atmospheric nitrogen can be fixed from bacteria through the natural process or either artificially. That is why there will be some nitrogen in the colonies atmosphere as that which exists on earth. Of course bacteria will be needed to fix the nitrogen,



but they will come with the trees and soil that will finally be shipped onto the colony in necessary cases. This way, money can be saved, especially from the money that will be spent to ship the gases. The other reason why we wanted to have some nitrogen in the atmosphere is that cutting it off completely would make an air leak in the colony potentially disastrous. However, having less nitrogen will lower the atmospheric pressure, and it may be a problem for human breathing. Fortunately, our body is not affected by atmospheric pressure; it is affected by how much oxygen is available. This is determined by oxygen's partial pressure. For safety reasons, we decided that we will have a pressure of 380 torr (about 7.35 psi) in our colony, the partial pressure of oxygen being 155 torr (3 psi), and the partial pressure of nitrogen being 225 torr (4.35 psi). This way, not only will a leak be less threatening, but also people can have comfortable time breathing -- the minimum pressure necessary for breathing is 114 torr (2.2 psi). In addition, we can also lessen the structural strain by containing this pressure of 380 torr pressure as opposed to 760 torr. The lower the pressure, the lower the mechanical stresses on structural systems. This allows the use of thinner membranes and lighter cable nets, exponentially reducing the costs and logistic difficulties inherent in the construction of any space habitat to be made. By reducing the amount of nitrogen, the percent composition of oxygen will rise. We may think it think that the colony is very likely to burn. Yet this is not true at all. Just like our lungs, fire depends only on how much oxygen is present in a certain volume during a certain time - the partial pressure of oxygen. Therefore, fires within the colony will not be any worse than those on earth.

The emissions monitoring and control devices in place at ecomaine are second to none. Some of the devices we use to make sure our air is clean include an electrostatic precipitator and expensive injections of carbon, urea, and lime slurry. The effectiveness of these methods is carefully measured by staff and by independent specialists.



Residential torus atmospheric gases:

Gas	Proportion
Nitrogen(N ₂)	78.08%
Oxygen(O ₂)	20.59%
Argon	0.94%
Carbon-dioxide(CO ₂)	0.03%
Other	0.36%

Agriculture torus atmospheric gases

Gas	Proportion
Oxygen(O ₂)	20.05%
Nitrogen(N ₂)	77.54%
Argon(Ar)	0.5%
Carbon-dioxide(CO ₂)	0.8%
Other	1.11%

Illumination & Day and Night Cycle :-

Sunlight is the most important and basic need for every living thing. Without natural light our life becomes artificial. Living in a closed box where even sunlight could not enter means only living, not surviving. Our aim is to provide all survival needs to our inhabitants not living needs. Our habitants should feel free and earth like on "Sri Chakra". Hence natural sunlight is allowed into our settlement through radiation protected windows. This light is totally radiation free, no inhabitant will suffer from UV-radiation or any other radiation from this sunlight.



Day and night cycle on Sri Chakra will be same as that on earth. 12 hours day and 12 hours night will make inhabitants comfortable for their daily routine.

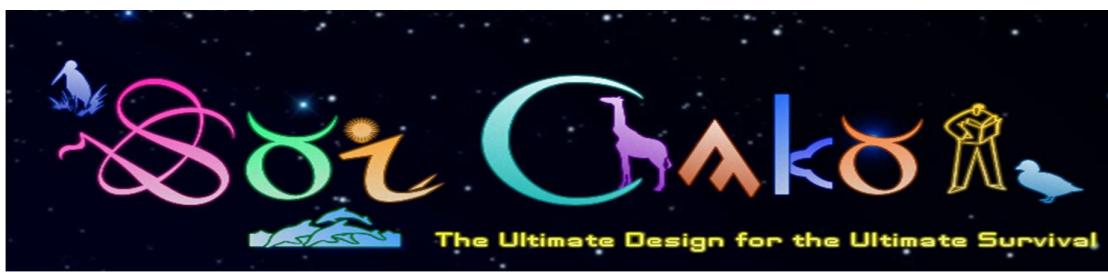
Emplacement of Sri Chakra is in L4. L4 is the place where we get unlimited solar energy. Hence to maintain the day and night cycle, we are providing illumination shutters for windows. These shutters are arranged on the surface of the windows internally in such a way that for every 12 hours these shutters will be automatically closed and opened. Seasons will also be controlled using illumination shutters.

KALPAVRUKSH (THE SUPER TREE):-

According to Indian mythology "Kalpavruksh" is a super tree which gives anything that we wishes to give. The basic needs that are required for human survival are oxygen, food and water. Here in our settlement we are placing artificial trees that maintain temperature, humidity & pressure provides artificial breeze, controls atmospheric gases supplies water and food.

The mechanism of these tasks will be in following manner. The total height of the tree will be 6 m. Stem of the tree is divided into 3 parts. Top most part is for production of oxygen, artificial breeze, humidity, pressure and atmospheric gases control. The branches of the tree is covered with artificial leafs. These leafs use sunlight and water to produce oxygen and hydrogen. Down to these branches, fan will be arranged. So, that cool breeze is spread out along with oxygen and Hydrogen. And down to these fans the gadgets will be arranged that are used to control atmospheric gases proportion.

Middle part of the stem is for water supply. If the pedestrians who are passing through the trees are thirsty and they need drinking water, simply they have to go near to the tree and they have to swipe their access card and select water or cool drink , whatever they are needed. Then after a water bottle or cool drink bottle will come out in the way cash comes from the ATM machine.

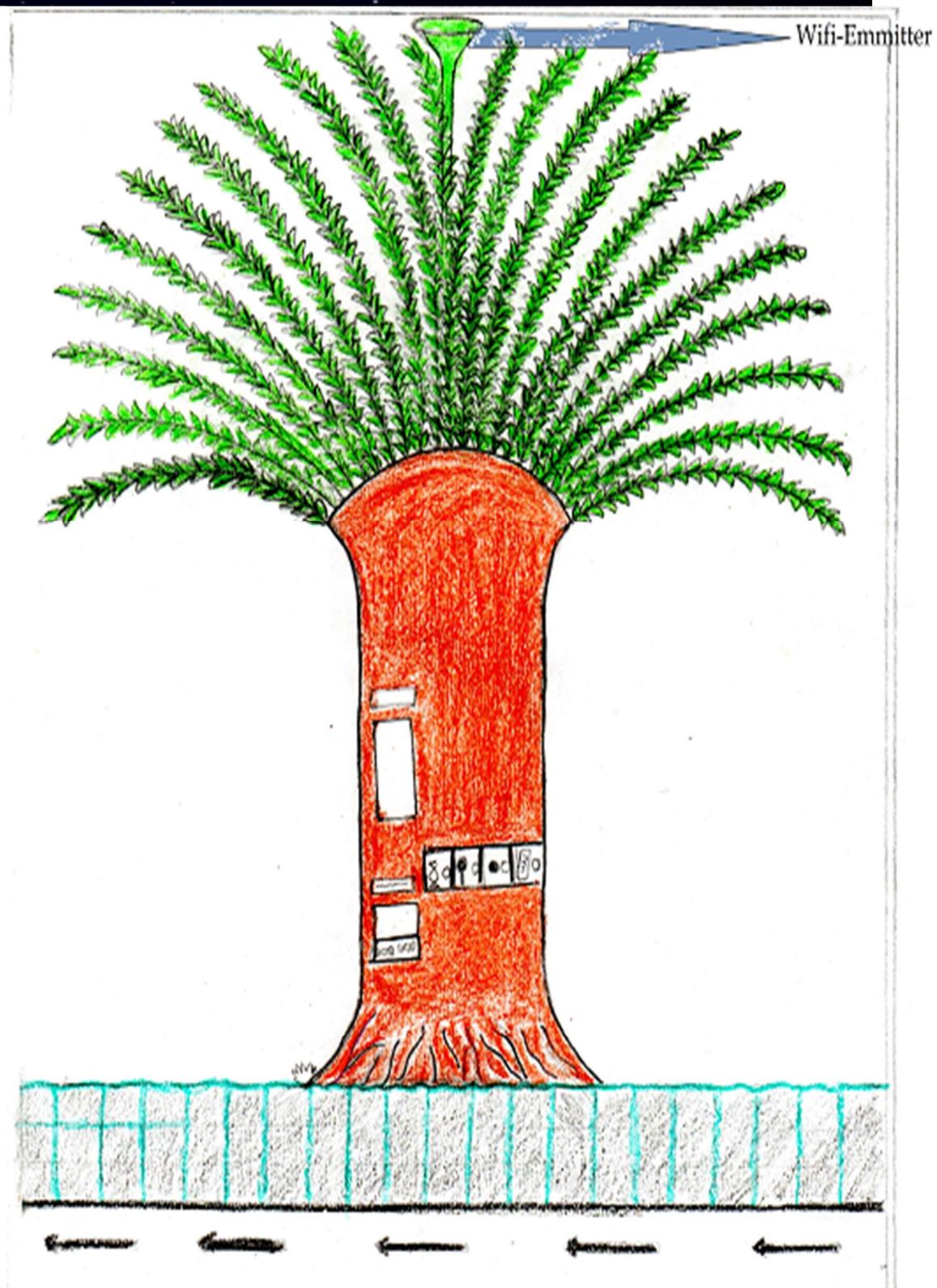


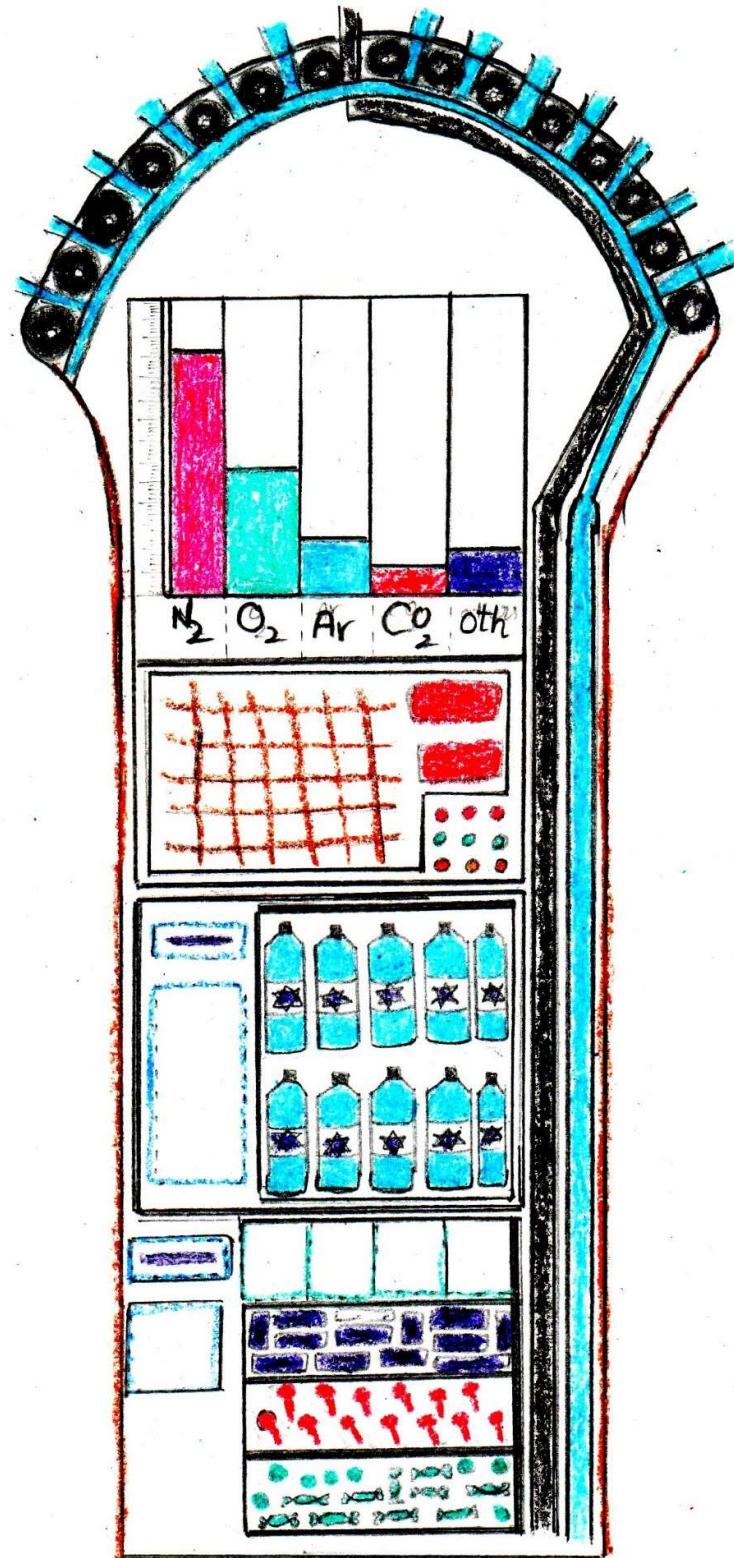
Third part of the stem is for food supply. Food in the sense here we are placing chocolates instead of any bacteria containing foods. Same access card swiping system is used to get chocolates. Refrigeration system will be installed inside the system. By this the nearby passing pedestrians enjoy their walk by eating cool chocolates. Four types of chocolates will be there in the system, they are cad berries, lollipop, candy and peppermints.

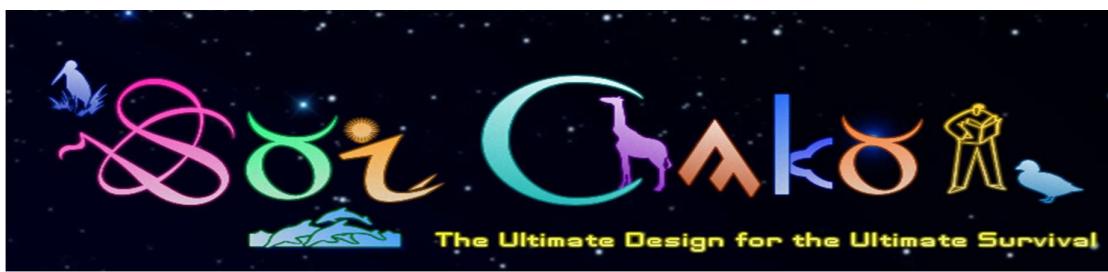
Additional to these a Wi-Fi emitting antenna is also placed in the branches and LED lights will also be arranged on the branches for the lighting in night time.

All the factors are totally made this tree to be a super tree known as "Kalpavruksh".

1. .Atmospheric gases control
2. Temperature and Pressure
3. .Artificial breezes
4. .Water
5. .Food
6. .Wi-Fi Emitter
7. .LED Lights
8. .Good look







Oxygen generation

Oxygen has most importance as habitat can't survive without this. The supply of oxygen is essential to the utilization of most lunar resources. There are 6 methods we preferred to synthesis of oxygen required for our settlement. There are 6 ways they are

- a) Moon regolith
- b) Biological processes
- c) Artificial photosynthesis
- d) Illuminate reduction with H₂
- e) Fluorination
- f) Volcanic glass reduction with H₂

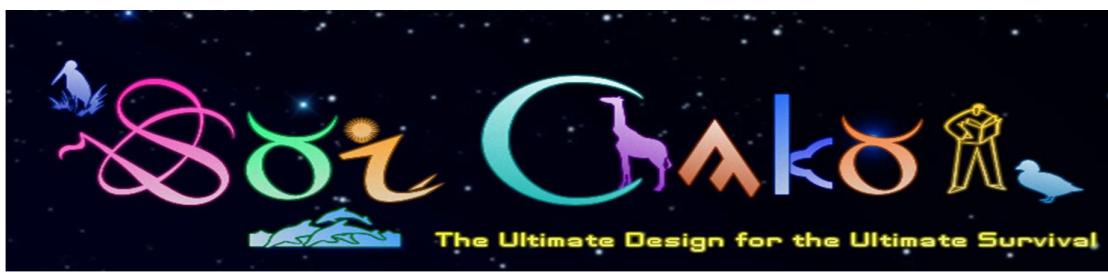
FROM MOON REGOLITH:-

About 45% of the lunar soil and rocks is made up of oxygen, and eventually we'd like to be able to use all of it. The reduction processes, particularly those which use hydrogen as the reducing agent, are the most technologically mature. Oxygen which is chemically bound to iron in lunar minerals and glasses can be extracted by heating the material to temperatures above 900°C and exposing it to hydrogen gas.

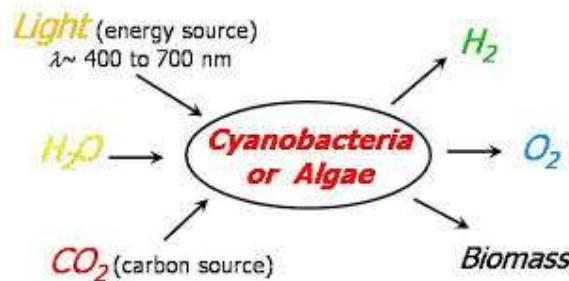
The basic equation is:



This process results in release of the oxygen as water vapor. The vapor must be separated from the excess hydrogen and other gases and electrolyzed. The resulting oxygen is then condensed to liquid and stored. Experiments using samples of lunar illuminate, basalt, soil, and volcanic glass have demonstrated the required conditions and efficiency of this process.



THROUGH BIOLOGICAL PROCESS:-



As we claimed initially that our habitat maximally tries to use natural biological cycles. We decided to do this method, since we have a stream running through the center of torus. We have a choice to grow flora and fauna. Under sterile conditions we will inject bacteria, microorganisms which produces oxygen such as algae, leeches, cyanobacteria, and other bio-bacterias. Through this we can monitor the imbalances caused and also purify the trace of contaminants.

ARTIFICIAL PHOTOSYNTHESIS:-

As we need to control the carbon dioxide concentrations in the atmosphere, we will replicate photosynthesis process and make it artificially. We will make it more efficient, absorbing more light, at a wider range of wavelengths, potentially even in dark to yield more energy. There are three steps involved in artificial photosynthesis

1. Light Capture and moving the electrons to the reaction centers
2. Splitting water into Hydrogen and Oxygen
3. Reducing Carbon Dioxide



In plants, light capture is handled by leaves which contain the green pigment chlorophyll. This pigment (along with accessory chlorophyll pigments) absorbs all photons with a wavelength of ~430-700nm, and through a complex process first splits water into its constituent parts, then combines hydrogen with carbon di-oxide to make the sugars. In artificial photosynthesis we are proposing to use nanoparticles to not only replicate this process but improve its efficiency. We are using light capturing titanium dioxide nanoparticles on surface it dramatically increases the surface area and therefore the light capturing potential of the surface. With excess of chloroplast light is exposed on carbon dioxide and water molecule and splitting of water molecule occurs.

ILLUMENITE REDUCTION:-

The production of oxygen from lunar materials is now not a dream. The basic process is to separate illuminate from lunar soil, crush it to a fine powder to maximize the surface area, and then heat it in an enclosed reaction vessel in the presence of hydrogen gas. The steam produced in the reaction is then condensed and split to produce oxygen and recover the hydrogen.

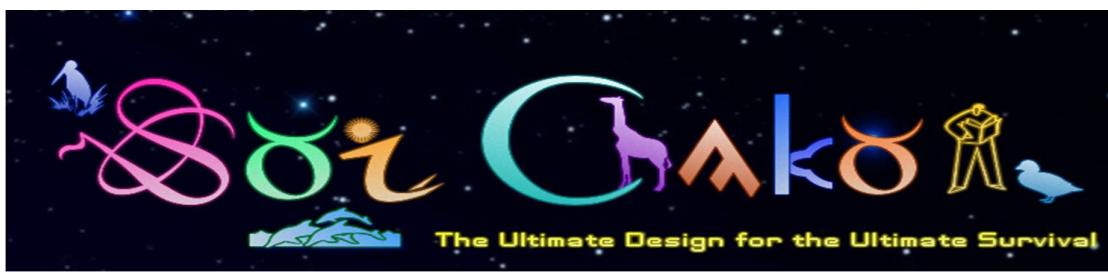
This process is best utilized if the plant is sited in a location in which illuminate composes a high fraction of the soil.

The reaction sequence is:

- Reduction:- $\text{FeTiO}_3 + \text{H}_2 \rightarrow \text{Fe} + \text{TiO}_2 + \text{H}_2\text{O}$
- Water Splitting:- $2\text{H}_2\text{O} \rightarrow 2 \text{H}_2 + \text{O}_2$
- Net Reaction:- $2\text{FeTiO}_3 \rightarrow 2\text{Fe} + 2\text{TiO}_2 + \text{O}_2$

THROUGH FLOURINATION PROCESS:-





Fluorine being lightest halogen and one of strong oxidizing agent capable of decomposing silicates. Moreover it is exothermic which runs spontaneously. Anorthite most abundant ingredient it also produces O₂ on fluorinated.

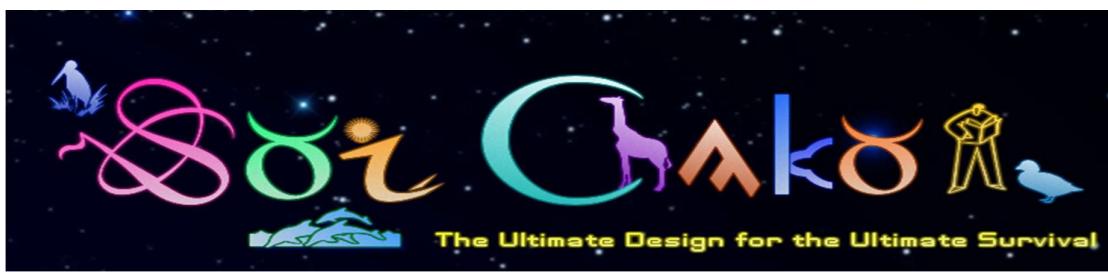


Which in turn we can use these byproducts CaF₂, Al₂SiO₅, SiO₂ – as reactants for O₂ production



OBSIDIAN (VOLCANIC GLASS):-

Obsidian is a naturally occurring volcanic glass formed as an extrusive igneous rock. Lunar glass may be one of the best sources of oxygen. The optimum feedstock for a lunar oxygen production process may be volcanic glass. The iron rich species promise particularly high oxygen yields. The deposit sampled uniformly fine grained and breakable, offering a feedstock which reacts rapidly and can be used with little or no processing perfectly to oxygen extraction. Complete reduction of the total Fe content of this iron rich glass is equivalent to an oxygen yield of 5%wt. Over 80% of this yield was achieved after 3 hours at a temperature of 1050°C.



WATER MANAGEMENT

“Water being formless, shapeless helps us to acquire a good shape, form and health.”

Water is the source of life. Is the one of the most plentiful compounds and not easily available directly in the world. Water is considered to be a fundamental condition of human's colonization. We need water for residence industries, all the social institutes, throughout the settlement. So we need to create a water cycle in our biosphere itself and we need to monitor all this management comprises of generating, purifying and reusing.

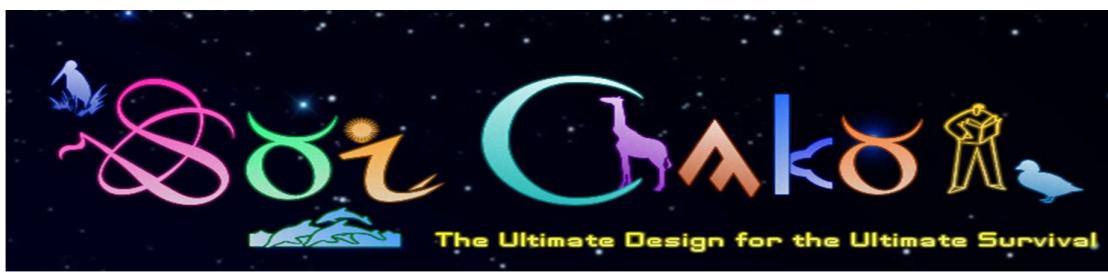
A. WATER REQUIREMENT

As we are initiating a permanent habitat, it must contain ample of water needed for domestic and commercial, public needs

Water needed for different requirements are listed below

USE	PER HEAD	NO. OF CONSUMERS	TOTAL LITERS PER DAY
Drinking purpose	5	367136	1835680
Hand and face wash	10	367136	3671360
Clothes washing	4	367136	1468544
Shower and toilet use	15	367136	5507040
Industrial use	1000	20	20000
Animal & plant growth	5	18356	91780
Aquaponics	1000	5	5000

As we use current advanced methods to sanitize dishes it doesn't need any water. And even clothes don't require water much. By this demonstration our Sri Chakra needs 680786924 liters per day.



WATER GENERATION

Finding water ice on the moon provides a potential for In Situ Resource usage, we could store water in the form of ice from the moon to sustain life and generate space ship propellant. Because the regolith is a high insulator, other heating methods like solar, laser or electric heating only heats the surface.

FROM LUNAR CRUST:-

We will induce Microwave energy which penetrates the soil heating from the inside out. The microwave penetration depth is based on frequency and on dielectric properties of soil. The absorbed microwave energy heats the soil which later on heats the water ice which sublimes to water vapor and percolates through the soil to be captured by a cold trap. As the soil can be

Heated in situ, excavation may not be required. Also at the cryogenic temperatures of poles, the frozen permafrost could be as hard as granite. Complex mechanical operations to dig the soil and processing chambers proposed for other extraction processes would not be required.

The most obvious method for extracting water would be to dig up the frozen soil by microwave penetration. But there's another method that could be more efficient and require less digging.

The Sabatier reaction and Bosch process:-

Sabatier process was discovered by French chemist Paul Sabatier in the 1910s. It involves the reaction of hydrogen with carbon dioxide at elevated temperatures (optimally 300–400°C) and pressures in the presence of a nickel catalyst to produce methane and water. It is described by the following exothermic reaction:



The Sabatier and Bosch processes are two Carbon Dioxide Reduction Systems which can be used extensively

The Bosch reaction discovered by Carl Bosch uses hydrogen as a means to produce water from carbon dioxide, and generates water



Potentially closing the loop in our cabin atmosphere constructive and revitalization systems.

For production of 1 kg of water, we need to react 0.222 kg of hydrogen with 1.222 kg of Carbon dioxide.

FROM MgSiO₄

The methane gas evolved in the Sabatier reaction can further utilized for generation of water.

The reaction is as follows



The byproducts produced can also be utilized for other purpose.

ILLUMENITE REDUCTION

To separate illuminate into its primary constituents, we add hydrogen and heat the mixture. This produces raw iron, rutile, and water. (Rutile is titanium dioxide, the ore commonly used for producing titanium metal on Earth. In its crystalline form, rutile is a gemstone. As a powder, it's the most common white pigment used in paint.)

The chemical reaction looks like this:



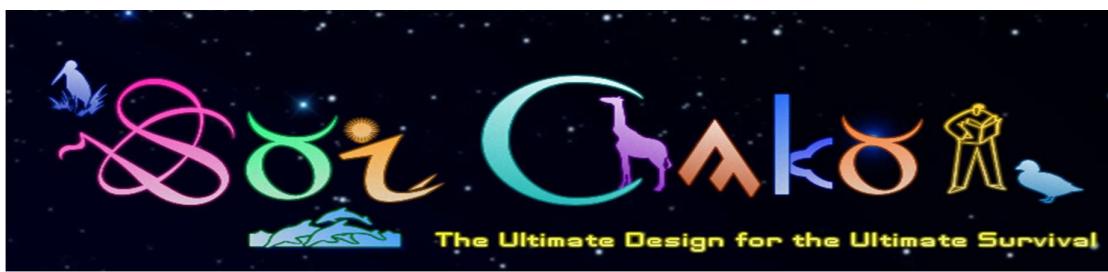
$$\Delta H = -165.0 \text{ kJ/mole}$$

ILLUMENITE REDUCTION WITH METHANE

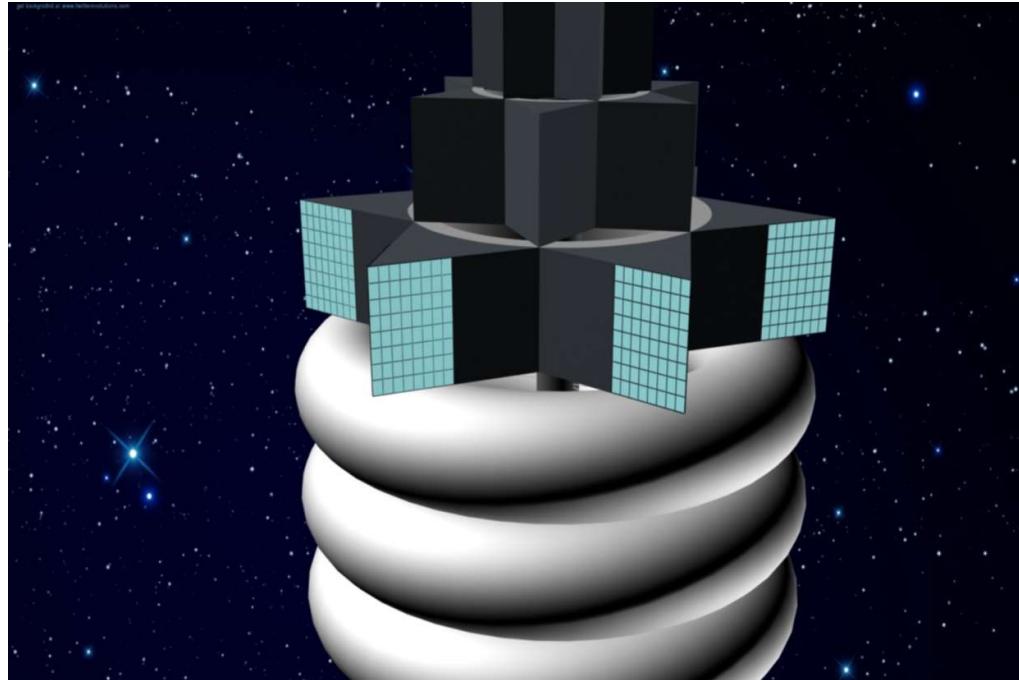
Illuminate can also be reduced with methane to derive water.



Here the methane cycle continues.



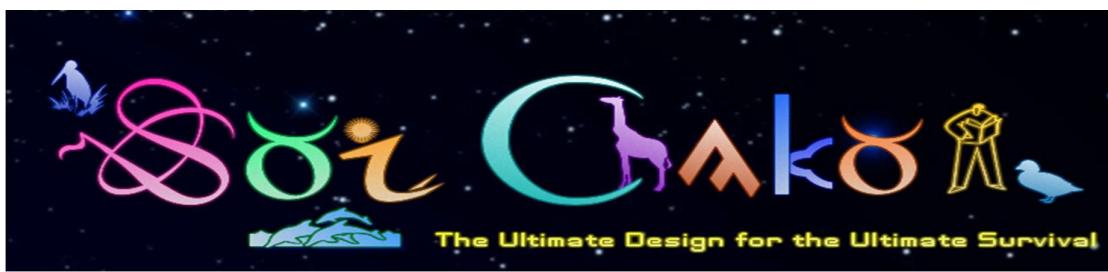
WATER STORAGE



The water is stored in large tanks located on outer surface of Chakra-A triangles at the edges. The walls are made of quartz-silicate glass which are transparent to UV light to kill microbes in it. By this we can use natural process which are safe. The water runs through the cylinder located at center, then supplied and stored in all tanks of respective tori. For transport of this water Nano pipes are used which are made of Nano technology not to let even a drop of water to go off.

PURIFICATION SYSTEM

Since water is only the most important element after oxygen human survival it plays a key role in life support system. As water is not viable all the time as it is more economic. Hence the solution for that is to reuse the water after purifying it. The purpose is to keep every single part of our system – 100% sanitary and bacteria free, sterilized condition. Sri Chakra provides highest standards of purity and quality. To increase its efficiency and capacity we will use wide range of applications. Water quality will be monitored to ensure against any kind of disease. Our storage tanks and our pumps are stainless. The entire



system is monitored by probably the most sophisticated analyzer and controller technology available at present. Sensor cells are rugged,

Weatherproof, corrosion resistant enclosure which continually sample round the clock and control different variables like ozone concentration, PH, conductivity etc.,

The disposed water from urine, Washing water, personal, and clothes Drinking water will have to meet the quality standards given by the World Health Organization, from food prep and consumption, Waste effluent water from industrial, engineering and spacecraft system.

FILTRATION

As water production is not viable process even after life adoption for years, the existed and disposed water must be recycled and reused. The following methods could be followed for water purification. They are:-

1. Sediment filtration
2. Removal of micro size particles
3. Disinfection
4. Reverse osmosis
5. Softening
6. UV-light

1. Sediment Filtration:-

Our complex process starts with a simple, folded-paper sediment filter. This filter traps large particles which may be present in the water-things like dirt, sand, slime and grit

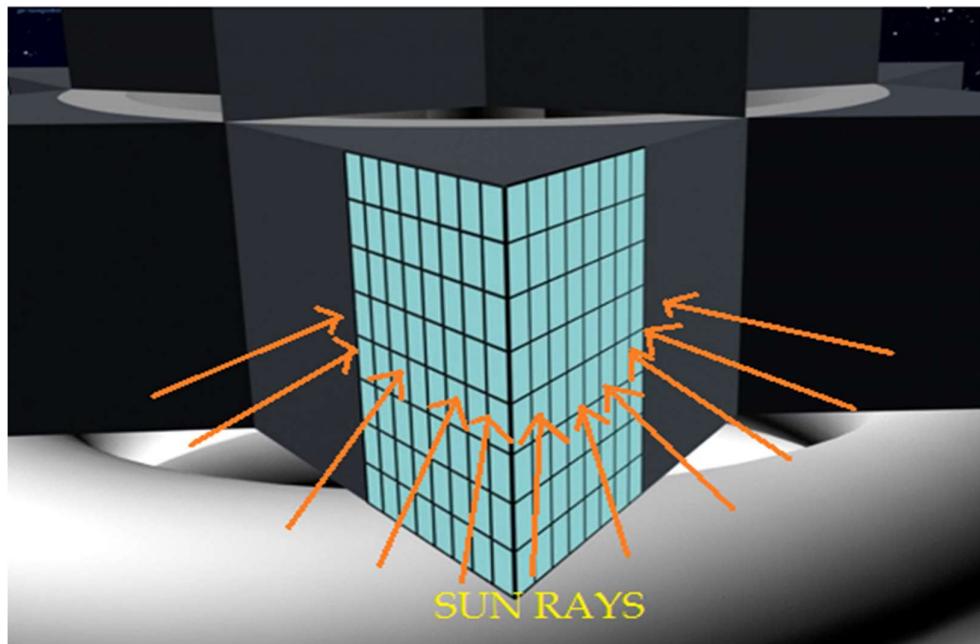
2. Micro porous layer: -

After the removal of sand and other particles still micro-very small size particles are left. So now the water is passed through a layer which has micro pores which allows only water.

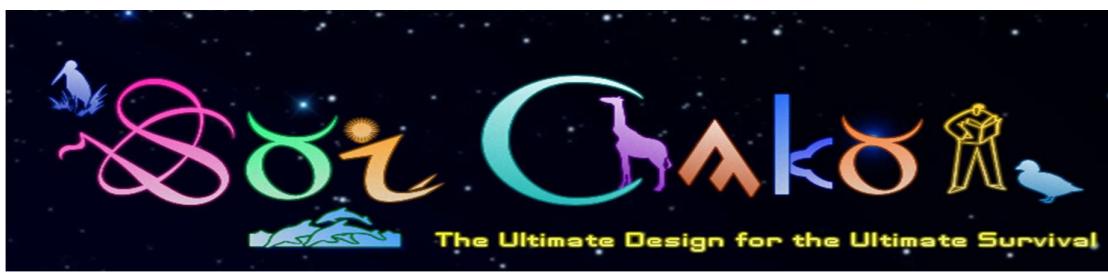
3. Ion Exchange:-

The next step in our purification process in our Sri Chakra is the removal of various metallic elements through a process known as ion exchange. Sometimes referred to as water "softening" ion exchange utilizes a large tank which is filled with a special, negatively-charged resin. The resin beads serve as bases or sites for the ion exchange to actually take place. As water passes through the ion exchange resin, metallic ions, which carry a strong positive charge, displace the more weakly charged sodium and potassium ions the regeneration process involves flooding the bed with a super saturated saline solution that effectively sweeps away the metallic ions from the resin sites.

4. Uv-light disinfection-



The water passes through a special chamber which houses a large ultraviolet light source. This ultraviolet light acts as a powerful sterilizing agent. If any bacteria, viruses, pathogen or other microbiological contaminants are present in the water, the ultraviolet light at this particular wavelength destroys the genetic material within these organisms, eliminating the possibility of bacterial or viral reproduction and proliferation. The organisms quickly die and



arecaptured and removed during the pre-filtering before the reverse osmosis purification.

5. Reverse osmosis:-

Reverse osmosis truly is the heart of Water purification process. In this process, the high pressure causes the impurities to become more concentrated on one side of the membrane. Only the pure water is able to cross the membrane; even the dissolved traces which cannot be removed by conventional filtration are trapped and eliminated by reverse osmosis purification system. Every drop of our purified water will pass through approximately twenty layers of reverse osmosis membranes and now 99.5% of the dissolved impurities actually get removed.

6. Ozonation:-

The most important part of our chemical-free disinfection is known as ozonation. Ozonation relies on oxygen to ensure that our purified water remains free of any possible microbiological contamination. The ozonation process takes basic molecular oxygen (O_2) and passes it

Through a special chamber in which it is exposed to a high voltage electrical charge. (This type of ozone generation is called cold-plasma discharge.) The electricity causes the oxygen molecule to split and recombine in a higher-energy form known as ozone (O_3). This ozone is then continuously circulated through the purified water.

7. Softening:-

The presence of certain cations which are came with action of soaps turn water into hard water. They need to be removed by creating efficient systems and make softened by above process.



WASTE MANAGEMENT

“Nothing is waste in this universe, if we use them wisely”

“We are committed to create almost in maintaining a clean and sustainable cycle”

Recycling doesn't just save materials it saves energy too. Automated robots will be used for collecting robots through refuse collecting trucks. For collecting the different kinds of refuse we use different methods they are collected separately respective of its composition, such as wet, dry wood, plastic, metals, glass etc., they are classified based on organic and inorganic waste. They can be biodegradable, no biodegradable...can be recycled and cannot. It contains stuff which has lot of potential energy in it.

Garbage, plant and human waste:-

They are brought to the recycling center after collecting in a separate cargo containers. That contains vegetable scraps, dead flowers, grass cuttings, dead roots and so on which are organic in nature. Human waste can also be added as an input to the composting process, as human waste is a nitrogen-rich organic material and contains more plant nutrients (nitrogen, phosphorus, potassium) in urine than in feces. They are composted to degrade naturally. The obtained organic material can also be recycled as mulch for agricultural or landscaping purposes. Compost is a good way to enhance the power generation in plant microbial fuel cell.

In addition, methane gas evolved from this can be captured and used for generating electricity and heat maximizing efficiencies.

Paper and wood:-

Unlike some other materials, paper can be recycled only so many times. Why because it's made from plant fibers that become shorter during paper making.

Waste wood is often turned into new wooden products such as recycled wooden flooring or garden decking, wonderful furniture. Waste wood can also be shredded and stuck together with adhesives to make composite woods such as laminates. It can also be composted or burned as a fuel.



Courtesy: Google Images

Metal:-

Most of the metal comes from food and drink cans and aerosols. The other metals steel, aluminum, titanium metals can be processes at high temperatures, will be melted down and molded into variety of desired shapes. Aluminum is also cast (molded) or extruded into many useful forms.

Glass:-

A mechanical processing system breaks the glass into small pieces called cullet. Magnets, screens and vacuum systems helps to remove metals, labels, bits of plastic, and caps. The cullet is blended with silica sand, soda ash and limestone. The mixture is melted molded into desired shape new containers. Stainless glass can be yielded. Obtained are using to make brand-new glass.

Oil:-

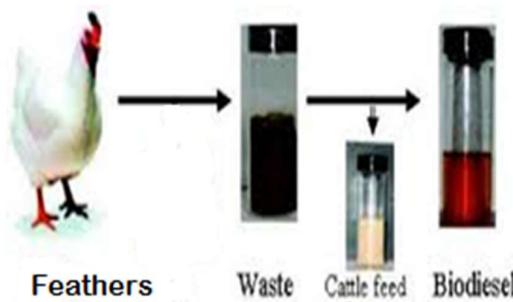
It our sustainable environment, our water bodies if it's leaked or misled. So Waste vegetable and other oils can be turned into a useful kind of vehicle fuel called biodiesel

Plastics:-

Plastic is most harmful material and no biodegradable of all the refuse. They won't degrade even for centuries. The only trouble is, plastics are relatively hard to recycle. Different kinds of plastic need to be recycled in different ways. Plastic is gathered by the robots in plastic collecting trucks. PET (polyethylene terephthalate) can also be reprocessed and can be turned into such things as textile insulation (for thermal jackets and sleeping bags). Milk bottles which are made of thicker, opaque plastic called HDPE and can be

Recycled into more durable products like flower pots and plastic pipes.

Fuel from Chicken Feathers:



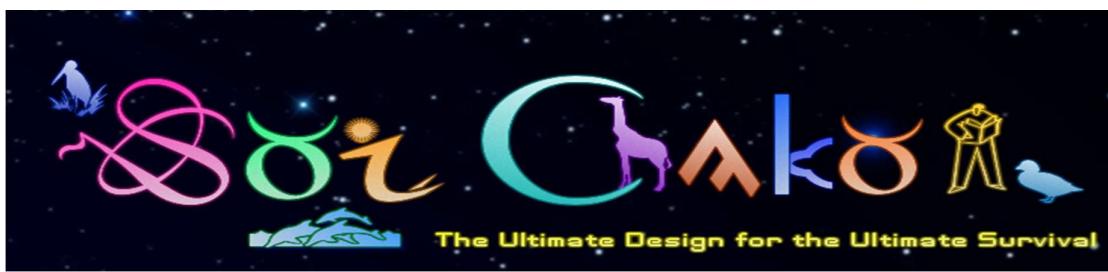
courtesy:Google images

We have arrived at the conclusion that feather meal has potential as an alternative, non-food feedstock for the production of biofuel. It will be extracted fat from chicken feather meal using boiling water and processed it into biodiesel.

Another benefit of extracting fat from feather meal is it provides both a higher-grade animal feed and a better nitrogen source for fertilizer applications.

It contains stronger and more absorbent keratin fiber than wood. This type of chicken feather bears a resemblance to highly versatile (and tiny) carbon nanotubes.

Through pyrolysis process a very high heat without combustion in the absence of oxygen is applied. This yields us fibers "that are micro porous, very thin and hollow inside like carbon nanotubes



Nanotube Technology Transforms CO₂ into Fuel:-

Presence of surplus carbon dioxide in the atmosphere has taken center stage either can be sent to agro sector or can be turned into fuel with the help of sunlight and titanium oxide nanotubes. These two elements, sunlight and titanium oxide nanotubes can transform carbon dioxide into methane. Ethane can be utilized as energy source. It seems like double benefit. At one hand, we are reducing the quantity of carbon dioxide into the atmosphere and we would be less dependent on celestial minerals.

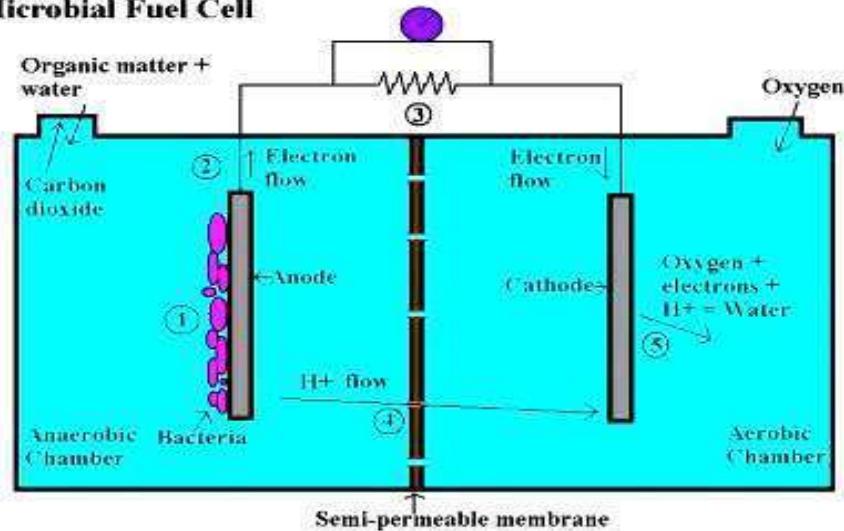
When sunlight comes into contact with titanium oxide, water molecules split apart. In this reaction hydrogen is freed from the water and the carbon released from CO₂, unite again to create burnable methane. Here oxygen is released as byproduct. We will adjoin more carbon dioxide and sunlight, thereby we will obtain more methane. Coal burning power plants could utilize the methane to heat water and generate more electricity

The top of the nanotubes is covered with a thin, reddish-brown layer of copper oxide. Here the copper and titanium oxide

Operate as catalysts. This way, industrial units don't have to establish new subsidiary units for the treatment of carbon dioxide.

Electricity from Wastewater:-

Microbial Fuel Cell



Courtesy: Google images

We will use Microbial fuel cell which is a device that cleverly utilizes naturally occurring bacteria to convert wastewater into clean water and producing electricity in meanwhile. A distinctive microbial fuel cell has two chambers. One is filled with wastewater or other nutrients. The second chamber has water. An electrode was inserted in both the chambers. Naturally occurring bacteria becomes

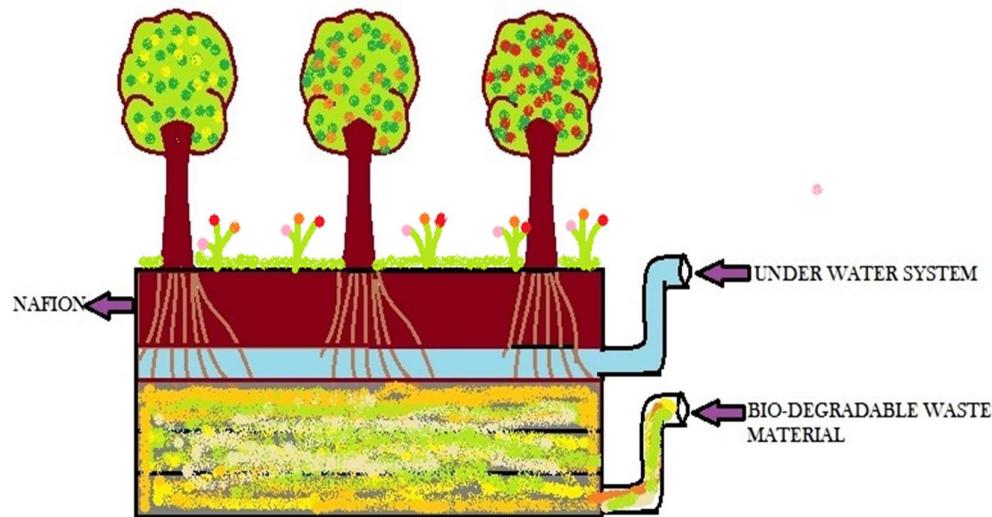
Active in the wastewater, destroys the organic material and generates electricity.

Hydrogen from Waste Materials:-

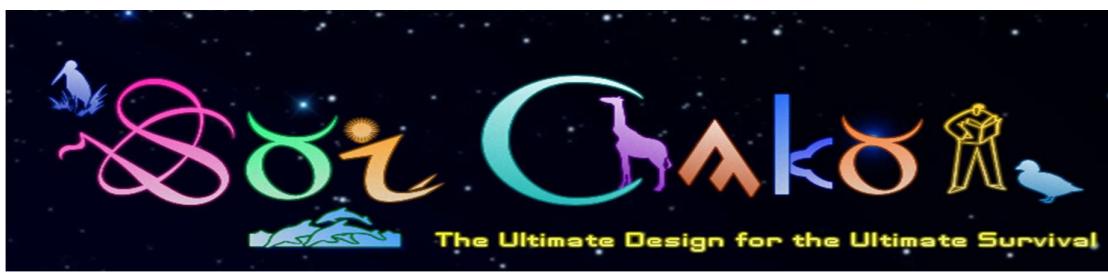
We will extract hydrogen from waste materials. These materials can be vegetable oil or the glycerol by-product of bio-diesel. Hydrogen is largely considered as a clean and green alternative fuel .these combining waste products with steam to release hydrogen. Waste sources are mixed with steam that produces hydrogen and carbon dioxide and excess water as a byproduct. The water is condensed by cooling without much hassle and the carbon dioxide is removed in situ by a solid sorbent material.

Uses of night soil

The dung, scar, Spoor, human biological waste is considered as faces. The human waste is referred as night soil. It retains a lot of energy nearly 50% that of original food. It is very useful as manure. Since it contains minerals. So in our system we will be directing the fecal matter into the agro sector where it will get deposited down the nafion layer which means a lot to plants. Manure contributes fertility to plants by adding organic matter and nutrients in fact in some countries elephant faces are used for making black ivory coffee. Coprophagy is also seen in some animals. After a certain period (May months) the minerals will get used off completely. Therefore the layer will be substituted with the new one



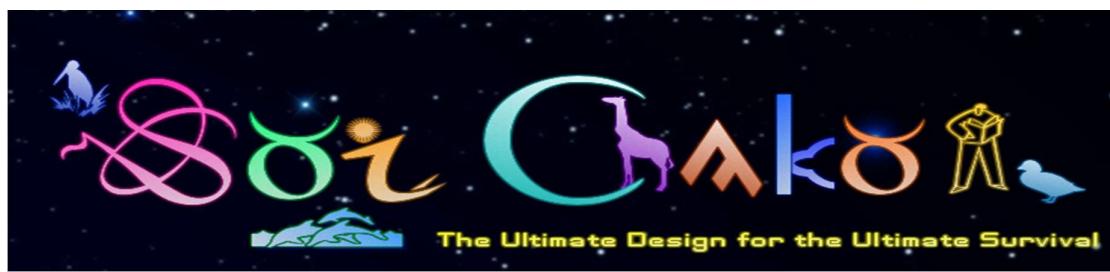
Courtesy: Self Art



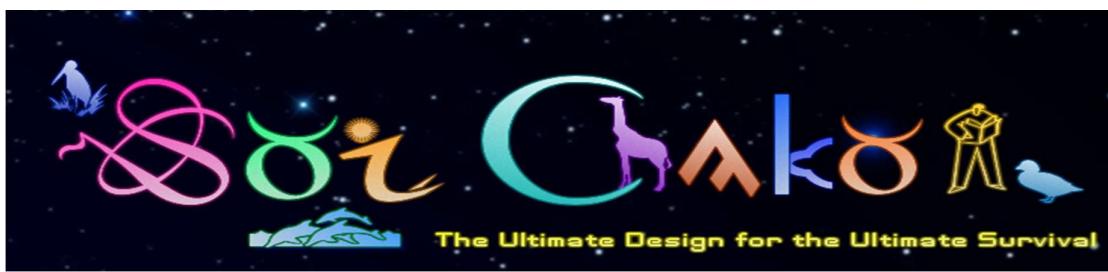
Waste to energy plant:-

The collected refuse which is un-recyclable will be converted into usable energy at 2000 degrees Fahrenheit in the form of electricity. We will use wide range of applications for maximum efficiency. Trucks stop at the scale house and then enter the enormous garbage area, known as the "tipping hall", and back-up to one of seven bays in order to unload the collected trash into the holding "pit" or "bunker," an enclosed seven story temporary storage area. A large indoor crane then continuously feeds that trash into each of our two boilers; this system operates round the clock, picking up two tons of material each time the claw is dropped into the pit.

It is estimated that **63.89 megawatt-hours** of electricity is produced per **100 tons** of waste.



POWER MANAGEMENT



Introduction:-

"Electricity is like a language that all modern appliances can speak."

The development of a nation is based on how it is utilizing its energy sources. If it is not using them in a proper way then the future of the nation can't be controlled. Electricity is one of the major requirements that every nation needs. Without the supply of the electricity, everything stops. That much we have depended on electricity for our survival.

In the same way it also applies to our settlement. Without continuous supply of electricity the functioning of our settlement stops. Hence it is the major requirement that our settlement needs for its better functioning.

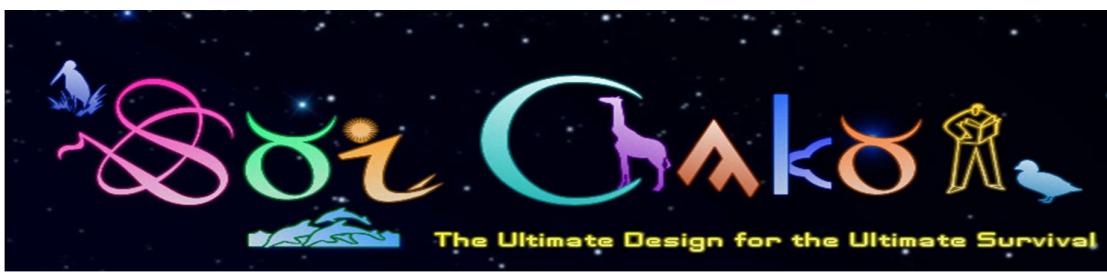
On Earth the energy sources available for the production of electricity are plenty. But in space their abundance is less. The only energy source in space is solar energy. But in Sri Chakra electricity is produced using three energy sources. They are

- A) Solar energy
- B) Dynamic Towers and
- C) Waste Materials

In these three sources the major share is occupied by dynamic towers.

A) SOLAR ENERGY :-

The term solar energy comes from Sun. Sun is a huge spherical ball of hot plasma. Sun is a seething ball of nuclear power. Sun emits cosmic radiations, light and very much heat. This light and heat are forms of energy, together known as solar energy.



We all know that energy is neither be created, nor be destroyed but can be converted from one form to another form. In the same way this solar energy can be converted into electrical energy by the use of solar panels.

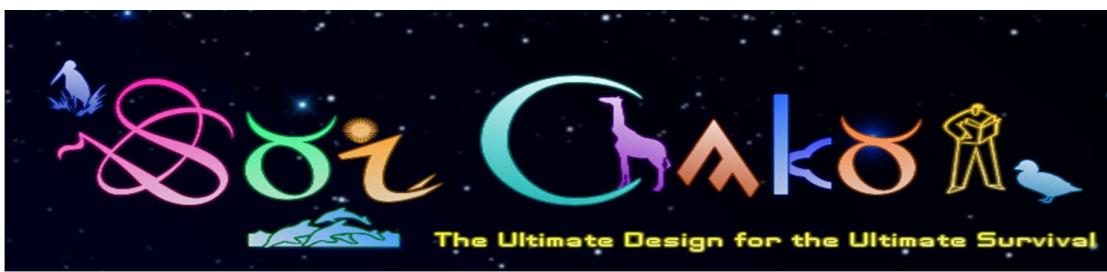
The solar panels are made up of many individual solar energy collectors known as solar cells (or) photo voltaic cells. Usually these solar cells are made up of semiconducting materials. The valence electrons present in the semi conducting materials absorb photons (nothing but sun light) and generates electricity. The electricity produced by each solar cell is combined to produce high voltage of electricity. This is how a solar panel works.

We use multijunction photo voltaic cells in solar panels. These cells are made from combination of several layers of Gallium Arsenide (GaAs) and Silicon. These can capture very large Spectrum light. The efficiency of multijunction photovoltaic cells made solar panels is about 40% which is highest value ever recorded.

Considering Earth situation, each sq. meter area of earth receives 164 watts of solar energy. If 16 solar panels are placed on the roof of house. Having each solar panel made up of grid $10^6 = 60$ small solar cells can probably generate about 4 kilo watts of electricity. Taking this information as a base.

1) Calculation for Industrial Torus and Residential torus – A:-

- Area covered with Transparent and opaque solar panels
= 10730797sq.m
- No. of solar panels = $10730797/60$ Total area/area for each panel= 178846 approx.
- Amount of electricity produced = $178846 \times 4/16 \times 7$
= 312980.5 KW/day.



2) Calculation for Residential torus – B:-

- Area covered with solar panels
= 7023794.4sq.m
- No. of solar panels = $7023794.4/60$
= 117063 approx.
- Amount of electricity produced
= $117063 \times 4/16 \times 7 = 204860.25 \text{ KW/day.}$

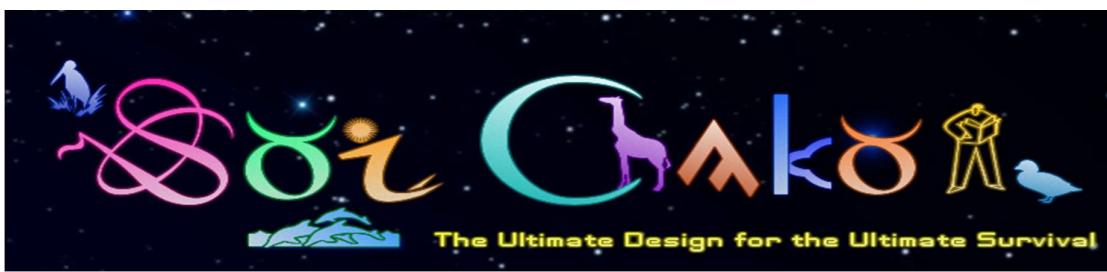
3) Calculation for chakras:-

Chakra – A:-

- Area exposed to sunlight = 1980000 sq.m
- Area exposed to reflected sunlight (sunlight which is reflected through gigantic mirror)
= 219506.08 sq.
- Total area covered with solar panels
= $1980000 + 219506.08 = 4175086.08 \text{ sq.m}$
- No. of solar panels = $4175086.08/60 = 69584$ approx.
- Amount of electricity produced = $69584 \times 4 / 16 \times 7$
= 121772 KW/day.

Chakra – B:-

- Area exposed to sunlight = 2249280 sq.m
- Area exposed to reflected sunlight = 1188397.056 sq.m
- Total area with solar panels = $2249280 + 1188397.056$
= 3437677.056 sq.m
- No. of solar panels = $3437677.056/60$
= 57294 approx.
- Amount of electricity produced = $57294 \times 4 / 16 \times 7$
= 1,00,264.5 KW/ day.



Chakra – C:-

- Area exposed to sunlight = 1365408 sq.m
- Area exposed to reflected sunlight = 531860 sq.m
- Total area covered with solar panels = 1365408 + 531860.736
= 1897268.736 / 60
- Total no of solar panels = 31621 (approximately)
- Amount of electricity produced = $31621 \times 4 / 16 \times 7$
= 55336.75 KW/day.

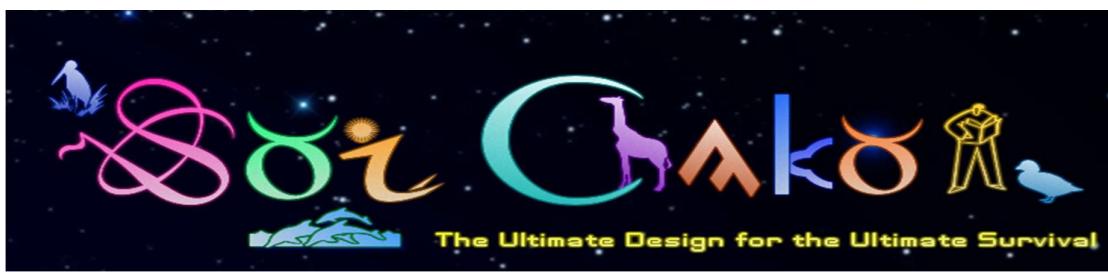
Upper triangle:-

- Area covered with solar panels = 472991.206 sq.m
- No. of solar panels = $472991.206 / 60$
= 7883 approx.
- Amount of electricity produced = $7883 \times 4 / 16 \times 7$
= 13795.25 KW/day
- Total electricity produced from solar panels will be
= 809009.25 KW/day

Total no. of solar panels = 462291

B) Dynamic towers:-

As already mentioned in the chapter residential design, dynamic towers are self-rotating towers. Architect named David Fischer has designed these towers. One tower is 420 meters height consists of 80 floors. Each floor rotates with a speed of one rotation in 90 minutes. Wind turbines are set under each floor. As a result along with the floor the turbines also rotate to generate electricity. In an 80 floor building there will be 79 turbines and they could generate up to 1,20,000kilowatt – hours of energy. Energy generated by each turbine is 15189.87 KW – hours.



Sri Chakra's dynamic towers are 55m height and each tower consists of 10 floors. There will be 9 turbines.

- Electricity generated from a turbines = 136708.86 KW – hours.
- No. of dynamic towers in RT-A and RT-B= 4172
- Total electricity generated from dynamic towers = 136708.86×2086
= 285174682 KW-hrs
= 285174682/24 KW/day
= 11882278.415 KW/day

C) Waste material:

Our approximate estimation for electricity produced from waste material is 89446 KW/day

Total electricity produced in Sri Chakra = $809009.25 + 11882278.415 + 89446 = 12780733.67$ KW/day.

We use multijunction photo voltaic cells in solar panels. These cells are made from combination of several layers of Gallium Arsenide (GaAs) and

Silicon. These can capture very large Spectrum light. The efficiency of multijunction photovoltaic cells made solar panels is about 40% which is highest value ever recorded.

Energy Storage and Topologies

Electrical energy is the form of energy that can be transmitted efficiently and easily transformed to other forms of energy. The main disadvantages with electrical energy involves storing it economically and efficiently. Though number of energy storage technologies are available, we prefer of efficiency, cost and reliability

concerns a lot. This section discusses different energy storage technologies available for this project and the reason for using them. Electrical energy can be converted and stored in different forms:

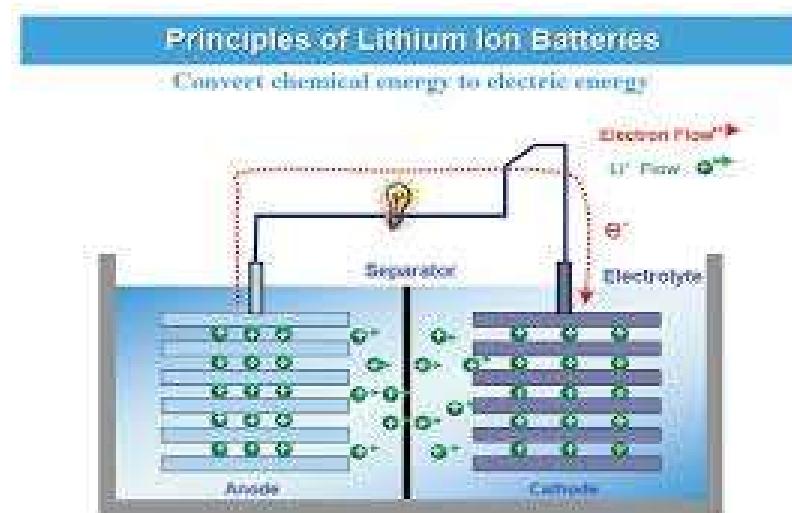
- Electrochemical Energy
- Electromagnetic Energy
- Electromechanical Energy and other methods

Electrochemical energy storage:-

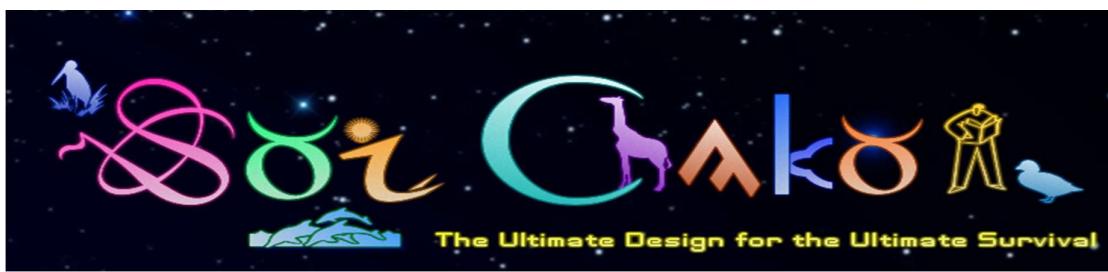
In this type electrical energy is transformed and stored in the form of chemical energy. There are two main kinds' batteries and fuel cells we are going to use. Batteries uses internal chemical components for energy conversion, storage whereas fuel cells uses synthetic fuel (Hydrogen) supplied and stored externally. Both use two electrodes, an anode and a cathode, which exchange ions through an electrolyte internally and exchange electrons through an electric circuit externally...

Coming into fuel cell, byproduct of a Hydrogen fuel cell is water. By electrochemical decomposition of water into hydrogen and oxygen and holding them apart, hydrogen fuel cells stores electrical energy. During discharge, the hydrogen is combined with oxygen,

Converting the chemical energy to electrical energy. The main benefit of this is of environment friendly.



courtesy:Google images



Lithium-Ion Batteries (Micro constructed batteries):-

This new batteries could allow for wireless devices to transmit their signals 30 times farther – or perhaps more usefully, be equipped with alternately that's 30 times smaller. If that wasn't enough this new battery is rechargeable and can be charged 1000 times faster than conventional lithium-ion battery.

Structure of Battery:

This battery normally has two-dimensional anode made of graphite and cathode made of li-salt, which has porous 3-dimensional anode and cathode to make this new electrode structure of polystyrene and then electro deposit nickel tin onto anode & manganese dioxide onto cathode. These porous electrodes have a massive surface area allows chemical reaction to occur in given space provides a massive boost to discharge speed so we will make button sized micro battery through enough density in slower power density is 2000 times greater.

Micro constructed Li-Ion Batteries:-

The batteries we use are much smaller & lighter. The smart phone batteries we use are having thickness of credit card, which can be recharged in few seconds and usable widely. These batteries also have wide applications in high powered settings such as lasers & medical devices. We will use fast recharge power tools.

ELECTRIC DOUBLE LAYER CAPACITORS (EDLC):-

Capacitors stores in the form of electrostatic field between the parallel plates of a charged capacitor.

Electrical Double-Layer Capacitors (EDLC's) are the super capacitors store energy with high power density, that are up to 1,000 times greater than what is typically found in conventional capacitor technology. We will introduce this (EDLC) which contains no conventional dielectric. Instead, an electrolyte (solid or liquid) is filled between two electrodes. In this an electrical condition which is formed between the electrodes



and electrolyte, called "electrical double layer," works as the dielectric. The mechanism of ion absorption and desorption to the electrical double layer contributes to the charge and uncharged of EDLC.

Activated carbon powder is applied to the electricity collector of the electrodes. The electrical double layer is formed on the surface where each powder connects with an electrolyte. In addition, super capacitors stop charging when their capacity limit is reached, avoiding the need for detection units to prevent overcharging. The super capacitors rapid charging rate also makes it effective in mass transit braking mechanisms and portable fuel cells for electric/hybrid vehicle

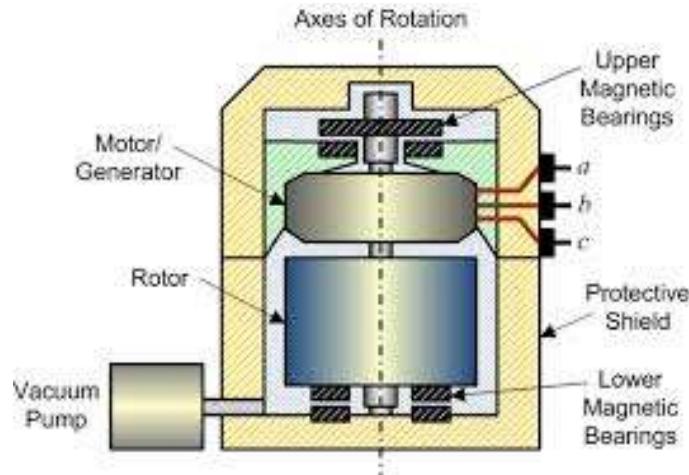
Electromagnetic energy storage (SMES):-

Electric energy can be converted and stored in the form of an electromagnetic field. A Superconducting magnetic energy storage (SMES) coil consists of a superconducting coil carrying large DC currents. In order to keep the temperature of the superconductor below its critical temperature, a cryogenic cooling system is arranged. Increasing the DC current increases the amount of energy stored. Once the current in the coil approaches its maximum value, the voltage across it will be zero and the SMES is fully charged. This storage system has very low losses due to negligible resistance. Besides SMES coils can be built for larger energy and power.

Electromechanical energy storage (FES):-

Flywheel energy systems (FES) are reliable, modular, and high-cycle life. Fly wheel store rotational energy in the form of kinetic energy by rotating the rotors.

Adding energy increases speed of flywheel. We use flywheel energy system which have rotors made of high tensile strength, Carbon fiber composites, suspended by magnetic bearings and spinning at 20,000 rpm to 50,000 rpm in a vacuum enclosure.



Courtesy: Google images

We can even have large maximum power output and much higher efficiency.

Energy usage:-

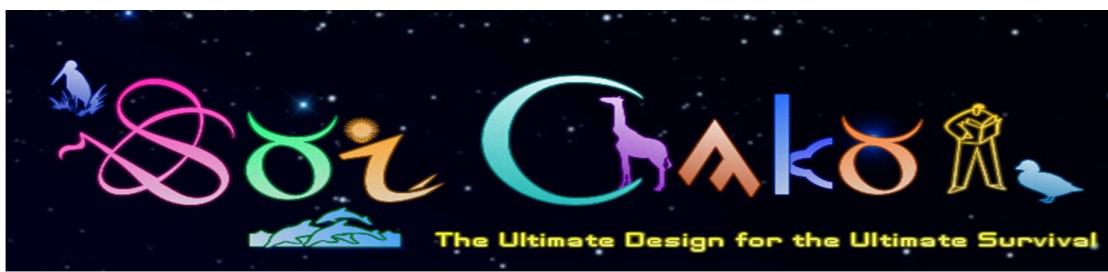
Consumption purpose	Kilowatts consumed per day
Residential	2046944
Industrial	2232114
Water	234083
Agriculture	504340
Lighting	180868
Entertainment	612345
Research laboratories	403211
Transportation	816421
Any other if required	100000

Remaining electricity = 5650407.67 KW/day

The remaining electricity can be sold to other settlement (or) Earth.



Human Life Designing & Social Infrastructure



In order to provide an earthly environment, we have concentrated on every aspect of space settlement design, and made Sri Chakra a self-sustainable, pollution free, technically advanced, safely protected settlement.

The aspects that are included in human life designing & social infrastructure are:

1. Community design
2. Residential design
3. Food and Diet
4. Health and Hygiene
5. Education
6. Transportation
7. Communication
8. Law and Politics
9. Business Management and Employment

Community design

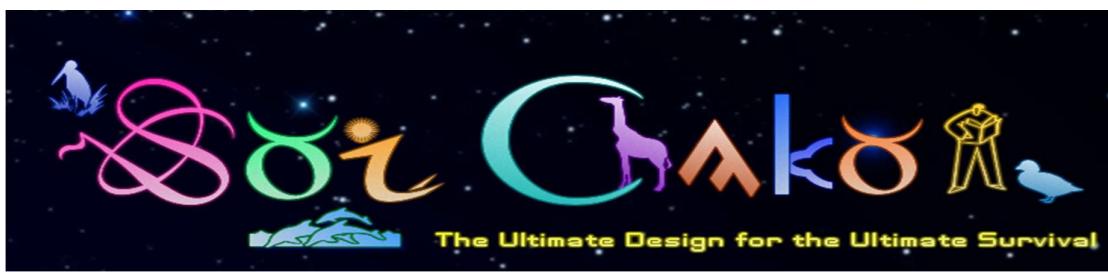
Sri Chakra has two residential tori namely RT-A (Residential torus-A) and RT-B (Residential torus-B) in which 367136 inhabitants can survive comfortably. Each residential torus has a total living area of 3121686 sq.m in which 663358 sq.m of area is for human life designing(schools, hospitals, shopping malls, parks, hotels, restaurants etc.,) and 1877575 sq.m of area is for human survival(houses, dynamic towers & apartments) and the remaining area is for roads and main water stream. This information has been clearly explained in the chapter brobdingnagian dimensions of Sri Chakra.

The 1877575 sq.m of human survival area of single residential torus is divided into 7 equal parts

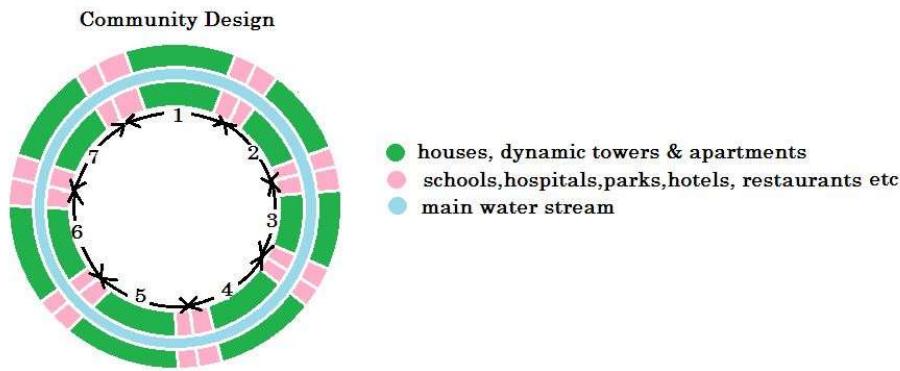
Area for each part = 268225 sq.m

And also the 663358 sq.m of human life designing area of single residential torus is divided into 7 equal parts

Area for each part = 94765.43 sq.m



These parts are placed alternately as shown in figure



Hence there will be 7 communities in one residential torus.

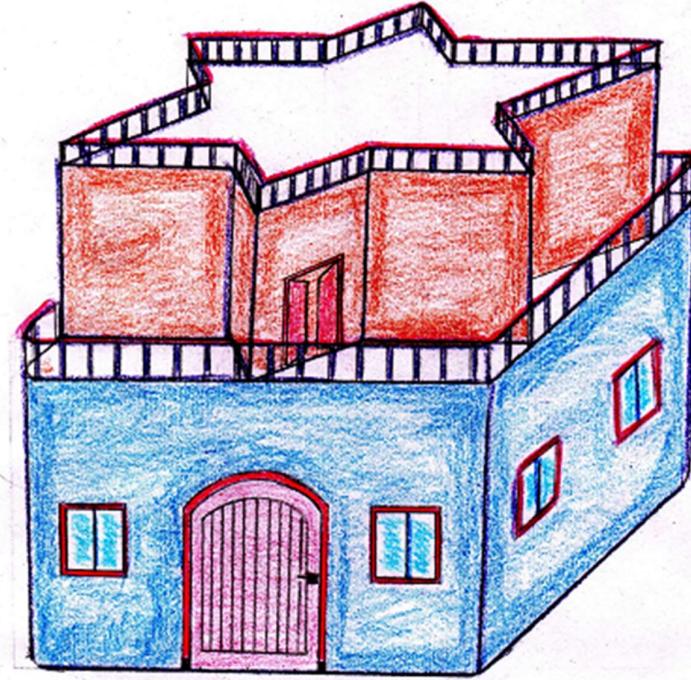
The major and middle part of each community is for houses, dynamic towers & apartments. Either sides of this middle part will be for a school, hospital, theatre, shopping mall, public toilet, auditorium, hotel, restaurant, park, bank, PHC & old age home, marriage bureau, temple, Govt offices, private offices, club, police station and other.

Second residential torus also follows the same design. Therefore all total there will be 14 communities in both the tori.

This sort of community design will make governing an easy task, and also all the facilities will be equally distributed to all the inhabitants.

Residential design:-

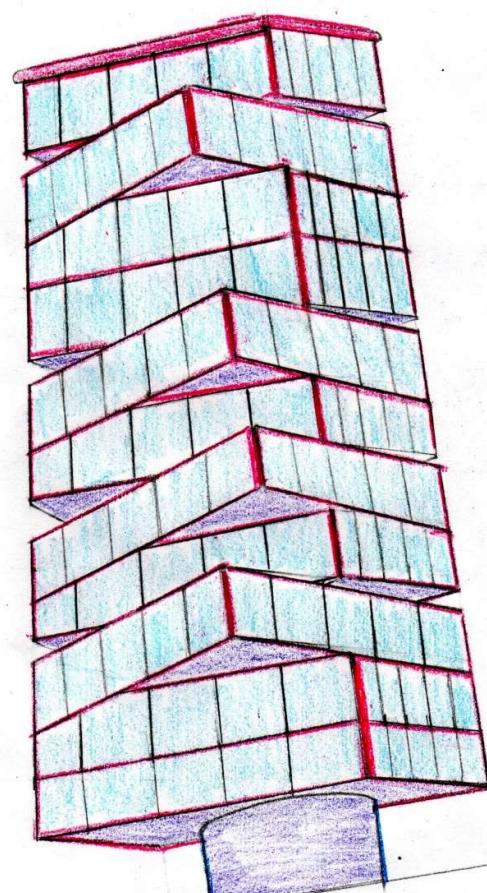
In this topic we concerned about the comfort and status of the inhabitants and designed 3 unique residential structures. Those are private residences, apartments and dynamic towers. Private residences are for inhabitants those who prefer privacy, apartments are for inhabitants who cannot afford private residences and dynamic towers are for those who wants to live in a different place and enjoy the thrill of living in a rotating home.



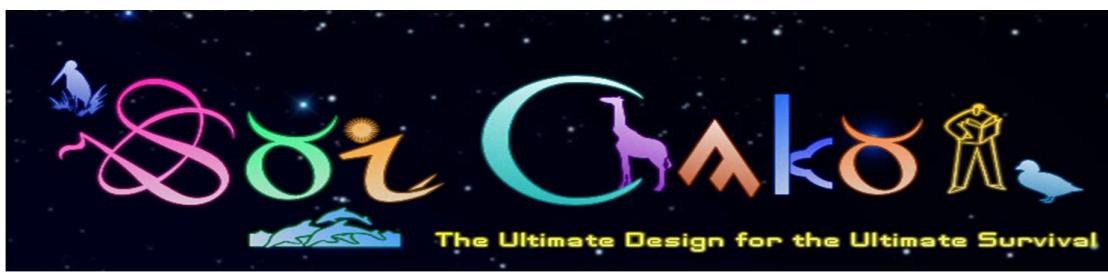
As already mentioned in the chapter Brobdingnagian dimensions, the area allotted for residences is 1877575sq.m and area for each residence will be 250sq.m. In total there will be 4172 private residences, 2356 apartments (consisting of 10 floors each) and 2356 Dynamic towers (consisting of 10 floors each).

Why Dynamic towers?

When we thought about residential design, the first and foremost thing came to our mind is that the houses that we pickup to place on our settlement should be comfortable and they have to be unique of all project's residences. In this aspect we have decided that our houses should not only fulfill the purpose of living comfortably but they also have to occupy major role in our settlement's development. When we are in search of this requirement, we found unique house design that can also be used to generate electricity that is none other than dynamic towers. These towers are also called as rotating towers. The idea of this dynamic towers is of an Architect named David Fischer who lives in Dubai. His idea is to design towers that can stand strong for tornadoes and also generate electricity.



Hence, these dynamic towers (or) rotating towers serve as major resource in producing electricity after solar power. The mechanism of these towers will be explained in the chapter power management.

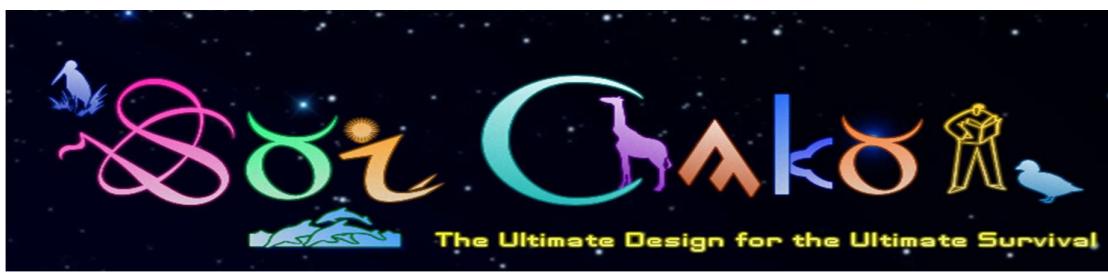


Food & Diet

Food

Good food gives good health. Food is the basic need for every human being, animal, plant, bird, insect and even bacteria. Mother Earth gave us all that we need on Earth in order to have a healthy and cheerful life. Same food is required for the inhabitants for their survival and also for Earthly environment. Same food in the sense same plants with rich proteins, carbohydrates, fats and calories. That's why on Sri Chakra we encourage the growth of almost all the plants, vegetables, fruits, nuts and cereals etc., that are on Earth.

The following are the lists of vegetables, fruits, nuts and cereals that are being cultivated on Sri Chakra



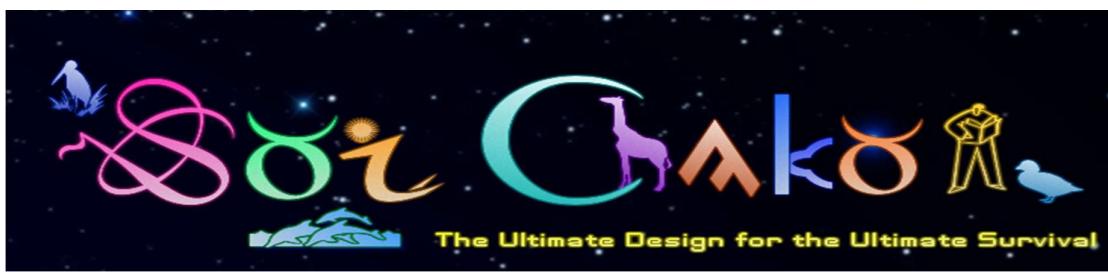
Vegetable list

Vegetable	Protein(g)	Carbohydrate(g)	Fat(g)
Tomato	1	4	0.20
Radish	0.3	2.1	0.3
Cucumber	0.65	3.63	0.11
Broccoli	2.3	3.9	0.3
Pepper	0.86	4.64	0.17
Cabbage	1.4	0.10	5.60
Lettuce	1.4	2.2	0.20
Carrot	1	9	0.20
Potato	2	19	0.10
Beans	24	60	1
Peas	5.40	14.50	0.40
Cauliflower	2	50	0
Mushroom	5	2.30	0.50
Spinach	3.50	2	0.30
Nettle	7.90	7.11	0.70
Onion	1.40	8	0.20
Garlic	7.20	26	0.20
Leek	0.7	6.3	0.1
Sweet potato	0.1	24.3	1.7
Sweet corn	0.9	14.1	2.5
Brinjal	0.4	15	3
Okra	8.2	20	2
Bottle guard	4.02	30.3	1.5
Snake guard	3.10	10.1	0.6
Coriander	2.40	11.3	2.5
Mir chi	1.3	12.44	0.50
Bitter guard	4.8	20.12	0.70
Ridge guard	5.4	16.06	2



Fruit list

Fruit	Protein(g)	Carbohydrate(g)	Fat(g)
Watermelon	0.5	5.5	0.3
Strawberry	0.5	5.8	0.3
Apple	0.1	9.5	0.2
Blackberry	0.5	9.2	0.3
Peach	0.6	9.4	0.1
Pineapple	0.3	9.6	0.3
Orange	0.8	10.6	0.1
Cherry	0.7	9.7	0.6
Apricot	1.2	9.2	0.3
Mango	0.4	14	0.2
Grapes	0.5	14.2	0.5
Banana	0.8	17.6	0.4
Dates	0.4	33	0.2
Kiwi	0.9	13.2	0.4
Raisins	1.2	29	0.2
Pear	0.3	12.5	0.3
Plum	0.7	10.7	0.5
Tangerines	0.6	10.9	0.2
Beet root	1.6	18.2	1.5
Nectarine	0.6	8.1	0.3
Raspberries	0.6	7.1	0.3
Honeydew melon	0.4	7.8	0.1
Cantaloupe	0.7	6.5	0.2



Cereals list

Cereal	Protein(g)	Carbohydrate(g)	Fat(g)
Rice	2.38	28.59	0.21
Wheat	13.50	72.28	2
Barley	12.48	73.48	2.30
Maize	3	18	1.10
Soybean	3.04	5.94	0.18
Rye	14.76	69.76	2.50
Oats	16.89	66.27	6.90
Sunflower	32	18.75	1
Mustard	15.4	55.2	1.20
Olives	11.50	22.3	0.12

Nuts list

Nut	Protein(g)	Carbohydrate(g)	Fat(g)	Calories
Coconut	0.9	4.1	8.9	94.3
Chestnut	1.5	21	1	98.9
Almond	6.7	6.2	16	182.9
Pistachio	8.8	11.9	18.9	237.4
Hazelnut	5.7	6.4	23.3	240.5
Pine nut	10.9	6.4	23	256.3
Walnut	6.1	5.5	26.1	261.3
Cashew	7	14.9	21.1	261.9
Pecan	3.6	5.5	28.5	273.8
Peanut	11.5	10.5	24.1	284.4
Macadamia	3.5	6.2	33.8	320.4



Diet

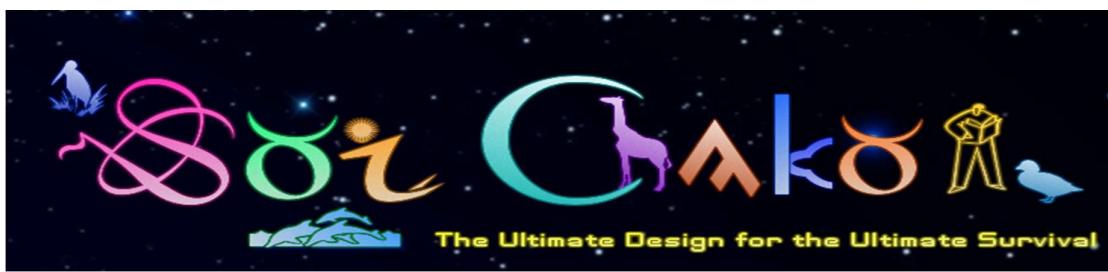
Unhealthy diet is the major reason for harmful chronic diseases, cardiovascular diseases, cancer, diabetes and obesity. Consumption of healthy diet is mandatory to keep all these diseases far away and it is also useful to control B.P, sugar. A healthy diet protects against malnutrition in all its forms.

Designing a healthy diet chart consisting of limited quantity of vegetables, fruits, meat and other food items and ordering the inhabitants to follow the same diet will not be so fair. Everyone's taste is not same, some people want tasty food with huge fat content and some people prefer only vegetables and someone likes to eat only meat and some more people take outside junk food. But every food must give good energy and does not cause ill health.

Taking this point of view, we have thought not to include a compulsory diet chart, but some diet rules must be included in the daily food intake as per adults, infants and young children.

Diet rules for adults:-

- Their daily must contain fruits, vegetables, nuts and whole grains.
- At least 400g of fruits and 500g of vegetables should be consumed per a day.
- Every adult should get less than 10% energy from free sugars, this quantity will be 50g. More 25g (5% energy) will be tolerated for additional health benefits. Free sugars in the sense honey, syrup, fruit concentrates and common sugar.
- Energy from fats should be less than 30%. Unsaturated fats preferable compared to saturated fats. The unsaturated fats are found in fish, nuts, sunflower, olive oils, avocado and canola whereas saturated fats are found in cream, butter, cheese, ghee, lard, coconut oil, palm and fatty meat. The fats which are not a part of healthy diet are industrial Trans fats found in fast food, snack food, fried food, frozen food, pizza, pies, cookies, margarines and spreads.
- Less than 5g of salt which is approximately equal to one teaspoon should be consumed per a day. And this salt must be iodized.



Diet rules for infants and young children

The growth period of first two years of a new born child is very crucial. Providing healthy diet during this period results in healthy growth and development of the child. If not the child will suffer from problems like obesity, informal growth of muscles and bones.

- Infants should be compulsorily breastfed for the first 6 months after birth.
- Infants should be breastfed up to 2 years or more than 2 years continuously.
- 6 months after birth along with breastfeeding infants should also be fed with safe and nutrient rich dense complementary foods. Salt and sugar should not be added in these foods.

These are the diet rules that every inhabitant of Sri Chakra has to follow.

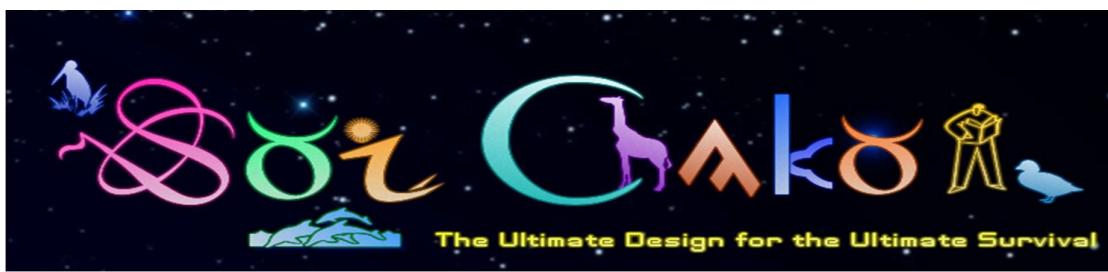
If in case any inhabitant consumes huge fat content food items, he/she has to work out by doing physical exercises like cycling, swimming, jogging, walking, weight lifting, running, gymnastics etc.,

Health & hygiene

Health

“Health is wealth”

Multi-specialty health care centers will be located in the 14 communities of two residential tori. Each hospital is being parted into two categories. One is giving treatment using modern technology and other is with Ayurveda. Selection of this category is left to the inhabitant's choice. These hospitals are provided with all advanced equipment's that all needed for surgeries. Doctors will be appointed by medical and Ayurveda College.



These are the wards present in our hospital.

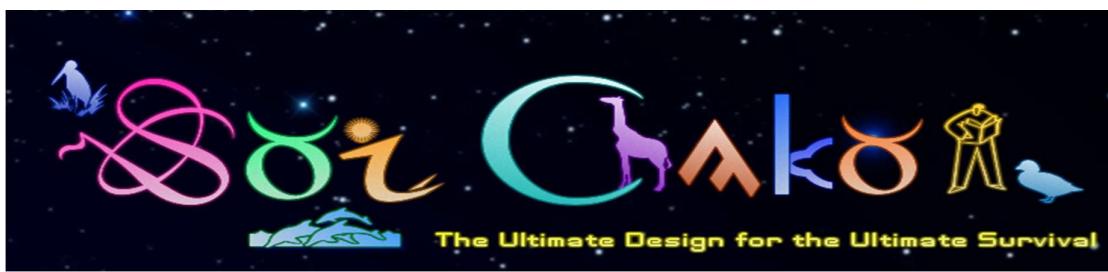
1. General ward
2. Maternity ward
3. Dental ward
4. Cardiology ward
5. Ophthalmology ward
6. Gynecology ward
7. Dermatology ward
8. Orthopaedic ward
9. Mortuary
10. ICU
11. Operation theatres
12. X-ray, Scanning rooms
13. Doctor visiting rooms
14. Waiting rooms

Two ambulances will be provided to each hospital, these ambulances will run to the patient's house immediately after receiving the call. **“108”** will be the call service number to get an ambulance. The reason is, there are 108 most popular holy temples in India known as **“divyakshetras”**.

This is about health care centers and their function. But there is no need of these multispecialty hospitals and advanced equipment if everyone is healthy and fit. The following are some of the practical advices on how to be healthy and strong.

“An apple a day keeps doctor away”

- Always including vegetables in daily diet.
- Eating fresh vegetables in season.
- Eating fruits and vegetables as snacks.
- Instead of butter, using vegetable oil; boiling, steaming and baking the vegetables than frying; removing fatty part of the meat while cooking.



- Avoiding fast foods which contain Tran's fats.
- Consuming saturated fat food item like ice-cream, cheese, butter in a limited proportion.
- Choosing low sodium content products.
- Limited intake of salty snacks like chips.
- Not having huge quantity of salt through curries (leads to high B.P.)
- Avoiding consumption of drinks containing high amounts of sugar.

Hygiene

Every house is provided with a house keeping robot which will clean the house daily and also every house is provided with a special dustbin. This dustbin has five separations build in it for dumping the waste. Those five separations are meant for dumping metal waste, plastic waste, food waste, fabric waste and paper waste. The house-keeping -robot collects wastage from the house and separates according to the material and dumps it in the dustbin. The dustbin is placed outside the house.

Municipal robots will be allotted for each community, this robots will go to every house in the community and collect the garbage from the dustbin then drive it to the wastage recycling centers in the industrial torus. These robots will also sweep roads and charge with solar power.

Education:-

“Education is soul of life”

Education plays a key role in forming the society because it shows impact on coming generation. If they are educated well they can create bright & marvelous era. As we know literates do smart work whereas illiterates cannot. Education also upgrade our knowledge makes innovative. It makes him thin fuel & tract.

In our Sri Chakra there will be kindergarten, elementary primary & higher schools, colleges, universities and other institutes for developing skills and others. We will include astronomy in higher subjects as they can see practically from upper chakra and clearly vision the mechanism of theories the younger inhabitants (students) will be a learners throughout life. We will be encouraging to increase the spirit of maximizing human potential. They will be taught to increase their aptitude skills. They encouraged to study in their respective & interested fields (subjects). Apart from academics, sports and games are also introduced in our Sri Chakra to maintain good physique. Daily evening such play in grounds available.

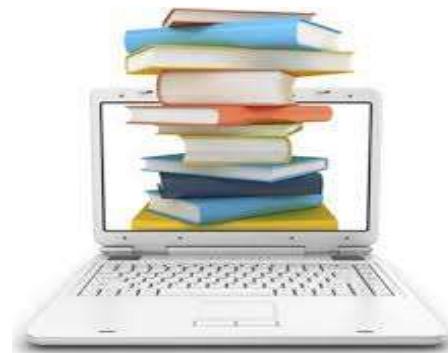
We will provide separate schools and stadiums for those who are concerned of games. And they will build up a lot of researches show that children who engaged with games has supreme health, agility, stress less, higher thinking ability and acquires leadership qualities, inter personal skills.

Libraries:-

Library is a collection of all information in the form of books. Made accessible. We will arrange all sort of books. And we will be collecting all the articles locally and from earth and will be recorded in our library. In this way our setters can also get aware of earth affairs. There will be two big halls in each library.

1. Reading hall
2. Debate hall

One will be used for reading books. Every book in our library is burned on CD's and digitalized. So we will have completely digital libraries which provides data in the form of Ext, visuals, audio and video to make understand quickly and completely.



courtesy:Google Images

And the other room is used as debate hall. If any Innovations, discoveries are made or if they have any sort of thought they have it makes people to of knowledge and wisdom. And people gets connected with great scholars can clear their doubts without any error.



courtesy:Google Images

Library is a treasury of knowledge of wisdom. So in this way libraries help lot for those who study self. It also means lot for those who research on particular topics.

Transportation

Most effective and advanced transportation system must and should be there in our settlement in order to save inhabitants valuable time. Not only effectiveness but we also concentrated upon their comfort and designed a very large transportation system. Lifts will be placed in the principal axle (or) central cylinder connecting the joining places of four spokes which are extending from each chakra and each torus. This inner skeleton lifting system acts as the major transportation system which connects all the tori and chakras to the docking chamber. There will be six stations interrupting the lifting system at the six intersection points of tori and chakras. These stations are connected to the spokes. And in spokes there will be railway system in which we are introducing maglev trains. These trains will travel with a maximum speed of 431 km/h and minimum speed of 10km/h. Maglev trains move very smoothly and quietly compared to the mass transit systems. This reduces sound pollution in our settlement. These trains are good example for electromagnetic suspension method which is easy to control and also to construct. The minerals that are brought from moon and asteroids to the docking chamber will be transported using the lifting system, maglev trains and as well as the goods, food products and other things manufactured in industrial torus will be easily transported to all the tori and chakra's. Maglev is a method of transportation in which vehicles are carried with magnets using magnetic levitation.



Internal transportation will be in two ways. Road ways and water ways. Main road is connected to all the roads. Two types of vehicles will be used, one type of vehicle made up of Bucky paper , as already mentioned in chapter Gadgets, this Bucky paper is made up of carbon Nano tubes.

Communication:-

Our Sri Chakra contains most advanced communication system in which the data can be transmitted from any point to another in ship. Communication is extremely essential for everyone. So we will provide uninterrupted continuous communication system without disturbance. As communication is a key for individual or collective success we will make it efficient.

The communication can be 2 types based on their usage

1. Intra communication
2. Between ships and earth and satellites

Intra communication refers to communication between individual within our settlement for that we will providing Wi-Fi network for that we will establish interplanetary network system. People will having multifunctional tabs in which they can do everything such as data storage, internet. Daily paper, Wi-Fi, browsing, alerts, and dangers regarding our settlements, diet we have to take and many other. They can even order delicious food items, groceries and other domestic communities which will be delivered at their door step with in due time. And we will be providing a continuous internet package with high speed. These multifunctional tabs are easy to carry. Will be using common network "SRI's" network this network usage requires authentication password which will be provided. Multifunctional tabs will also guide us map to public places, shops or any concert or stage (meeting) that may arranged on meetings or weekends.

Our Sri Chakra settlement also provide Sri Chakra's local web site which tells us all issues and matter regarding our settlement and it brings all our Sri Chakra's residents on one plat form.



External:-

This includes the transmission of data between the Sri Chakra, Earth, Moon and satellites. First of all we will place two huge antennas and our docking system in which one receiving data from Earth and another for satellites and moon. After it from antenna the radio waves are sent to local servers and then integrated with our settlement network system. This helps for people for who wants to talk to their acquaintances who are on Earth. As the communication system for spaceships from earth to our Sri Chakra is very complex this helps us in this it makes trips easier and brings all us on one platform.

Internal:-

Bracelet sort of watches are used in our habitat which monitor our health, mental, physical conditions, pulse rate display on the screen it has.

Sri Chakra satellite:-

There will be an artificial satellite which works on our settlement. It is completely used for our habitat and for transmitting waves from Earth's satellites to us. It works on principle of radio waves.

Administration and Laws

Administration

An effective administration system plays key role in society's development. Administration is very much needed to run a society in a systematic manner. It also needed to distribute the facilities which all people have the right to gain.

Taking this point into consideration we have decided that our settlement also needs an effective administration system (or) Governing body so that all the communities can be systematically governed as a result all the inhabitants feel free, secure and earth like environment. Another important aspect is that the governing body should be a people's one because to achieve liberty and to protect individual rights it is a compulsory one. This can be achieved only by democratic government.



"As Abraham Lincoln said democracy is of the people, for the people and by the people". Therefore administration on Sri Chakra will totally be a democratic one. This democratic administration is an administration in which inhabitants in each residential torus elect seven community representatives in their representative communities, so that there will be 14 community representatives in both of the residential tori and inhabitants will also elect their torus representative namely RT-A representative and RT-B representative. Adding them the governing body is now consists of 16 members. These 16 representatives will elect a president who is the head of total settlement. Additionally 6 more officers will be appointed by the president for the remaining places namely docking, entertainment, research laboratories,

Agriculture, Industries and Defense. Required officers for all these branches will be appointed by 6 officers.

Laws:

So far we are clear about the governing system, but no one can ensure that effective government can control crimes. The government's duty is to lead the people and provide all the facilities that are needed to them, so we are also including some laws that no inhabitant have to break. Most important criteria of a space settlement is to provide an earth like environment. Hence, the constitution we follow on our settlement will be same as that on earth.

Sri Chakra's construction material, infrastructure we use like artificial trees, robots, gadgets, illumination mirrors etc., are highly advanced and costly also. Therefore, no inhabitant have to damage this infrastructure.

Every inhabitant on our settlement is provided with an access card, smart tab and an electronic display Bucky paper. If anyone wants to go to a building, shopping mall or any other stationaries they should show their access cards as identities and every house has finger print identity to enter into it. Therefore, access cards are compulsory.

Sri Chakra's population involves people bearing different religions, castes and life style. So, no one have to form groups of their religion conflicts and antisocial elements. This is strictly prohibited.

Last but not least if anyone on our settlement have to carry a weapon for example gun, they have to take license from our government. Some tests will be conducted and enquiry will be done and then decision will be taken whether to issue the weapon or not. If anyone is found with a

weapon that is not licensed then they will be imprisoned and serious actions are taken.

Breaking the laws considered to be a crime and if anyone violates the laws punishment will be given. The level of punishment based on the severity of crime committed.

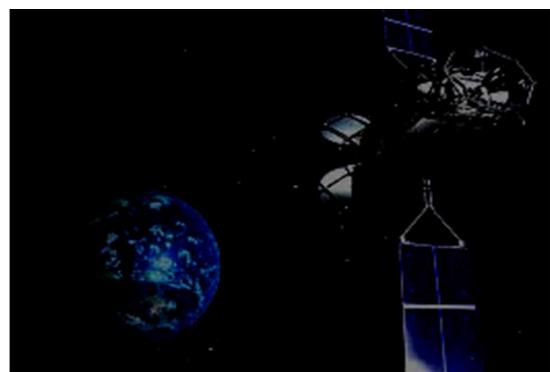
Business Management & Employment

Business management:

We all know that our plans become great when they are challenged and maintained strictly without failures. Our economy and welfare completely based on the concepts of our trade and productivity. In our project the service category which we are discussing plays main role to makescenario the best. Business is a combination of strategy and economic policy. Social entrepreneurship, business models are developed. This sector brings all the business personals on a platform. The business management and economic services are relative to each other since commercial business of all sources which we have abundantly, provides us self-depending life. Since we have abundant sources we can provide a great source of business by transporting the products which are available in our settlement. With the following products of our settlement, our business is to be done:

Electricity:- (sending electricity to earth in the form of microwaves)

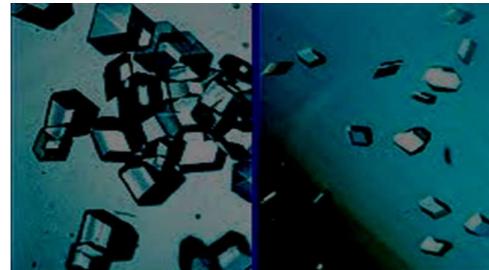
As we have abundance of solar Energy, we can produce ample of Electricity which needed for our entire Colony. The surplus electricity is sent to The earth by converting it into the form Of micro waves. Besides we can send it By the solar power satellites to other Celestial bodies where research excavations need energy.



courtesy:Google Images

Micro-gravity:

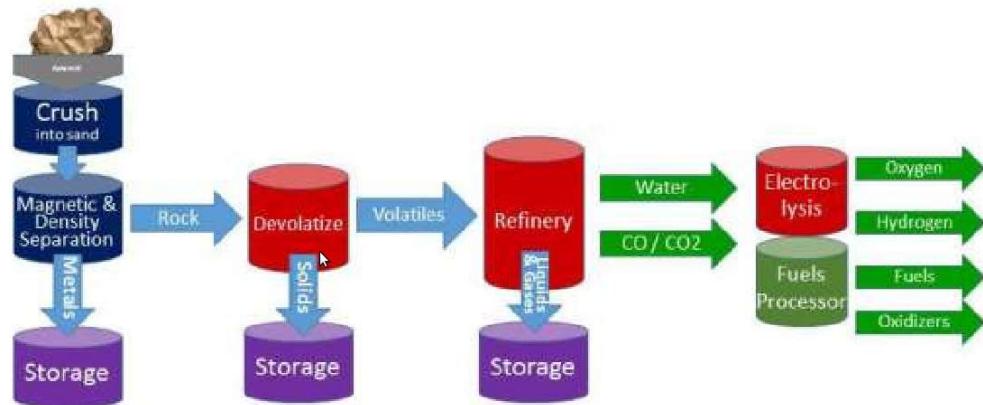
Future space research will stress both scientific and commercial goals. Micro-gravity produces vapor crystal growth, metals, ceramics, biological



courtesy:Google Images

materials and glasses. Processes will include solidification of metals and alloys, as well as transporting fluids and chemicals in microgravity. With Micro-gravity we can make most strengthen glasses i.e., on the earth when we are making glasses moisture will include in glass material and it causes to lose strength of glass but in space there is no moisture so we can make the glasses stronger than earth glasses. As the demand abruptly going to increase on earth new materials, more efficient use of fuel resources, new medicines, advanced computers and lasers and better communications we can directed from our settlement. Like space, opportunities offered by microgravity science are vast, and only beginning to be explored. Since we have abundant silicon which is primary raw material in making of ceramics we can use of it.

TURNING ROCKS INTO MONEY



courtesy:Google Images

Ofcourse, it is surprise to hear that rocks are turned into money. Isn't it? Yes it is! But it is possible when we look into this method. We will make money by



utilizing potential which existed in our vast solar system. The asteroids and mineral and potential rich rocks are trapped by large machines called asteroid trapping. A large machines called asteroid trapping machines. Once it got into industrial unit they are crushed into finer particles. Then after they are converted into different volatiles and further refined into water, oxygen, fuels, different valuable minerals and other oxides.

Employment:

"Employment is nature's physician and is essential to human happiness."

-Galen

Our settlement supports every service individually with required employes.so business and management system provides a top personals, well skillful led, and secretarial services.

We are organizing this sort of system which everyone could wish to become a part of this system. This helps them to work independently in adverse situations. There will be business schools arranged in each residential sector to develop their marketing and new business ideas in them. Besides there will be high intensive sessions and practical mechanism explained. Employees allotted to desired field with their higher qualifications and high experienced. The marketing techniques that are specifically tailored to the local market women in the workplace by offering increased flexibility in time worked, better retraining, and innovative, industrial specific performance markers. Managers destined for the service sector are being trained to use unique measurement techniques, better worker support and more charismatic leadership style. Our settlement's employment is controlled by the three main parts which are described below:

Major Sector:

This sector controls main property of our settlement i.e., all industries, agriculture including poultry, forestry, transportation, scientific laboratories and other main things. This sector allows many no. of employees by their experience and qualifications. And other facilities recycling methods likewise management methods are also controlled by this. A major economy is obtained by extracting the undetectable asteroids which are present around our settlement. Many of them can be melted which contains several elements whose value is unmeasurable and has a lot demand on our earth.



Minor sector:

This sector comprises of transportation system, like textile industries, manufacturing industries and transformation of raw materials which provide all the basic necessities to our habitat.

Although it occupies small proportion, it plays a crucial role in our habitat. It comprises all commercial transactions private and governmental, sales, Investments, logistics and transportation. Perfect competition requires perfect knowledge of the state of the market employers are trained specially for this.



INDUSTRIES

Industries are very important for the development of a country. GDP decides whether a country is developed or developing. And this GDP is because of the industrial development. Hence industries play a major role in a country's economy. In the same way our settlement also needs all types of industries for its development. Not only development but also industries are required in the production of all the materials, infrastructure, machines, and goods etc., which are essential for the human survival. This is the reason for allotting whole torus as industrial torus.

As mentioned earlier industrial torus will be constructed first so that the materials needed for the construction of next levels will be processed in their respective industries. Here is the list of industries placed in Sri Chakra

S.NO	INDUSTRY	PERCENTAGE OF INDUSTRY
1	Construction industry	8%
2	Energy industry	18%
3	Robotic industry	15%
4	Computer industry	8%
5	Food industry	14%
6	Water industry	8%
7	Fertilizer industry	3%
8	Pharmaceutical industry	2.5%
9	Health care industry	1.5%
10	Textile, leather& fibre industry	3.4%
11	Domestic appliance industry	1%
12	Communication industry	4%
13	Transportation industry	2.3%
14	Mass media industry	3%
15	Entertainment industry	0.5%
16	Cosmetic industry	2%
17	Jewelry industry	0.2%
18	Mining industry	5%
19	Banking industry	0.1%
20	Defense industry	0.5%



Small account on some of these industries is given below

Construction industry

Radiation protected windows and the layers of materials which are needed for the construction process are being manufactured in this industry. This industry will be in function until the construction of whole settlement completes.

Energy industry

Total electricity needed for the whole settlement is produced in this industry using nuclear and solar power. All the solar panels are connected and controlled by this industry.

Food industry

Processing of food grains, vegetables and spices which are sent from agro-torus, production of dairy products, sugar, tea & coffee powder, cooking oil, flour, turmeric, tamarind, chili powder, chocolates, biscuits, chips, energy drinks, bread, ice creams, cakes, pizzas and all other food products are the activities of this industry.

Computer industry

Most of the systems in our settlement are computerized. Computers, laptops which are needed for office, home purpose are being manufactured in this industry.

Textile, leather and fiber industry

Textile products like clothes, bed sheets, curtains, kerchiefs etc., and leather products like foot wear, belts, shoes, bags, gherkins etc., and fiber products like ropes, painting brushes etc., are being manufactured in this industry.

Domestic appliances industry

These appliances involve all home infrastructure like cooking bowls, utensils, plates, glasses, refrigerators, microwave ovens, induction stoves, cutters, chapatti makers, hot boxes, flasks etc., These are all manufactured in this industry.



Mass media industry

The activities of this industry are

- * Film industry
- * Broad casting
- * Publishing and
- * Internet services

Cosmetic industry

Cosmetics like talcum powders, body lotions, fairness creams, lip sticks, eye makeup products, nail paints, hair dyes etc., are being manufactured in this industry.

Mining industry

The minerals which are extracted from moon and asteroids are being processed in this industry for the further use. A clear description about mining is given in the chapter mineral extraction.

Defense industry

Infrastructure needed for protection of Sri Chakra is manufactured in this industry.



ENTERTAINMENT



“Smile and the whole world smiles with you”

Entertainment is a form of activity that holds the attention and interest of a person and gives pleasure and delight, Entertainment is the only refreshment that no one ignores in their life. Survival in space leaves some sort of fear for most of the human beings .Enclosed machinery and consistent life of space settlement add to this fear. Our idea is to provide a healthy earthly environment in our colony so that the inhabitants can survive without any homesick feelings (or) fear of machinery life. Besides theaters, cinemas, video games, houses etc.,We are creating six unique refreshment spots where the inhabitants can meet for fun and efface all the conflicts from their minds and refresh themselves completely.

These six unique refreshment spots in Chakra-A includes water world, snow world, Bird sanctuary, Zoo, Forest resorts and Sports & games hub.

Water world:-

Water world is a place where inhabitants experience refreshment through water. Beach plays a major role in creating earthly environment in our colony. People visit beach along with their families and enjoy a lot. We are providing different type beach houses which attracts tourists in a large ratio. In addition to these, this refreshment spot also includes swimming pools, restaurants, ice cream parlors, fun fare, circus, cultural event auditoriums etc.,

Snow world:-

Snow world is the area which is totally covered with snow this arrangement offers a superb refreshment. People can play with snow, children build snow houses (igloos), ice skating, travelling in cable cars, watching wonderful views of space as well as snow world

Bird sanctuary:-

Bird sanctuary is a place where birds are brought to live and be protected for the rest of their lives. All species of birds in the world are brought here. There is no chance of extinction of any species in our colony because ours is an ecocfree colony. So that we can protect all the species for our future generations.





- **Zoo:-**

A zoo (zoological park or zoological garden, and also called as menagerie) is a facility in which animals are confined within enclosures displayed to the public and in which they also may be bred. Same as in bird sanctuary zoo also contains all species of animals in the world. These animals are protected safely through generations. Zoo provides refreshment to the visitors and as well as serves as good income in tourism field.

- **Forest resorts:-**

We are creating a forest environment in which the resorts are located. These resorts (or) houses are constructed on the trees, which gives the inhabitants a crazy feeling of living in tree houses. Especially people who prefer privacy for example newly married couple, they want to go for a vacation to a place which offers natural environment views like trees, lakes etc., And they also prefers privacy, that's why we are placing these forest resorts with extra luxurious facilities and with special menu of food items.

We assure that this will definitely provide an earthly environment and also attracts tourists.

- **Sports and Games:-**

Sports and games are the good sources of refreshment. Every person likes playing sports and games. Cricket is the major sport all the world running behind. Famous competitions like Olympic Games, Asian games, common wealth games, world cup (cricket as well as in hockey) etc., Got a very big reputed name on Earth. Considering this situation, we are placing cricket stadium, hockey stadium, indoor games like badminton, table tennis, chess kabaddi etc., in our colony.

Addition to these six unique refreshment spots we are also including '0' gravity chamber and planetarium for entertainment purpose.



- **'0' gravity chamber :-**

This is the place where there is no gravity at all in habitants can experience crazy feeling of weightlessness and also watch natural views of space. Inhabitants who enters into this chamber are provided with bio suits in order to protect them from the physical effects of being weightless. No inhabitant is allowed to stay more than one hour in this chamber.

- **Planetarium:-**

Large telescopes are placed here for the inhabitants to view the gigantic views of heavenly bodies in space.



Cost Estimation



Name	Quantity	Cost/unit	Total cost
Solar panels	462,291	20	554,749,200 \$
Robots	30,000	8,000 \$	240,000,000 \$
Laboratories	6	1,000,000 \$	6,000,000 \$
Industries	20	2,000,000 \$	40,000,000\$
Buildings			
Dynamic	4,172	50,000 \$	208,600,000 \$
houses	8,344	40,000 \$	333,760,000 \$
Transportation people	367,136	12,000 \$	4,405,632,000 \$
Space shuttle	500	1,000,000 \$	500,000,000 \$
Infrastructure	1	300,000,000 \$	300,000,000 \$
Employees' salaries	20,000	(31 years) 1,500,000 \$	30,000,000,000 \$
Materials	20	12,500,000,000 \$	250,000,000,000 \$
Others	-	63,411,258,800 \$	63,411,258,800 \$

Total cost = 349,994,000,000 \$



Income:-

Name	Quantity	Price /unit	Total price
Electricity	5650407.67 kw/day	0.05 \$	103119938.7 \$/year
Entertainment	-	500 \$/day	182500 \$/year
Tourism	-	1000 \$/day	365000 \$/year
Export micro-gravity Industrial products	-	20000 \$/day	7300000 \$/year
Excess agriculture products	-	500 \$/day	182500 \$/year
Total		111149938.7 \$	

Name	Task years
Construction team recruitment	2035
Construction team finalization	2036-2037
Construction studies	2036-2037
Meeting with other countries for approval and funds	2037-2038
Lunar base construction	2039-2045
Robots & vehicles	2040-2065
Import of construction material	2040-2050
Level-1	2042-2043
Level-2	2043-2045
Construction of industries	2045-2048
Level-3	2047-2049
Level-4	2049-2051
Completion of agricultural infrastructure	2051-2052
Level-5	2053-2055
Level-6	2056-2058
Level-7	2058-2059
Level-8	2059
Placing of solar panels and giant telescope	2059-2060
Construction of buildings	2060-2062
Construction of interior design	2063-2065
Final touches	2064-2065
Transport of inhabitants	2064-2065
Setting in	2066

It takes 25 years to start our "Sri Chakra" and it takes 31 years to complete "Sri Chakra"-The ultimate design for the ultimate survival.



EPILOGUE

As no one in our team had ever participated in a space related competition, initially when we decided to do the project we don't even have confidence on us. But as the time passes on, we thoroughly went on reading all the space settlement related NASA articles and pdf's of grand prize winners. Unexpectedly an enthusiasm took birth in our minds and that enthusiasm had an important role in keeping us motivated during all the problems we came through.

This project helped us a lot, we have seen a new side of ourselves, we improved our communication skill, we have learnt surprising facts about hostile space, we came know about new technologies of this modern era, we have known valuable information that is beyond our syllabus which we are studying now. This project also took us to search 5th&6th class science textbooks to know about food diet charts and made us remember our early school science projects, overall we once again time travelled into our beautiful childhood.

Finally we have spent sleepless nights to complete the project. We gave our best and accomplished the task in a time period of one and half month.

If any mistakes are found in our project, we sincerely request NASA AMES ORGANISATION to excuse us.



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“NOTHING IS IMPOSSIBLE”

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