Portfolio

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Calcium Paint

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Present and justify a problem and solution requirements

EGYPT GRAND CHALLENGE(S) Fig.1

1)Reduce and adapt to the effect of climatic change.

2)Improve the scientific and technological environment for all.

3)Address and reduce pollution fouling our air, water, and soil.

4)Increase the industrial and agricultural bases of Egypt.

5)Recycle garbage and waste for economic and environmental purposes

6)Work to eradicate public health issues/disease.

7)Manage and increase the sources of clean water.

8)Deal with urban congestion and its consequences.

9)Improve the use of alternative energies.

10) Deal with population growth and its consequences.

11) Improve uses of arid areas.

Figure 1

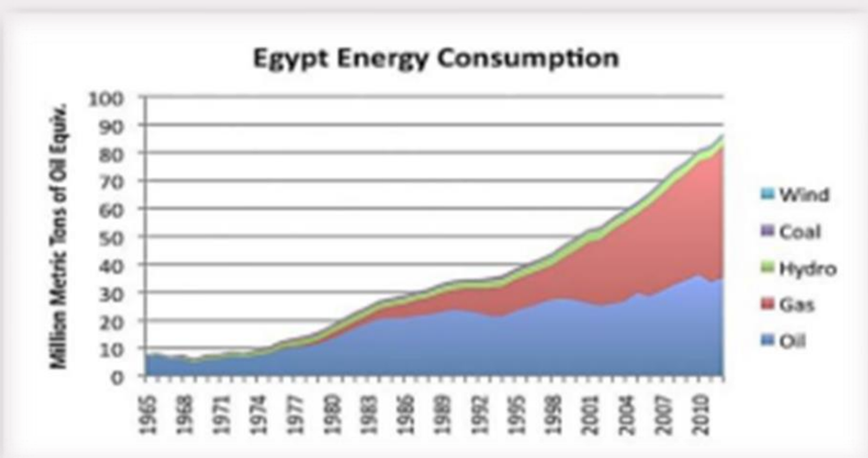
Increase the industrial and agricultural bases of Egypt.

Industrialization is generally accompanied by:

1. Social changes as increased urbanization and
2. The spread of manufacturing towns.
3. Economic changes such as a fall in birth rates.

In the **1950s**, Egypt started an ambitious industrial strategy that helped achieve economic development, creating jobs, and increasing national revenues. Unfortunately, this industrialization was hit hard by the policy of nationalization and Egypt's defeat in the **1967** war. In the early **1990s**, the government has promoted privatization to eventually increase industrial output as shown in the pic. In **2001** industry accounted for 30% of GDB (Gross Domestic Product). Major industrial products included:

- ✓ textiles
- ✓ chemicals (including fertilizers, polymers, and petrochemicals)
- ✓ pharmaceuticals
- ✓ food processing
- ✓ petroleum
- ✓ construction
- ✓ cement
- ✓ metals



Graph 1

light consumer goods the causes why the industrial base nowadays in Egypt is low:

a. There are human resources, but the educational standards, whether in schools, universities, or technical colleges, are low. That's why there are low levels of productivity.
b. Low level of domestic saving in general and the reduction of foreign direct
c. Investment **(FDI)**, particularly after the **2011** Revolution.
d. The recent decline in energy supplies as shown in graph (1).
e. Egyptian industries at home and in international markets face heavy competition because Egyptian products are of low quality and relatively high prices.
f. Social instability and social Dissociation graph (1) Egypt energy consumption **1965**:**2010** Some suggested solutions to develop the industrial base by:
   - ✓ Establishing new industries, but also to deepen existing industries.
   - ✓ Having political stability, predictability of policies, pressure for performance, public-private partnership, respect for property rights, and production capabilities of local firms in the value chain.

Recycle garbage and waste for economic and environmental purposes

Over the last four decades, human beings have tripled our consumption of the earth's natural resources, said a recent report from the United Nations Environment Programmer. And according to the World Resources Institute "one half to three quarters of annual resource inputs to industrial economies is returned to the environment as wastes within just one year."

In **2013**, the U.S. produced **254** million tons of garbage or municipal solid waste. About **87** million tons of this was either composted or recycled, **32.7** million tons were burned for energy and **134.3** million tons went to landfills. Over many years Egypt suffers from the problem of Garbage which is considered the main factor in the spreading of diseases not only in Egypt.

Figure 2

There are many causes for this problem such as Egypt has no centralized garbage collection system, and most refuse all goes to the same dumps, Trash is thrown on streets .and there are no crucial decisions that prevent throwing the rubbish in the streets. There are many side effects for this problem including such as Spreading **Fig.2,3** diseases, Decay at the social level, as the standard of living will decrease, poor social behavior, and decay in the economic field.

Many solutions have been presented for solving the problem of garbage in Egypt including the Ministry of Environment contracted in **1990's** local and international companies to collect transport and recycle solid waste, feeding pigs with the organic waste and selling the solid waste to recycling companies, Cairo districts have been divided into smaller units to facilitate the garbage collection and enhance accountability. The Ministry of Environment launched a national campaign to improve the solid waste management system

Figure 3

Reduce and adapt to the effect of climatic change

Climate change is one of the most complex issues facing us today. It involves many dimensions (**science**, **economics**, **society**, **politics**, and **moral**) and is a global problem, felt on local scales, that will be around for decades and centuries to come. Carbon dioxide, the heat-trapping greenhouse gas that has driven recent global warming, lingers in the atmosphere for hundreds of years, and the planet (especially the oceans) takes a while to respond to warming. So, even if we stopped emitting all greenhouse gases today, global warming and climate change will continue to affect future generations. In this way, humanity is "committed" to some level of climate change.

How much climate change?

That will be determined by how our emissions continue and exactly how our climate system responds to those emissions. Despite increasing awareness of climate change, our emissions of greenhouse gases continue a relentless rise. In **2013**, the daily level of carbon dioxide in the atmosphere surpassed **400** parts per million for the first time in human history. The last time levels were that high was about three to five million years ago, during the Pliocene Epoch.

Because we are already committed to some level of climate change, responding to climate change involves a two-pronged approach:

1. Reducing emissions of and stabilizing the levels of heat-trapping greenhouse gases in the atmosphere ("**mitigation**"). **Fig.4**
2. Adapting to the climate change already in the pipeline ("**adaptation**"). **Fig.4**

Figure 4

Mitigation – reducing climate change – involves reducing the flow of heat-trapping greenhouse gases into the atmosphere, either by reducing sources of these gases for example: (**burning of fossil fuels for electricity**, **heat**, or **transport**) or enhancing the "**sinks**" that accumulate and store these gases such as (**oceans**, **forests** and **soil**). The goal of mitigation is to avoid significant human interference with the climate system, and "**stabilize greenhouse gas levels in a timeframe sufficient to allow ecosystems to adapt naturally to climate change, ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner**".

Adaptation – adapting to life in a changing climate – involves adjusting to actual or expected future climate. The goal is to reduce our vulnerability to the harmful effects of climate change like (**sea-level encroachment**, **more intense extreme weather events** or **food insecurity**). It also encompasses making the most of any potential beneficial opportunities associated with climate change for example (**longer growing seasons** or **increased yields in some regions**).

Throughout history, people and societies have adjusted to and coped with changes in climate and extremes with varying degrees of success. Climate change "**drought in particular**" has been at least partly responsible for the rise and fall of civilizations. Earth's climate has been relatively stable for the past **12,000** years and this stability has been crucial for the development of our modern civilization and life as we know it. Modern life is tailored to the stable climate we have become accustomed to. As our climate changes, we will have to learn to adapt. The faster the climate changes, the harder it could be. **While** climate change is a global issue, it is felt on a local scale. Cities and municipalities are therefore at the frontline of adaptation. In the absence of national or international climate policy direction, cities and local communities around the world have been focusing on solving their own climate problems. They are working to build flood defenses, plan for heatwaves and higher temperatures, install water-permeable pavements to better deal with floods and stormwater and improve water storage and use.

According to the 2014 report on Climate Change Impacts, Adaptation and Vulnerability (page 8) Fig.5 from the United Nations Intergovernmental Panel on Climate Change, governments at various levels are also getting better at adaptation. Climate change is starting to be factored into a variety of development plans: how to manage the increasingly extreme disasters we are seeing and their associated risks, how to protect coastlines and deal with sea-level encroachment, how to best manage land and forests, how to deal with and plan for reduced water availability, how to develop resilient crop varieties and how to protect energy and public infrastructure.

(Click the book cover image for the download link)

Figure 5

Improve the scientific and technological environment for all

Global warming is becoming an increasingly important issue on the political and public agenda and is heavily linked to developments in science and technology.

Some existing benefits of technology:

The introduction of computer systems into both the home and work environments has eradicated the need to have reams of paper files; in the long run these simple changes will have a considerable impact on the environment and help to preserve forests. Recycling technology will also help to eliminate waste.

New developments:

While technology is blamed for much of the pollution that contributes to global warming, it may also provide the solution to the problem. Research into new methods of generating power and electricity is abundant; experts hope to find cleaner, renewable sources of energy to replace the finite supply of fossil fuels and reduce global warming and climate change. New methods such as wind turbines, solar power and hydro-electric power are under scrutiny and are constantly subject to trails to improve the efficiency of existing systems.

Every day, new research is being conducted to improve the systems involved in the modern world. New systems of removing waste and improving the efficiency of the distribution of electricity, for example, may benefit many people in the future by cutting emissions and improving efficiency. Projects such as those involving cars that run on cleaner fuels may also significantly change the way we live in the future; energy efficient products such as light bulbs will also contribute to making the environment cleaner.

Helping the developing world:

One of the principal reasons behind the significant gap between the developing world and the developed world is a lack of technology. The developed world is heavily reliant on technology which makes life much easier and production much more efficient. Technology is lacking in developing countries and this contributes to widespread poverty and a lack of basic amenities such as clean, running water and food supplies. New technology which will boost food production, improve infrastructure, improve healthcare, and provide sanitation facilities could dramatically change the quality of life in the developing world. With the help of charitable organizations and Government leaders from developed countries, this kind of technology is gradually being introduced into developing countries.

Figure 6

Address and reduce pollution fouling our air, water, and soil.

Each pollutant has its own health risk profile, which makes summarizing all relevant information into a short chapter difficult. Nevertheless, public health practitioners and decision makers in developing countries need to be aware of the potential health risks caused by air and water pollution and to know where to find the more detailed information required to handle a specific situation. This chapter will not repeat the discussion about indoor air pollution caused by biomass burning (chapter 42) and water pollution caused by poor sanitation at the household level (chapter 41), but it will focus on the problems caused by air and water pollution at the community, country, and global levels.

Estimates indicate that the proportion of the global burden of disease associated with environmental pollution hazards ranges from 23 percent (WHO-1997) to 30 percent (Smith, Corvalan, and Kjellstrom 1999). These estimates include infectious diseases related to drinking water, sanitation, and food hygiene; respiratory diseases related to severe indoor air pollution from biomass burning; and vector borne diseases with a major environmental component, such as malaria. These three types of diseases each contribute approximately 6 percent to the updated estimate of the global burden of disease (WHO 2002).

As the World Health Organization (WHO) points out, outdoor air pollution contributes as much as 0.6 to 1.4 percent of the burden of disease in developing regions, and other pollution, such as lead in water, air, and soil, may contribute 0.9 percent (WHO 2002). These numbers may look small,

but the contribution from most risk factors other than the "top 10" is within the 0.5 to 1.0 percent range (WHO 2002).

Because of space limitations, this chapter can give only selected examples of air and water pollution health concerns. Other information sources on environmental health include Yassi and others (2001) and the Web sites of or major reference works by WHO, the United Nations Environment Programme (UNEP), Division of Technology, Industry, and Economics (http://www.uneptie.org/); the International Labour Organization (ILO), the United Nations Industrial Development Organization (UNIDO; http://www.unido.org/), and other relevant agencies.

Indicates some of the industrial sectors that can pose significant environmental and occupational health risks to populations in developing countries. Clearly, disease control measures for people working in or living around a smelter may be quite different from those for people living near a tannery or a brewery. For detailed information about industry-specific pollution control methods, see the Web sites of industry sector organizations, relevant international trade union organizations, and the organizations listed above.

Selected Industrial Sectors and Their Contribution to Air and Water Pollution and to Workplace Hazards.

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Air pollutants are usually classified into suspended particulate matter (PM) (dusts, fumes, mists, and smokes); gaseous pollutants (gases and vapors); and odors.

Suspended PM can be categorized according to total suspended particles: the finer fraction, PM10, which can reach the alveoli, and the most hazardous, PM2.5 (median aerodynamic diameters of less than 10.0 microns and 2.5 microns, respectively). Much of the secondary pollutants PM2.5 consists of created by the condensation of gaseous pollutants—for example, sulfur dioxide (SO2) and nitrogen dioxide (NO2). Types of suspended PM include diesel exhaust particles; coal fly ash; wood smoke; mineral dusts, such as coal, asbestos, limestone, and cement; metal dusts and fumes; acid mists (for example, sulfuric acid); and pesticide mists.

Gaseous pollutants include sulfur compounds such as SO2 and sulfur trioxide; carbon monoxide; nitrogen compounds such as nitric oxide, NO2, and ammonia; organic compounds such as hydrocarbons; volatile organic compounds; polycyclic aromatic hydrocarbons and halogen derivatives such as aldehydes; and odorous substances. Volatile organic compounds are released from burning fuel (gasoline, oil, coal, wood, charcoal, natural gas, and so on); solvents; paints; glues; and other products commonly used at work or at home. Volatile organic compounds include such chemicals as benzene, toluene, methylene chloride, and methyl chloroform. Emissions of nitrogen oxides and hydrocarbons react with sunlight to eventually form another secondary pollutant, ozone, at ground level. Ozone at this level creates health concerns, unlike ozone in the upper atmosphere, which occurs naturally and protects life by filtering out ultraviolet radiation from the sun.

Sources of Outdoor Air Pollution

Outdoor air pollution is caused mainly by the combustion of petroleum products or coal by motor vehicles, industry, and power stations. In some countries, the combustion of wood or agricultural waste is another major source. Pollution can also originate from industrial processes that involve dust formation (for example, from cement factories and metal smelters) or gas releases (for instance, from chemicals production). Indoor sources also contribute to outdoor air pollution, and in heavily populated areas, the

contribution from indoor sources can create extremely high levels of outdoor air pollution.

Motor vehicles emit PM, nitric oxide and NO2 (together referred to as NOx), carbon monoxide, organic compounds, and lead. Lead is a gasoline additive that has been phased out in industrial countries, but some developing countries still use leaded gasoline. Mandating the use of lead-free gasoline is an important intervention in relation to health. It eliminates vehicle-related lead pollution and permits the use of catalytic converters, which reduce emissions of other pollutants

PROBLEM TO BE SOLVED

To Success in any project, you should identify the challenges of this project well. Then, you should know the consequences that will come after and before these challenges. After that, your best is possible now. Therefore, our 2nd semester contains multiple challenges that must be identified well before starting to work on a good solution.

The main idea of this semester's challenge is about the improvement of the industrial base in Egypt. In addition, more challenges are involved besides this challenge. These challenges are:

The Recycling

Recycling is the process of converting waste products into reusable materials. Recycling differs from reuse, which simply means using a product again. According to the Environmental Protection Agency (EPA), about **30** percent of U.S. solid waste (i.e., the waste that is normally handled through residential and commercial garbage-collection systems) is recycled. About 15 percent is incinerated and about 55 percent goes into landfills.

Figure 7

Recycling is appealing because it seems to offer a way to simultaneously reduce the amount of waste disposed in landfills and save natural resources. During the late 1980s, as environmental concerns grew, public opinion focused on recycling as a prime way to protect the environment. Governments, businesses, and the public made strenuous efforts to recycle. By 2000, the recycling rate had nearly doubled the 1990 rate of 16 percent. A big portion of the increase has been in yard trimmings and food scraps collected for composting.

Recycling, however, is not always economically efficient or even environmentally helpful. The popular emphasis on recycling stems partly from misconceptions. One misconception is that landfills and incinerators are environmentally risky. It is true that at one time landfills were constructed to fill in swamps (sometimes to reduce insect infestation). If material leaked out from the landfill, it could contaminate nearby waters. But today landfills are sited away from wetlands. They are designed to keep their contents dry, and monitoring programs ensure that any leakage that does occur is caught before it causes harm.

Another misconception is that we are running out of landfill space. The truth is that landfills today are large enough to accommodate the solid waste produced by the United States until 2019, even if no new ones are established. Economist Daniel Benjamin (2003) reports that the fear of running out of landfill space stems from an EPA study in the 1980s that counted landfills rather than landfill capacity. In fact, the report omitted the fact that landfill space was actually increasing because sites were getting larger. Indeed, the EPA continues to publish a chart showing the declining number of landfills even while stating that "at the national level, capacity does not seem to be a problem, although regional dislocations sometimes occur" (EPA 2002, p. 14).

People also tend to overestimate how much space is required to bury our trash. Numerous studies have shown that it is not all that much. Statistician Bjørn Lomborg has calculated that a ten-mile-square, 255-foot-deep landfill could contain all the trash produced in the United States over the next century.

The Economics of Recycling

In the absence of government regulation, the economics of each material determines how much of it is recycled. For example, about 55 percent of all aluminum cans were recycled in 2000. Recycling of beverage cans goes back to 1968, when the Reynolds Metals Company started a pilot project. The chief motivation was to respond to public concerns about litter, which were spurring laws that required deposits on beverage containers. But energy prices began to rise during the 1970s and, because producing new aluminum from bauxite requires large amounts of energy, recycling aluminum cans became economically attractive.

About 56 percent of paper and cardboard was recycled in 2000. Recycling is economically rewarding because cardboard can be made from a wide variety of used paper. In addition, because many places (such as supermarkets and discount stores) use large quantities of corrugated boxes, collection costs can be low.

In contrast, only about 9 percent of plastic packaging is recycled. Because different plastic resins cannot be mixed and reprocessed, plastics must be separated at some point if they are to be recycled. The plastics packaging industry has developed symbols for different kinds of resins, but people do not seem eager to separate plastic. In addition, the relatively low cost of producing new plastic from oil-based petrochemicals makes recycling less economically rewarding.

Ironically, recycling does not eliminate environmental worries. Recycling is a manufacturing process and, like other manufacturing processes, can produce pollution. An EPA study of toxic chemicals found such chemicals in both recycling and virgin paper processing, and for most of the toxins studied, the recycling process had higher levels than the virgin manufacturing did. Nor will recycling more newspapers necessarily preserve trees, because many trees are grown specifically to be made into paper. A study prepared for the environmental think tank Resources for the Future estimated that if paper recycling reached high levels, demand for virgin paper would fall. As a result, writes economist A. Clark Wiseman, “some lands now being used to grow trees will be put to other uses.” The impact would not be large, but it would be the opposite of what most people expect—there would be fewer trees, not more. Finally, curbside recycling programs require additional trucks, which use more energy and create more pollution.

Curbside Recycling

The private sector typically adopts recycling when and where it makes economic sense. When recycling is a government program, however, it can be costly and can waste rather than save resources. Using figures collected by Franklin Associates, Daniel Benjamin compared the costs of traditional municipal waste disposal (by landfill but allowing residents to drop off material for recycling) and curbside recycling (where the city picks up recyclables separate from trash). He found that the curbside recycling programs cost between 35 and 55 percent more than the traditional landfill disposal. Recycling programs used “huge amounts of capital and labor,” writes Benjamin. Used materials were sold, but the costs of workers and equipment vastly outweighed the revenues from their sale.

Other problems arise, too. In 2003, the citizens of Tucson, Arizona, were disturbed to learn that the city’s recycling contractor was landfilling glass that many of them had separated and put into recycling bins. Prices for recycled glass had fallen so low that it would have cost eighty dollars a ton to ship it to Los Angeles to find a buyer. Depositing the glass in a landfill cost only twenty-eight dollars per ton.

These facts, however, have not stopped many local governments from establishing expensive curbside programs. Seattle’s city council went even further in December 2003, voting to make recycling mandatory. When the program went into effect in

2005, residents were prohibited from putting any recyclables into their trash. The city's previous method of charging residents on a per-trash-can basis (charging more for larger cans) provided an inducement to reduce waste, whether through recycling or other means, and helped boost Seattle's recycling rate to 40 percent. This was not high enough for the council, however, which made the program mandatory in hope of reaching a 60 percent recycling rate.

Recycling is not a panacea for environmental problems. It is instead only one of several means for disposing of waste. Recycling is widely used where the economics are favorable but inappropriate where they are not. Government regulations may override the economics, but only at a high cost and by requiring actions, such as curbside recycling, that people will not do voluntarily.

The Consequences

1. More pollution and energy consumption.

It's contradicting, but the reality is that recycling tons of garbage will require waste to be transported, sorted, cleaned and processed in separate factories, all of which need energy and may result in by-products that can pollute air, water or soil. When more trucks are employed to pick up recyclable products, air pollution will also increase. In fact, the exhaust of the 179,000 waste collection vehicles in 2009 contains three dozen toxins that are all airborne.

2. Result in pollutants.

When waste materials break down, pollutants, such as chemical stews, will harm the environment. Toxins and impurities from the original material, such as lead paint or spray cans, could pass through recycling and then carried through the recycled product. Worse, it could take years before we realize that the items we have been using is contaminated. Recycled steel used in buildings in Taiwan, for example, has caused gamma radiation poisoning for the past 12 years.

3. Increased processing cost and low-quality jobs.

Recycling cost can go thrice as much as the cost of putting garbage in landfills. This is why it is often considered cost-inefficient, even if it is eco-friendly. The process is also labor intensive. And even when the manpower requirement is high, the kind of work involved can lead to low morale and poor quality of life, because the pay is also low.

Figure 8

Address and reduce pollution fouling on air, water and soil

Air pollution

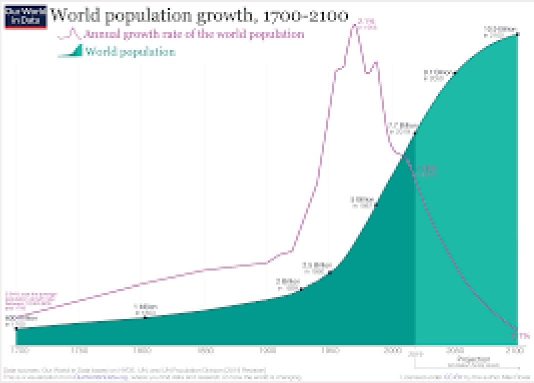

Figure 9

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Impacts on Health

Epidemiological analysis is needed to quantify the health impact in an exposed population. The major pollutants emitted by combustion have all been associated with increased respiratory and cardiovascular morbidity and mortality (Brunekreef and Holgate 2002). The most famous disease outbreak of this type occurred in London in 1952 (U.K. Ministry of Health 1954), when 4,000 people died prematurely in a single week because of severe air pollution, followed by another 8,000 deaths during the next few months (Bell and Davis 2001).

In the 1970s and 1980s, new statistical methods and improved computer technology allowed investigators to study mortality increases at much lower concentrations of pollutants. A key question is the extent to which life has been shortened. Early loss of life in elderly people, who would have died soon regardless of the air pollution, has been labeled mortality displacement, because it contributes little to the overall burden of disease (McMichael and others 1998).

Long-term studies have documented the increased cardiovascular and respiratory mortality associated with exposure to PM (Dockery and others 1993; Pope and others 1995). A 16-year follow-up of a cohort of 500,000 Americans living in different cities found that the associations were strongest with PM2.5 and also established an association with lung cancer mortality (Pope and others 2002). Another approach is ecological studies of small areas based on census data, air pollution information, and health events data (Scoggins and others 2004), with adjustments for potential confounding factors, including socioeconomic status. Such studies indicate that the mortality increase for every 10 micrograms per cubic meter(µg per m3) of

Figure 10

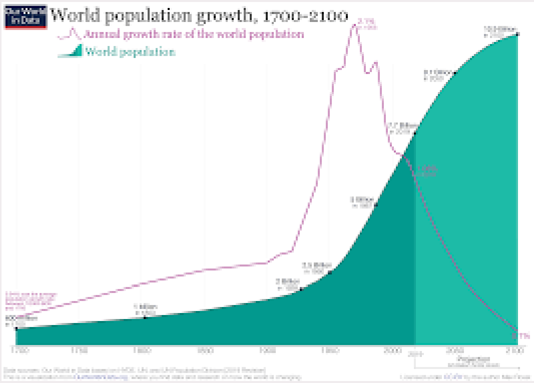


Figure 11

PM2.5 ranges from 4 to 8 percent for cities in developed countries where average annual PM2.5 levels are 10 to 30 µg/m3. Many urban areas of developing countries have similar or greater levels of air pollution.

Water pollution

Chemical pollution of surface water can create health risks, because such waterways are often used directly as drinking water sources or connected with shallow wells used for drinking water. In addition, waterways have important roles for washing and cleaning, for fishing and fish farming, and for recreation.

Another major source of drinking water is groundwater, which often has low concentrations of pathogens because the water is filtered during its transit through underground layers of sand, clay, or rocks. However, toxic chemicals such as arsenic and fluoride can be dissolved from the soil or rock layers into groundwater. Direct contamination can also occur from badly designed hazardous waste sites or from industrial sites. In the United States in the 1980s, the government set in motion the Superfund Program, a major investigation and cleanup program to deal with such sites (U.S. Environmental Protection Agency 2000).

Coastal pollution of seawater may give rise to health hazards because of local contamination of fish or shellfish—for instance, the mercury contamination of fish in the infamous Minamata disease outbreak in Japan in 1956 (WHO 1976). Seawater pollution with persistent chemicals, such as polychlorinated biphenyls (PCBs) and dioxins, can also be a significant health hazard even at extremely low concentrations (Yassi and others 2001).

Sources of Chemical Water Pollution

Chemicals can enter waterways from a point source or a nonpoint source. Point-source pollution is due to discharges from a single source, such as an industrial site. Nonpoint-source pollution involves many small sources that combine to cause significant pollution. For instance, the movement of rain or irrigation water over land picks up pollutants such as fertilizers, herbicides, and insecticides and carries them into rivers, lakes, reservoirs, coastal waters, or groundwater. Another nonpoint source is storm-water that collects on roads and eventually reaches rivers or lakes. Table 43.1 shows examples of point-source industrial chemical pollution.

Paper and pulp mills consume large volumes of water and discharge liquid and solid waste products into the environment. The liquid waste is usually high in biological oxygen demand, suspended solids, and chlorinated organic compounds such as dioxins (World Bank 1999). The storage and transport of the resulting solid waste (wastewater treatment sludge, lime sludge, and ash) may also contaminate surface waters. Sugar mills are associated with effluent characterized by biological oxygen demand and suspended solids, and the effluent is high in ammonium content. In addition, the sugarcane rinse liquid may contain pesticide residues. Leather tanneries produce a significant amount of solid waste, including hide, hair, and sludge. The wastewater contains chromium, acids, sulfides, and chlorides. Textile and dye industries emit a liquid effluent that contains toxic residues from the cleaning of equipment. Waste from petrochemical manufacturing plants contains suspended solids, oils and grease, phenols, and benzene. Solid waste generated by petrochemical processes contains spent caustic and other hazardous chemicals implicated in cancer.

Another major source of industrial water pollution is mining. The grinding of ores and the subsequent processing with water lead to discharges of fine silt with toxic metals into waterways unless proper precautions are taken, such as the use of sedimentation ponds. Lead and zinc ores usually contain the much more toxic cadmium as a minor component. If the cadmium is not retrieved, major water pollution can occur. Mining was the source of most of the widespread cadmium poisoning (Itai-Itai disease) in Japan in 1940–50 (Kjellstrom 1986).

Other metals, such as copper, nickel, and chromium, are essential micronutrients, but in high levels these metals can be harmful to health. Wastewater from mines or stainless steel production can be a source of exposure to these metals. The presence of copper in water can also be due to corrosion of drinking water pipes. Soft water or low pH makes corrosion more likely. High levels of copper may make water appear bluish green and give it a metallic taste. Flushing the first water out of the tap can minimize exposure to copper. The use of lead pipes and plumbing fixtures may result in high levels of lead in piped water.

Mercury can enter waterways from mining and industrial premises. Incineration of medical waste containing broken medical equipment is a source of environmental contamination with mercury. Metallic mercury is also easily transported through the atmosphere because of its highly volatile nature. Sulfate-reducing bacteria and certain other micro-organisms in lake, river, or coastal underwater sediments can methylate mercury, increasing its toxicity. Methylmercury accumulates and concentrates in the food chain and can lead to serious neurological disease or more subtle functional damage to the nervous system (Murata and others 2004).

Runoff from farmland, in addition to carrying soil and sediments that contribute to increased turbidity, also carries nutrients such as nitrogen and phosphates, which are often added in the form of animal manure or fertilizers. These chemicals cause eutrophication (excessive nutrient levels in water), which increases the growth of algae and plants in waterways, leading to an increase in cyanobacteria (blue-green algae). The toxics released during their decay are harmful to humans.

The use of nitrogen fertilizers can be a problem in areas where agriculture is becoming increasingly intensified. These fertilizers increase the concentration of nitrates in groundwater, leading to high nitrate levels in underground drinking water sources, which can cause methemoglobinemia, the life-threatening "blue baby" syndrome, in very young children, which is a significant problem in parts of rural Eastern Europe (Yassi and others 2001).

Some pesticides are applied directly on soil to kill pests in the soil or on the ground. This practice can create seepage to groundwater or runoff to surface waters. Some pesticides are applied to plants by spraying from a distance—even from airplanes. This practice can create spray drift when the wind carries the materials to nearby waterways. Efforts to reduce the use of the most toxic and long-lasting pesticides in industrial countries have largely been successful, but the rules for their use in developing countries may be more permissive, and the rules of application may not be known or enforced. Hence, health risks from pesticide water pollution are higher in such countries (WHO 1990).

Naturally occurring toxic chemicals can also contaminate groundwater, such as the high metal concentrations in underground water sources in mining areas. The most extensive problem of this type is the arsenic contamination of groundwater in Argentina, Bangladesh (box 43.2), Chile, China, India, Mexico, Nepal, Taiwan (China), and parts of Eastern Europe and the United States (WHO 2001). Fluoride is another substance that may occur naturally at high concentrations in parts of China, India, Sri Lanka, Africa, and the eastern Mediterranean. Although fluoride helps prevent dental decay, exposure to levels greater than 1.5 milligrams per liter in drinking water can cause pitting of tooth enamel and deposits in bones. Exposure to levels greater than 10 milligrams per liter can cause crippling skeletal fluorosis (Smith 2003).

Figure 12

Exposure to Chemical Water Pollution

Drinking contaminated water is the most direct route of exposure to pollutants in water. The actual exposure via drinking water depends on the amount of water consumed, usually 2 to 3 liters per day for an adult, with higher amounts for people living in hot areas or people engaged in heavy physical work. Use of contaminated water in food preparation can result in contaminated food, because high cooking temperatures do not affect the toxicity of most chemical contaminants.

Inhalation exposure to volatile compounds during hot showers and skin exposure while bathing or using water for recreation are also potential routes of exposure to water pollutants. Toxic chemicals in water can affect unborn or young children by crossing the placenta or being ingested through breast milk.

Estimating actual exposure via water involves analyzing the level of the contaminant in the water consumed and assessing daily water intake (WHO 2003). Biological monitoring using blood or urine samples can be a precise tool for measuring total exposure from water, food, and air (Yassi and others 2001).

Health effects

No published estimates are available of the global burden of disease resulting from the overall effects of chemical pollutants in water. The burden in specific local areas may be large, as in the example cited in box 43.2 of arsenic in drinking water in Bangladesh. Other examples of a high local burden of disease are the nervous system diseases of methylmercury poisoning (Minamata disease), the kidney and bone diseases of chronic cadmium poisoning (Itai-Itai disease), and the circulatory system diseases of nitrate exposure (methemoglobinemia) and lead exposure (anemia and hypertension).

Acute exposure to contaminants in drinking water can cause irritation or inflammation of the eyes and nose, skin, and gastrointestinal system; however, the most important health effects are due to chronic exposure (for example, liver toxicity) to copper, arsenic, or chromium in drinking water. Excretion of chemicals through the kidney targets the kidney for toxic effects, as seen with chemicals such as cadmium, copper, mercury, and chlorobenzene (WHO 2003).

Pesticides and other chemical contaminants that enter waterways through agricultural runoff, stormwater drains, and industrial discharges may persist in the environment for long periods and be transported by water or air over long distances. They may disrupt the function of the endocrine system, resulting in reproductive, developmental, and behavioral problems. The endocrine disruptors can reduce fertility and increase the occurrence of stillbirths, birth defects, and hormonally dependent cancers such as breast, testicular, and prostate cancers. The effects on the developing nervous system can include impaired mental and psychomotor development, as well as cognitive impairment and behavior abnormalities (WHO and International Programme on Chemical Safety 2002). Examples of endocrine disruptors include organochlorines, PCBs, alkylphenols, phytoestrogens (natural estrogens in plants), and pharmaceuticals such as antibiotics and synthetic sex hormones from contraceptives. Chemicals in drinking water can also be carcinogenic. Disinfection by-products and arsenic have been a particular concern (International Agency for Research on Cancer 2004).

Reduce and adapt to the effect of climate change

Much of the nation’s experience to date in managing and protecting its people, resources, and infrastructure is based on the historic record of climate variability during a period of relatively stable climate. Adaptation to climate change calls for a new paradigm—one that considers a range of possible future climate conditions and associated impacts, some well outside the realm of past experience. Adaptation is a process that requires actions from many decision-makers in federal, state, tribal, and local governments, the private sector, non-governmental organizations, and community groups. However, current efforts are hampered by a lack of solid information about the benefits, costs, and effectiveness of various adaptation options, by uncertainty about future climate impacts at a scale necessary for decision-making, and by a lack of coordination. Therefore, a national adaptation strategy is needed to support and coordinate decentralized efforts. As part of this strategy, the federal government should provide technical and scientific resources that are currently lacking at the local or regional scale, incentives for local and state authorities to begin adaptation planning, guidance across jurisdictions, shared lessons learned, and support of scientific research to expand knowledge of impacts and adaptation.

RESEARCH

Before having our solution, many of websites and resources have been searched, and finally, we found out a good solution that will affect all sides in the environment and the other perspectives.

Our challenge is related to developing the industrial base in Egypt. As, it is known, this topic contains inside it many of scientific topics that should be understood well. From these topics are: what are the types of manufacturers in Egypt? Therefore, we make a huge scientific data base about most of the manufacturers. What are their weaknesses and strengths points? And all purposes that is related to these industries.

We will introduce these industries in detail: Egypt is one of Africa's biggest economies, with a GDP of $**1.198** trillion and a GDP per capita of $11,850. However, distribution of wealth in the country is a pressing issue, with **26**% of Egyptians living below the poverty line. The official currency used in the country is the Egyptian pound. Regulation of the currency and local banks is the mandate of the Central Bank of Egypt, which is the country's national reserve bank. Annual exports from the country are valued at $**20.88** billion, with the primary export commodities being petroleum products and crude oil, chemicals, and textiles. On the other hand, the country's annual imports are valued at $**57.91** billion, with foodstuff, machinery, and equipment being the main import goods. The leading industries in the country are the agricultural, energy, and tourism industries.

Agriculture:

The Nile Valley and Delta are the country's two most agriculturally productive lands, which covers an estimated **6** million acres when combined. Grains (rice, wheat, and corn), cotton, sugarcane, tobacco, and onions are the most important crops in Egypt. Most of Egypt sits on a desert, which expands each year, threatening the country's **3.1**-million-hectare arable land. An estimated **11,736** hectares of this agricultural land is lost to desertification each year. As water is a scarce resource in the country, Egypt has invested heavily in solar-powered desalination facilities. The country relies on food imports to sustain its domestic demand. The domestic production of wheat in the country was about **8.3** million tons in **2015**, against a demand of **19.6** million tons. In the same period, the country produced **6.1** million tons of corn, against a demand of **10.9** million tons. Most of the imported grain is sourced from the United States.

Energy:

The performance of Egypt's economy is dictated by the country's energy industry, which is the country's top foreign exchange earner. The main sectors in this industry are oil, natural gas, hydro-power, and solar and wind power.

Oil:

Oil dominates Egypt's energy industry, with the country producing as much as **0.9** million barrels of oil each day. The proven oil reserves on which Egypt sits on are among the largest globally, estimated to be **3.7** billion barrels. Egypt is a significant player in global oil production and is a member of the OAPEC (an acronym for Organization of Arab Petroleum Exporting Countries). The Gulf of Suez, the Western and Eastern Deserts, and the Sinai Peninsula are Egypt's top oil-producing regions. The biggest of all refineries in the country is the El-Nasr Refinery situated in Suez, which has a capacity of refining about **0.146** million barrels of oil each day. Cumulatively, all nine refineries in the country have a daily capacity of processing over 0.726 million barrels. The country consumes most of its oil; as much as 0.564 million barrels each day, the majority of which is used in power production.

Natural Gas:

Egypt is also a major producer of natural gas, having Africa's third largest confirmed gas reserves. The country is believed to sit on 120 trillion cubic feet of natural gas reserves. The Zohr region sits on the largest gas field deposits in the Mediterranean region, estimated to have 30 trillion cubic feet in volume. Egypt's Eastern and Western Deserts are believed to cumulatively have 5.7 million barrels in shale oil reserves, among the highest in the region. Most of the natural gas produced in Egypt is consumed locally. In 2013, 1.9 trillion cubic feet of the total 2 trillion cubic feet of natural gas produced in the country went to the domestic market. The Middle East is an important market for Egypt's natural gas, most of which is transported through the 750-mile long Arab Gas Pipeline.

Hydroelectricity:

Hydropower is the number-one source of Egypt's electricity, as the country taps into the power of the Nile. There are numerous hydropower stations found along the Nile, with the Aswan High Dam, the Naga Hamady and the Esna Dam being the three major stations. Aswan High Dam is the most important of the three and has an electricity production capacity of 2,100 MW. The country is also about to venture into nuclear energy, after years of deliberations and plans are underway to establish a $1.5 billion nuclear power plant at El Dabasa.

Solar And Wind Power:

Another sector in the industry is solar energy. With most of the country being a desert and having some of the highest annual solar hours in the world, it is expected that Egypt is a major player in solar energy production. But despite increased investments from the Egyptian government in renewable energy source, solar energy accounts for only 1% of the country's electricity. Nonetheless, Egypt is home to impressive solar installation projects, including the world's largest solar installation; the Benban Solar Park. Wind energy is another area in which Egypt has great potential, particularly along the coast of the Red Sea. The country has put in place infrastructure to tap into this energy resource, which is expected to account for about 12% of the country's electricity production.

Paint:

The Paints and Coatings Industry is one of the most heavily regulated industries in the world. The sector consists of manufacturers of paints, varnishes, lacquers, shellacs, stains, and a variety of other specialty coatings. The Indian Paint Industry is estimated to be Rs.**50,000** Crores industry.

In our summer **2013** educational series on paint and color technology, we begin with a review of one of the basics: what ingredients are in paint? The variety of paint products offered can be overwhelming. And with each variety of paint offering different properties that affect the outcome of a design project, understanding what's in a can of paint is key to success.

All paints generally have four main ingredients – (**pigments), binders, solvents (liquids) and additives**. Pigments provide color and hide, while binders work to "bind" the pigment together and create the paint film. Solvents are the liquids that suspend the ingredients and allow you to place the paint on the surfaces, and additives are ingredients that provide specific paint properties such as mildew resistance. All four ingredients combine to provide paint that meets your specific design needs. To begin...

First: Pigments - Provide Color, Hide and Bulk

Pigments are finely ground particles that are dispensed into paint and provide color and hiding properties. There are two primary types of pigment - prime pigments and extender pigments. Prime pigments are those that contribute to both wet and dry hide in paint. Titanium dioxide **(TiO2)** is the costliest pigment, and it contributes directly to a paint's wet hide, while providing whiteness Colorants are prime pigments that provide the actual color within the can. There are two main types - organic and inorganic.

Figure 13

- Organic colorants provide the brighter colors, and examples of these pigments include hansa yellow and phthalo blue. These are not very durable for exterior paint application.
- Inorganic colorants are the duller, earthy colors and are more durable for exterior paint application. Examples of these kinds of pigments include red oxide, yellow ochre, and umber.

Extender pigments are lower cost pigments that give extra weight or bulk to the paint. These types of pigments contribute only to a paint dry hide but are necessary to control gloss. Some extender pigments also provide additional film performance in the areas of scrub or abrasion resistance. Commonly used extenders include clay, silica, diatomaceous silica, calcium carbonate, talc, and zinc oxide.

- **Clay:** Used mainly in interior paints, clay provides hiding power.
- **Silica:** Provides enhanced durability in exterior paints as well as scrub and abrasion resistance.

- **Diatomaceous silica:** Consisting of fossilized organisms, this form of silica is used to control sheen levels.
- **Calcium Carbonate:** Used in both interior and exterior paints, calcium carbonate, also called chalk, is a general purpose, low cost, low hide pigment.
- **Talc:** Also called magnesium silicate, talc is a soft, general purpose extender pigment.
- **Zinc oxide:** Used primarily in primers and exterior paints, zinc oxide provides mildew resistance, corrosion inhibition and stain blocking support.

Figure 14

The correlation between the climate change and the increase of the Co2 levels is researched:

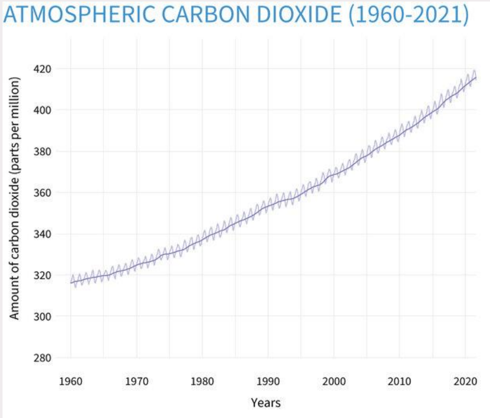


Figure 15

Based on preliminary analysis, the global average atmospheric carbon dioxide in **2020** was **412.5** parts per million (ppm for short), setting a new record high amount despite the economic slowdown due to the COVID-19 pandemic. In fact, the jump of **2.6** ppm over **2019** levels was the fifth-highest annual increase in NOAA's **63**-year record. Since **2000**, the global atmospheric carbon dioxide amount has grown by **43.5** ppm, an increase of **12** percent.

The modern record of atmospheric carbon dioxide levels began with observations recorded at Mauna Loa Observatory in Hawaii. This graph shows the station's monthly average carbon dioxide measurements since **1960** in parts per million (ppm). The seasonal cycle of highs and lows (small peaks and valleys) is driven by summertime growth and winter decay of Northern Hemisphere vegetation. The long-term trend of rising carbon dioxide levels is driven by human activities. NOAA Climate.gov image, based on data from NOAA Global Monitoring Lab.

Carbon dioxide levels today are higher than at any point in at least the past **800,000** years. In fact, the last time the atmospheric CO_2 amounts were this high was more than 3 million years ago, during the Mid-Pliocene Warm Period, when temperature was **2**°–**3**°C (**3.6**°–**5.4**°F) higher than during the pre-industrial era, and sea level was **15**–**25** meters (**50**–**80** feet) higher than today.

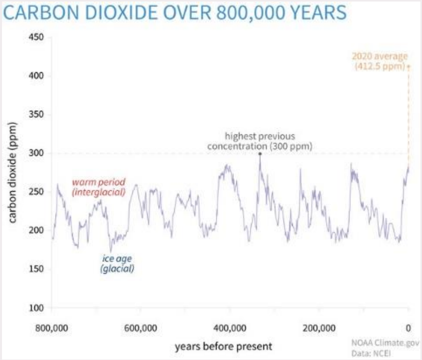


Figure 16

Global atmospheric carbon dioxide concentrations (CO2) in parts per million (ppm) for the past **800,000** years. The peaks and valleys track ice ages (low CO2) and warmer interglacial (higher CO2). During these cycles, CO2 was never higher than **300** ppm. On the geologic time scale, the increase (orange dashed line) looks virtually instantaneous. Graph by NOAA Climate.gov based on data from Lüthi, et al., **2008**, via NOAA NCEI Paleoclimatology Program**. [Correction: August 20, 2020. An earlier version of this image had an error in the time scaling on the X axis. This affected the apparent duration and timing of the most recent ice ages but did not affect the modern or paleoclimate carbon dioxide values.]**

After, this research, we notice that the Co2 levels increase quicker than in the last years. Therefore, we tried hard to use the Co2 positively. In other words, Co2 is useless and harmful. In addition, we cannot prevent it completely from its emission. Therefore, we thought about how we can make it useful instead of harming ourselves.

We searched most of the compounds that the Co2 is embedded in them. We found that there is a compound called calcium carbonate (limestone or calcite). its composition is CaCo3, but the Co2 is not in this compound. No, but if we add an oxygen atom, then we can produce the Co3. But how we can do this? if we pass the Co2 into the water, it will gain an oxygen atom. There is another problem, how can we gain the calcium atom? As it is known, seawater has calcium. Then, if we pass the Co2 on seawater, it will gain an oxygen atom and the Ca.

OTHER SOLUTIONS ALREADY TRIED

1st – Solar Tracking System

Solar energy is safe and clean. Plus, it helps prevent machinery destruction while also combating climate change. The importance of solar energy lies not simply in its cheapness and reliability, but in the fact that it helps sustain homes and factories. With industries already sensitized.

In this project, we'll show you how we used the PA-14 Mini Linear Actuator to track the Sun through a single axis of motion. Doing so increases the A solar tracker is a device used to tilt solar panels in the direction of sunlight. Thus, solar trackers track the sun throughout the day and ensure that the solar panels capture or collect as much energy as possible. Their sole purpose is simply to maximize production.

Converting Solar Panel Power

There are three simple steps in converting solar energy into electrical energy. Each step is performed by an individual component as listed below. Sun gold Solar Panel SGM-90W-18V. This absorbs photons from sunlight and converts them to electricity which is outputted as a varying DC voltage. Solar Charge Controller Genasun GV-10 regulates the DC voltage from the solar panel to charge the battery. 12VDC Lithium-Ion Battery stores the electricity for use immediately or at a later time. In our system, we attached a car cigarette lighter connector to the battery. This allows us to easily connect 12V automotive accessories to the solar panel. In our video we used an oscillating fan, a high-power LED spotlight and even a phone charger.

HOW TO BUILD A PORTABLE SOLAR TRACKER

Control System

The linear actuator is controlled by an Arduino microcontroller using a Wasp motor controller. It takes the reading from photoresistors to determine which side of the panel is receiving light and adjusts the position of the solar panel until the photoresistor readings are fairly equal. This ensures that the solar panel is pointed directly at the sun and yields maximum power.

Therefore, this solution can be used to be a good source of electricity to provide the aluminum industry with it as it consumes the biggest amount of the energy compared to the other industries.

2nd – name 2

Prevent Machinery Damage with IBT's Industrial Maintenance Technologies Division

By IBT Inc August 02, 2012 Industrial Maintenance

The stuff of industry is man-made and, therefore, inherently breakable. Usually at the time and in the manner that is most inconvenient for all concerned. When it does, you need a friend. We can recommend that you call your old friend IBT’s IMT (Industrial Maintenance Technologies Division). If they’re not your old friend, they can be your new best friend.

IMT is who you want on your side when something malfunctions. Actually, IMT is even more valuable before stuff happens and stuff breaks. IMT’s technicians are available 24/7/365. They can come in and identify and correct machinery problems before they cause damage, expense, unplanned downtime and loss of production. They have a large arsenal of sophisticated technical tools and they’ll draw upon years of knowledge and experience, as well.

They can do a complete on-site inspection and analysis to determine where the trouble can start. They also handle trouble shooting, diagnosis and repair services, either as needed or as part of a predetermined service program.

Best of all, they can break out the tech equipment and check out all of your critical production and support systems. With these diagnostic tools, they can analyze machine dynamics and performance, identify misalignments and imbalances and find vibration problems that lead to excess wear and tear on rotating equipment. They diagnose mechanical and electrical problems which may affect the condition and performance of bearings, belts, pulleys, shafts, pumps, gearboxes, fans, motors, cooling towers, chillers – the whole factory’s worth of mechanical components.

When they find a problem, they can fix it: laser aligning it precisely, balancing it dynamically, repairing and/or overhauling serviceable components. Recurring or dramatic problems and equipment failures can be analyzed to determine root causes and prevent recurrences.

Some mechanical systems benefit from reexamination and possible rethinking and reengineering. IMT can update mechanical systems and components, adding newer technology.

One of the best ways to deal with a system's tendency to break is to greatly decrease the likelihood of something bad happening. The principle here is to fix it before it breaks. By working with IMT in establishing a predictive and preventive maintenance program, you can avoid catastrophic failure and costly downtime.

A program of planned maintenance on a regular schedule will be able to replace critical wear components at a time of your choosing – not when they break. Based on analysis, observation strong record keeping discipline and solid mechanical knowledge, preventive and predictive maintenance can put you in control.

IBT Industrial Maintenance Technologies Division offer their services in a number of ways: You can make arrangements for them as needed, set up a planned program, or lay the groundwork for a rapid deployment plan through making some preliminary arrangements. They are eager to meet with you to discuss all the ways that they can keep trouble in the works under control – for more details, email Chris Treat.

3rd Make the case for cities as the main hubs of economic growth

With LISs set to cover the broader geographies bounded by CAs and LEPs, it is important that partners within those areas prioritise policies in a way that reflects the economic role that cities play, as well as the interdependencies between these urban cores and their surrounding areas.

Cities, and city centres in particular, offer a number of inherent benefits to businesses, such as access to lots of skilled workers and access to a network of businesses. As a result, occupying only 8 per cent of land, cities are home to 55 per cent of businesses, 64 per cent of high skilled exporters, 60 per cent of jobs (see Figure 1) 59 per cent of national economic output is produced in cities.2

Figure 1: Workplace population in England and Wales by MSOA, 2011

Source: Census, ONS, 2011

But cities are not islands. On a basic level, reflecting this concentration of economic activity, cities provide opportunities for workers living elsewhere in the wider city region and the wider city region offers places for people to live. The exact nature of these relationships will vary across CAs and LEPs as some form one large conurbation (Greater Manchester CA, for example), others have more than one economic centre (Cambridgeshire and Peterborough CA, for example) or one smaller town/city within a predominately rural area (Greater Lincolnshire LEP, for example). These interdependencies are often evident in commuting patterns (see Figure 2).

Figure 2: Greater Manchester commuting patterns, 2011

Source: Census, ONS, 2011

CAs and LEPs should avoid ‘jam-spreading’ and priorities investment and interventions that reflect the role that cities play and these economic interactions. For example, it may be appropriate to priorities the development of commercial and incubation space in a city Centre, while investing in transport infrastructure or employment training that connects surrounding towns and suburbs into these areas of economic opportunity.

GENERATING AND DEFENDING A SOLUTION

—SOLUTION AND DESIGN REQUIREMENTS—

The design requirements: -

1. Low cost
2. Decrease environmental impact
3. Ecofriendly
4. **Viscosity**
5. **Color degree**

The challenges targeted to solve requires solutions to meet the needs of the main problems. The characteristics would a successful solution have varied according to the needs of the problem. If the problem is associated with the high cost of something and it is hard to get it. So, the solution should meet this need which is lowering the cost. The atmosphere contains CO2 which increase the environmental impact and cause greenhouse effects, so we take the CO2 from the air of factories and atmosphere air, so we decrease it. Also, the project doesn’t affect the environment so it’s ecofriendly. The pain has many properties from them color and viscosity. The viscosity is measured by a fan work with DC circuit and put it in the paint and measure its velocity to know if the viscosity is acceptable or not as its velocity must be between [m/s , m/s]. If it is < m/s so the viscosity is high, so we must add water and if it is > m's so the viscosity and we must add limestone. So, we have two values the speed of the fan must be between them to make the paint usable. The color is also important requirement as it has a specific degree and after adding some pigment to color the paint the color sensor measure the color degree and compare it with the specific color if it is lighter that needed some pigment will be add or if the color acceptable nothing will happen and if the degree is heavier than the specific so some paint will add.

SELECTION OF SOLUTION

Before the solution was defended, we follow some steps to reach the right one. First, we follow the EDP steps. Therefore, we defined the challenge well at the beginning and this helps us a lot in our solution defending and selection. This step was achieved in two ways:

1- asking some capstone teachers and
2- 2- the research; this is our main reference as we researched on multiple trusted websites.

After finishing and understanding the challenge well, now, defending the solution is possible and easy. The research and the challenge put some criteria for defending the required solution. These criteria are

1- Using waste materials
2- 2- Green energy.

Furthermore, it requires to use of a feedback control mechanism. In other words, the system of the process should be automated not manual. After we understood these requirements well, we started to search for a solution. A solution that accomplishes all these requirements. Moreover, it should contribute to solving the big challenge which is improving the industrial base in Egypt. We searched a lot and we noticed that the Co_2 levels increase later in large amounts. Therefore, from this point, we thought about how to reduce these high levels of carbon dioxide gas.

Our solution is dependent mainly on carbon dioxide gas. This will be explained in detail in the following lines. After the carbon dioxide gas is emitted from the factories or car engines; it goes over the atmosphere and in the way increases the Co2 levels in it. Therefore, we'll take it from the factories before being out of it and use it in our industry. Therefore, How can we benefit from Co2? After capturing the Co2 from the factories, we'll pass it to seawater. As the seawater contains minerals, not H2o only like Ca and Na. The reaction will be determined as following: $H_2o + Na + Ca + Co_2 \rightarrow CaCo_3 + NaCo_3 + H_2\uparrow$. After this, the limestone (calcite) ($CaCo_3$) and $NaCo_3$ will be precipitated at the bottom of the beaker. From this point, we converted the Co2 which is waste material into a usable material that can be used in multiple industries. Now, we have got a limestone from this reaction.

The industry that we will work on is the painting industry. Among the components of the paint, the industry is the limestone. Therefore, we'll take the limestone with the other components of the paint and mix them to get the final form of the paint. This is the side of the solution.

Feedback system

There is another side which is the feedback control system. The feedback system depends on the properties of the product which is produced. As we work in the paint industry, the two properties that will be considered are color and density. These two properties will be checked through the color sensor and density sensor. The color sensor is controlled through the Arduino Uno. Moreover, it contains 3 colors which are Red, Green, and Blue (RGB). These are the three basic colors. These colors can be used to put a specific degree of any color. For example, if we want to detect the white color; the degree of Red, Blue, and Green will equal zero. The color will be checked as there is a certain degree of the color of the paint if the degree of the color is less or more than the required value there is an action will be taken which is increasing limestone if the color degree is less than the required and it will increase a freshwater is the color degree more than the required.

Another check-up point is the density of paint. We will put specific density to the paint; then, the density will be measured. After that, the calculated density will be compared to the standard density. Next, if the calculated density is less than the standard, it will be increased with limestone, but if it is not, it will be diluted with fresh water.

After the research and reaching a solution, the next step is the prototype selection or construction. The prototype is selected in a way that is suitable for implementing our idea. After the solution is identified in the previous section (selection of solution). Then, the prototype is selected as follows:

- A closed tube was brought it along to put the Co2 inside it. Furthermore, it should contain a hole to go the Co2 out from the closed tube to the process. In addition, It should be closed well because the Co2 can go out from the tube.

- After that, a pipe was bought to act as a transition state of Co2 from the closed pipe and the process (which is a closed beaker).

- The next step is bringing a closed beaker. This beaker should contain some opening points. Each one has a specific task or mission. For example, it should contain an opening point at the side to enter the Co2 inside it. Furthermore, the bottom side should be a paper that contains small holes inside it to let the water pass and the precipitated limestone precipitated in the beaker.

- Then, the limestone will be taken into the process of making the paint. This is by overthrowing the limestone beaker into the paint beaker.

- The final step is bringing out three beakers. The first is for the stored limestone. The second is for the water. The last one is for the paint. The paint beaker will be put in between the stored limestone beaker and the water beaker. The water and stored limestone beakers will be in a free motion state to overthrow their components (when they are needed) inside the paint beaker.

- Therefore, the whole process of making the paint is completed right now.

SELECTION OF PROTOTYPE

After the research and reaching a solution, the next step is the prototype selection or construction. The prototype is selected in a way that is suitable for implementing our idea. After the solution is identified in the previous section (selection of solution). Then, the prototype is selected as follows:

- A closed tube was brought it along to put the Co2 inside it. Furthermore, it should contain a hole to go the Co2 out from the closed tube to the process. In addition, It should be closed well because the Co2 can go out from the tube.

- After that, a pipe was bought to act as a transition state of Co2 from the closed pipe and the process (which is a closed beaker).

- The next step is bringing a closed beaker. This beaker should contain some opening points. Each one has a specific task or mission. For example, it should contain an opening point at the side to enter the Co2 inside it. Furthermore, the bottom side should be a paper that contains small holes inside it to let the water pass and the precipitated limestone precipitated in the beaker.

- Then, the limestone will be taken into the process of making the paint. This is by overthrowing the limestone beaker into the paint beaker.

- The final step is bringing out four bottles. The first is for the stored limestone. The second is for the water. The third is for the paint. The fourth is for the color pigment.

- These four bottles are put on a holed piece of wood four holes for these four bottles. Then, there is another piece of wood holed one hole in order to pass the required substance and at the same time close on the other bottles.

- In addition, there is a DC motor that moves the piece of wood that is responsible for closing and opening the bottles.

Figure 16

- Furthermore, there are two gears were added, one on
- the piece of wood and another one on the DC motor to attach to each other.

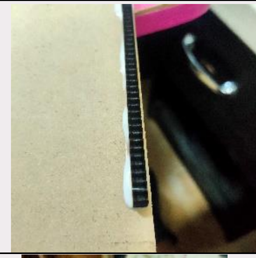
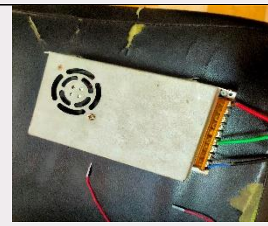
Therefore, the whole process of making the paint is completed right now.

Figure 17

CONSTRUCTING AND TESTING A PROTOTYPE

MATERIALS AND METHODS

Material name	Price	Image
Wood	Free from the Fab lab	
Two Boxes	20 L. E	
Ultrasonic	30 L. E	
Color sensor	110 L. E	
Relay module	40 L. E	
Two DC motors	200 L. E	

Gears	**Free from the Fab lab**	
Arduino mega	**250 L. E**	
Power Supply	**100 L. E**	
Current Sensor	**35 L. E**	

Methods

After we selected our project solution, we made our prototype in steps as:

Figure 18

- **First,** we made the main body by making three levels of wood, in the upper level we put 4 bottles which contain the materials for making the product, in the middle level we put the container which will have the product, in the bottom level we put a container that will have the waste seawater got from the bottom level
- **Second,** in the upper level we made a special mechanism that opens and closes a specific bottle. The mechanism is a plate of wood that moves by a motor that make it move by gears in the motor that is attached to the plate.

This plate has a single hole in it where we move the hole to the place of the bottle that we need to add its material.

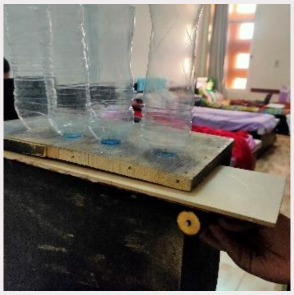


Figure 19

- **Third,** in the middle level we put a motor in the container box to stir the materials added in the box to make the final product and to keep the product wet and not solidified.
- **Fourth,** we started to make the **Feedback Control System** by adding some sensors to benefit from its data. First, we put a current sensor in the stirring motor to estimate the speed of the motor (such that if the motor consumes big current then the speed is low and vice versa) and by this we can estimate the viscosity of the product. Second, we added ultrasonic on the top of the middle container to calculate the height of the product in the box and to prevent it from overflowing. Third, we put a color sensor on the middle box to check the color of the product and to know if we achieved the required color. All these sensors are controlled using Arduino.

Figure 20

- **Fifth,** to show the data of (Volume, stirring speed, Color) to the user we made a **Graphical User Interface** using java to view the data to the user and view if it achieves 90% of the design requirements. (Red means the readings don't satisfy the design requirements and green means it achieves it)

```
  background(0,204,255);
  textSize(40);
  fill(255);
  text("Volume: ", 10, 50);
  fill(0);
  text(volume,180,50);
  if(volume < 2500)
    fill(0,255,0);
  else
    fill(255,0,0);
  rect(500, 20, 120, 40);
  fill(255);
  text("Color: R = ,G = 0,B = 0",10,130);
  fill(0);
  text(Color,140,130);
  if(Color > 200)
    fill(0,255,0);
  else
    fill(255,0,0);
  rect(500, 100, 120, 40);
  fill(255);
  text("Stirring speed: ",10,210);
  fill(0);
  text(speed,300,210);
  if(speed >= 30 && speed <= 60)
    fill(0,255,0);
  else
    fill(255,0,0);
  rect(500, 180, 120, 40);
}
```

Figure 21

TEST PLAN

Our design requirements are divided into 2 sections, the first one is the amount of limestone pigment formed the quality of the product which is distributed into the color of the paint and its viscosity. Our test plan was to make CO2 pass through the well water (H2O), then combine it with Calcium and sodium and produce the amount of needed limestone (CaCO3 & Na2CO3) in the middle box. Then the bottles in the upper level will start to drop the required contents into the container of limestone and the stirring motor will start to mix them. The required contents are water, extra limestone, pure white paint, and red color. After pouring the required contents there may be some problems, for example, the product has a high viscosity, or the color isn't correct. So, first, the project checks the color using the color sensor and then gives a signal to the upper motor if the product needs to have more color by pouring more red color or lightening the color by pouring white paint. Also, for checking the viscosity, the stirring motor will act as a viscosity meter which gives us information about if the product is viscous or not, and according to this information the upper motor makes the water bottle pour (if it is high viscous) or make the limestone bottle pour (if it is low viscosity). The process will continue until the ultrasonic sensor checks that the height of the product in the box is suitable and prevent it from overflowing outside the box.

```
void loop() {
  int motorSpeed = analogRead(currentSensor);
  ColorValue Color = ColorCode(); //Getting values of the color

  int height = Ultrasonic(); // Get the height of the product
  int volume = height * 22 * 14; // Calculating volume of the product in the box
  // length = 22 cm, width = 14 cm, height = calculated with ultrasonic

  if(volume > MaxVolume) //if volume of the product is greater than
    StopProcess();   // the limit volume the code will stop the process
                     // to avoid any overflow

  if(validColor(Color) == 1) // if the color is heavy or overdose
     openHole(paintIdx); // Increase white paint to make the color lighter

  if(validColor(Color) == -1) // if the color is light
    openHole(colorIdx); // Just increase red color

  if(motorSpeed > upperboundSpeed) // if the speed of motor is more than
    openHole(limeIdx);              // usual then the product has light
                                    // viscousity then increase limestone

  if(motorSpeed < lowerboundSpeed) // if the speed of motor is less than
    openHole(waterIdx);             // usual then the product has heavy
                                    // viscousity then increase water

}
```

Figure 22

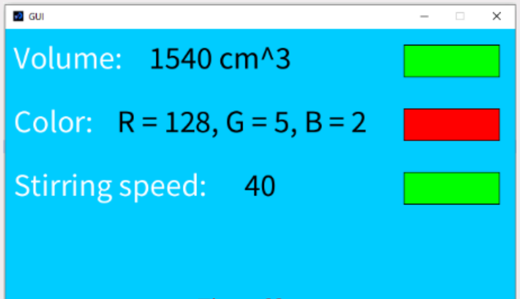


Figure 23

DATA COLLECTION

Trial number	Trial -1-	Trial -2-	Trial -3-	Trial -4-	Last 3 trials Average
Amount of limestone	1 gm/liter	5.6 gm/liter	4 gm/liter	7.5 gm/liter	5.7 gm/liter

The results were divided into 2 sections, the section of limestone was not successful in the first trial, in this project we want to reach at least 5 gm/liter limestone, but that did not happen in the first trial because the first trial produced only 1 gm/liter. That happens because the CO2 leaked from the tube of the chemical reaction of acetic acid with Na2CO3. Hence the amount of CO2 combines with seawater decreased so the result was bad here. Also, the color sensor was damaged and that leads to a strange color of the paint. We fix the problem by replacing the tube and we buy a more accurate color sensor. On the second Trial, the amount of limestone (our pigment which we produce) was very good and was 5.6 gm/ liter. The third trail extracted a good amount of limestone which is 4 g/l, but the product was low in viscosity, so we solved this problem by adding an emergency bottle that have extra limestone. The fourth one was a perfect one with 7.6 g/l limestones, pure red color, and great viscosity.

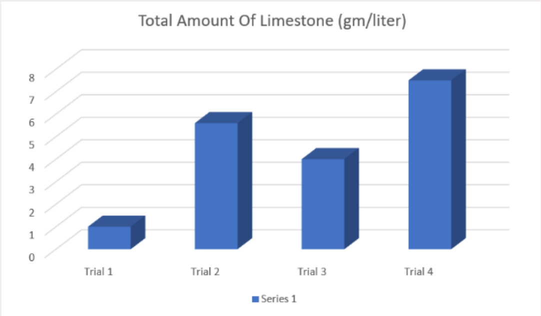
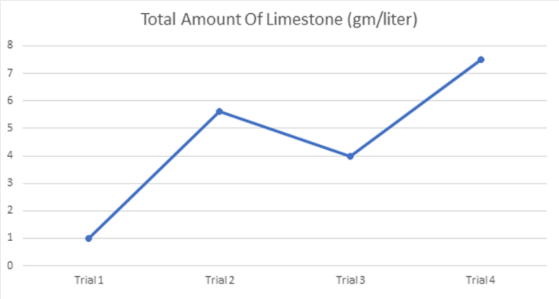


Chart 1

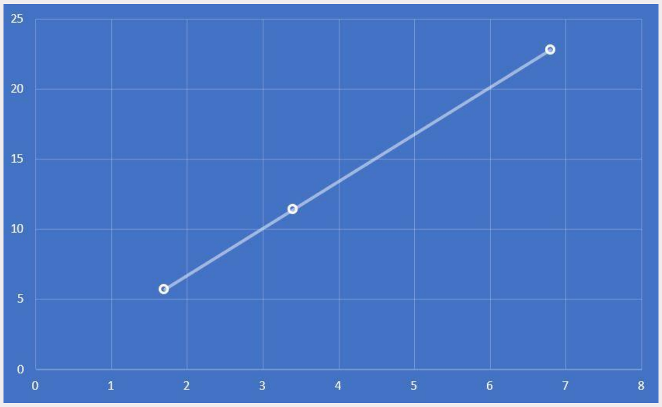


Graph 1

EVALUATION, REFLECTION, RECOMMENDATIONS

ANALYSIS AND DISCUSSION

To solve any problem, you should identify well what the problem is; and then the gap will be identified. The industry has multiple challenges. The paint industry has challenges. For example, if the paint needs a pigment, the workers will put it themselves. This consumes time and effort. Therefore, we work on an automation system that could put the pigment automatically if needed. Furthermore, we worked on making this pigment using waste material which is the Co2 emitted from the factories' chimneys. This happened due to passing the Co2 into seawater. The first result was 1 g/L. This is too bad a result. We looked for the reason that makes this happens. Before this, the Co2 was prepared to make the experiment. It was made using sodium carbonate and vinegar. They were put together in a bottle; then, they will pass into a tube that will pass it to the well water. There is a balloon that binds the tube and bottle together. The error happened is the balloon was too big and by the way makes part of Co2 escape. After that, we bring a suitable balloon size, so the final result was 5.7 ± 0.7 g/L of limestone which is the pigment. After that, the design requirements were checked to indicate on success or failure of the project. The first one is viscosity. The second one is the paint color. A specific value of the color has been specified. Then, we make an if condition to compare the input value with this ideal value. If this value is more than the ideal, water will be added to fix the paint. on the other hand, if the opposite happens, the limestone will be added to fix the paint too. After that, the ideal value of the color was reached, and there is not any addition of limestone and water. Therefore, this requirement indicates the success of paint fixation.



Graph 2

"Everything in this universe will not happen without a reason made it be". In this context, each result that occurred, or an action was taken, was due to a specific reason. These reasons in science are called laws and theories. Our project contains these laws like chemistry laws and programming. Both contributed to the success of this project as follows:

As it is known, the actual result is not equal to the theoretical one. Theoretically, there is 7827 g/m^3 of limestone should be produced, but 5700 ± 10 g were produced. Why and how is the limestone produced? Furthermore, Why is this amount specifically produced? At first, the Co2 was passed into seawater. Seawater contains many components like H2O, chlorine, sodium, and calcium. Equational, 2H2O + Ca + 2Na + 2Co2 → CaCo3 + Na2Co3 + 2H2 ↑. At TDS = 4430 ppm, the concentration of Ca is 1975 ppm (mg/L), and the concentration of Na is 1250 ppm. Then, this is how the limestone is made:

- As Ca concentration equals 1975 mg/L; then, we convert it from mg/L to g/m^3 to be 1975 g/m^3. Furthermore, As calcium molar mass is 40, so Ca moles equal 1975/40 = 49.4 moles.
- Therefore, we should use the same number of moles in Co3 to make the equation balanced. Then, Multiply moles of Co3 by Co3 molar mass = 49.4*60 = 2962.5 g.
- Next, add the two masses (2962.5 + 1975) = 4937.5 g.
- As the Na concentration equals 1250 mg/L. It will be converted to g/m^3 to be 1250 g/m^3. It will convert to moles to know how many moles should be used in the Co3. It will equal 1250/23*2 = 27.2 moles (23 is Na molar mass; Na is multiplied by 2 as Co3 valency is 2 and Na is 1).
- 27.2 moles of Co3 are consumed. Therefore, 27.2*60 = 1632 g.
- Then, 1632 + 1250 = 2882.
- Therefore, 2882 + 4937.5 = 7819.5 g.

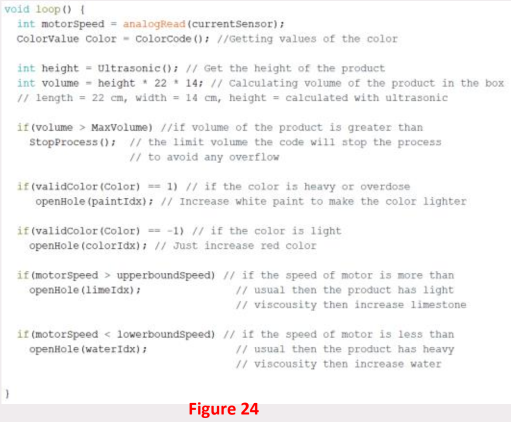
This is: Why is this amount specifically produced?

These results are theoretical, but there are actual results that happened due to certain reasons. For example, the total limestone is 5700 g instead of 7819.5 9. They are different due to natural errors. For example, some of Co2 will be held on the tube walls. In addition, not all the Co2 will react with a & Na. The main component of this process is the Co2. Co2 is prepared using sodium carbonate and vinegar. In Na2Co3, we use 27 moles for each component, therefore, we should convert it to liters to know the amount needed for the reaction. Then, 27*22.4 = 604.8 L. On the other hand, in CaCo3, we used 49.4 moles. Therefore, 49.4*22.4 = 1106.56 L. On a small scale, we should use 0.6 + 1.1 = 1.7 liters Co2 for each liter of well water. The feedback control system is used to make an automation system. This automation system checks if the paint needs a fixation like in viscosity or color. Also, The feedback control system provides information and data about the product like its volume, its RGB (parameters of color), or its viscosity. In our project, we use Arduino and Java to make the feedback control system. The Arduino acts like the brain of the prototype which takes data and gives orders.

First, we use several sensors that are controlled by the Arduino which are:

• Ultrasonic sensor: we use it to calculate the height of the product in the box such that we can calculate the volume of the product till now and prevent it from overflowing outside the box and damaging other things by giving order to the upper motor to close all bottles and stop the process.

• Color sensor: we use it to check the RGB (color) of the product and check if it is dark red then we need to open the bottle of pure white paint to lighten the color or if the color is light red then we will open the bottle that contain red color to darken the color a little until it reaches the best color.



```
void loop() {
  int motorSpeed = analogRead(currentSensor);
  ColorValue Color = ColorCode(); //Getting values of the color

  int height = Ultrasonic(); // Get the height of the product
  int volume = height * 22 * 14; // Calculating volume of the product in the box
  // length = 22 cm, width = 14 cm, height = calculated with ultrasonic

  if(volume > MaxVolume) //if volume of the product is greater than
    StopProcess();  // the limit volume the code will stop the process
                    // to avoid any overflow

  if(validColor(Color) == 1) // if the color is heavy or overdose
     openHole(paintIdx); // Increase white paint to make the color lighter

  if(validColor(Color) == -1) // if the color is light
    openHole(colorIdx); // Just increase red color

  if(motorSpeed > upperboundSpeed) // if the speed of motor is more than
    openHole(limeIdx);               // usual then the product has light
                                     // viscousity then increase limestone

  if(motorSpeed < lowerboundSpeed) // if the speed of motor is less than
    openHole(waterIdx);              // usual then the product has heavy
                                     // viscousity then increase water

}
```

Figure 24

• Stirring motor & current sensor: we use this motor to mix the contents together in the box and quick the reaction between them also we benefit from it in by knowing the viscosity of the product. We connect the current sensor to the motor to get data about the current consumption by the motor. As we found a reverse relationship between the consumed ampere and the speed of the motor.

When the motor found resistance in the product or when the product is high viscos then the speed of the motor will decrease, and the consumption of current
will increase and vice versa. When the system found that the product is high viscous it will add water and if it is a low viscosity, it will add more limestone.

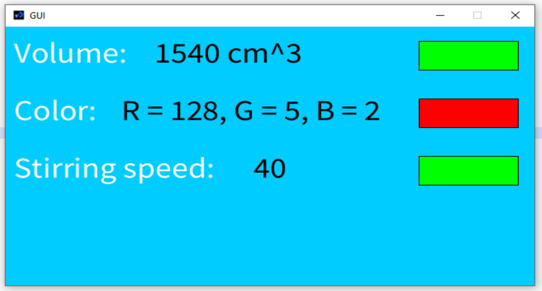


Figure 25

Second, we use java to make a GUI that displays the data we need to know like the stirring speed of the motor, the volume, and the color. The system compares the results read with the theoretical values we calculated and see if its efficiency is more than 90% or not (it will give green light if it is efficient and red otherwise).
learning transfers:
- PH.2.11: we studied diode and one of these applications is LED (pn junction) we used it.
- ES.2.10: we studied the outgassing of released gases, and this is similar to the stage of CO2 production.
- BI.2.10: we studied the hormonal cycle, for example, the positive and negative feedback of LH and FHS, and this is similar to the feedback control system in the modification process in our product.
- CH.2.09: we studied electrochemistry and types of reactions that benefit us in the stage of the reaction.
- PH.2.12: We studied DC and AC current which benefit us in the connections and the power distribution of the circuit of the Arduino, motors, and sensors.

Geology :

As we studied in ES.2.10 the outgassing, the outgassing helped us a lot in our project.

The outgassing Is a process which the volcanos eruptions take place or the gases goes out from the earth's surface.

This helped us because we have a stage of a chemical reaction of acetic acid and Na2CO3 and this stage

Extracts CO2 and this CO2 continue the process to go through the water of Wells and then limestone formed.

Chemistry:

We studied previously the types of reactions in chemistry, and we used this base when we deal with the chemical reaction of acetic acid with Na2CO3.

Biology:

We also studied the evolution of bio organisms. And as we know that everything in our life undergo evolution, also that happens in our project when it had been constructed, it started with stage of making layers of the big wooden box and then bringing the bottles of water, sensors and so on to construct it.

Mechanics:

As we studied in the learning outcome of the center of mass and gravity that the body stays at equilibrium when it stands on its base or be in the vertical line of its center, and that which we used in the second layer of wood in the box to make the box with current sensor is more stable and in equilibrium.

RECOMMENDATIONS

According to the design requirements and what our capstone projects aim to solve this semester, we designed our successful, special, and professional ideas.

To complete the success, we should cover all points which are related to the large scale or provided materials and the future research.

In the case of our prototype now a small container has the reaction of Acetic acid with Na_2CO_3 then CO_2 produced go throw another container containing sea (hard)water (contains Calcium) or also the water of wells as we used the limestone formed will be a part of paint components.

In the future in this project, the wood which we used in our prototype would be changed by stainless steel. This is because a lot of reasons as the hardness of it is very strong to endures because its hardness is 15-5PH. The container of the chemical reaction will be changed by thermal glass to preserve it without other reactions. The tube will be designed in a U shaped from strong inert plastic to not make reactions with CO_2 produced. This project will work in paint factories. And the beakers will be changed into containers. The chemical reaction which produced CO_2 will be changed by direct air capture, which filter CO_2 from the other gases in air. The motors will be changed in the future by stepper motors.

LEARNING OUTCOMES

Mathematics:

[LO. 6] – In this learning outcome we studied the **limits.**

limits are the approaching of a point at a curve to a straight line parallel to X-axis that has function of [Y=constant]. By using limits, we get this constant and it writes in the form of lim x→point.

For example: we have an equation and if we replace the X with a point 5 and the Y= undefined so we have to get the limit to know the approaching line to the Y-axis. So, we replace X by 5.000000001 this is the limit from the positive section which is from right of 5 toward it and it's form is [lim $x \to 5^+$] and also replace by 4.99999999 this is the limit from the negative section which is from left of 5 toward it and it's form is [lim $x \rightarrow 5^-$]. If [lim $x \rightarrow 5^-$] = [lim $x \rightarrow 5^+$] so the limit [lim $x \rightarrow 5$] exist

[LO. 7] – In this learning outcome we studied the **rate of change, average rate of change & differentiation.**

Slop of a straight line is the deference between Y divided deference between X ($\frac{\Delta Y}{\Delta X}$) = ($\frac{Y1-Y2}{X1-X2}$). So, what if the graph is curved?

We decide the point at which we want to find the slope at and then get it's derivative which is the rate of change

1- **Rate of change** is the slop of any point and equal $\frac{Y-(Y+h)}{X-(X+h)}$.

2- **Average Rate of change** which is the accurate slop at a point when the (h) approach to Zero so we get the lim [$h \rightarrow 0$] $\frac{Y-(Y+h)}{X-(X+h)}$, here we use the connection of **Limits (LO 6)**

3- **Differentiation** is also the average rate of change

Connection with our project is that we get the differentiation in the relation between **(Amount of produced limestone {X-axis})** and **(Amount of CO_2 {Y-axis})**

Physics:

[LO. 11] – In this learning outcome we studied **diode.**

Diode is a small semiconductor metal that convert from AC circuit to DC circuit.

Connection we use a supply to convert the alternating current from the house to the fan

[LO. 12] – In this learning outcome we studied the **AC circuit.**

AC circuit is the alternating current circuit and it’s a current with variable value and direction and it is used in houses as it changes the direction of flowing of electrons many times in one second.

Connection with our project that convert from AC circuit to DC circuit that will help us to measure the viscosity as we need to power a fan and fan wants DC circuit to rotate in one direction.

[LO. 12] – In this learning outcome we studied **DC circuit.**

DC circuit is the direct current circuit and it’s a current with constant value and direction and it is used in machines that move in one move and charging and it can’t be converted to AC circuit.

Connection with our project that convert from AC circuit to DC circuit and use a fan with DC circuit and put it in the paint and measure its velocity to know if the viscosity is acceptable or not as its velocity must be between [m/s , m/s]. If it is < m/s so the viscosity is high, so we must add water and if it is > m’s so the viscosity and we must add limestone.

Biology:

[LO. 9] – In this learning outcome we studied **hormone controls cycle, Darwin, boom.**

There is a similarity between steps in the biological process and steps in industrial processes. all the steps are done for specific task. this semester in biology we studied many cycles and their steps to achieve require task as the industrial processes.

For example, hormone controls cycle, this cycle explains the hormone control in the menstrual cycle in female body. as the hormones in this cycle like estradiol and progesterone send negative or positive feedback to the hypothalamus gland to stop or continue releasing FSH and LH.

For example, in industrial processes there would be some controllers like hormones in biology. Then we can work on replacing it by recycled materials or increasing the efficiency.

For example, in marble factories, the SiO2 is a waste product, so we will reuse it in the stage of heat to increase the marble compressive

So, there are some materials when we increase it, the product, and its efficiency increases. For example, when estradiol increases, the FSH, LH hormone increases in ovarian cycle, (positive feedback) the growth of follicle increases.

With no pregnancy in luteal phase, progesterone hormone decreases by corpus luteum, then made negative feedback on hypothalamus gland then FSH, LH decreases, uterine lining damage and the female start bleeding.

It is the same in acid gas removing from natural gas. as in this process the factory needs to purify the neutral gas from acid gases by using amine that can adsorb the acid gases.

so, when the level of acid gases increase it sends positive feedback to the industry to release amines to remove them. and when the acid gas level still normal, it sends negative feedback to the industry to not release amine at this time

Feedback control system is like the feedback which occurs in the hormones

Darwin:

Origins of the evolution. Darwin followed the scientific method. Darwin started by observing natural phenomenon, like animals and plants in the Galapagos islands in south Africa He observed that the organisms there are different, yet close to each other. They are also closer to South American organisms than any other place in the world. more about the theories describing the origins of life. some samples of the finches. asking experts that sell birds about selective breeding, the way of getting desired traits in organisms. Finches 13 different species. He worked with fossils

BOOM:

This LO connects with the capstone that if you developed anything in the process, it would help you to develop the efficiency of the process or the product you are working on, as we learned in biology, the development of the living species of all the time depends on the development of the environment of the specie. When you modify or edit the feedback of the process, it helps you to achieve the design requirement; interesting fact, the nature did it too, the nature selected the creature that could live or die, continue or extinct, or even mate with each other to make some feature of both parents continue with the offspring

changing in the environment over time, And the impact of the environment, which is the biggest factor that caused all this variation that seems to be the world now, this relationship between the variation and the condition of the environment also applies to the environment and the use of recycling materials, as with the increase in the population, the need for recycling materials also increases. Quantitative characters, which vary along a continuum within a population. Heritable Quantitative variation usually results from the influence of two or more genes on a single phenotypic character. Our design requirement that we must choose green energy or waste is like having too many discrete characters in a classified on one basis

Connection with our project that the color sensor and viscosity measuring gives feedbacks and according to the result the Arduino will take its action depending on the results and this is similar to what happen in the female.

Geology :

As we studied in ES.2.10 the outgassing, the outgassing helped us a lot in our project.

The outgassing Is a process which the volcanos eruptions takes place or the gases goes out from the earth's surface.

This helped us because we have a stage of a chemical reaction of acetic acid and Na_2CO_3 and this stage

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