UDYOG'23

KHOYAKHOYA CHEMICAL PLANT

TEAM WAYNES

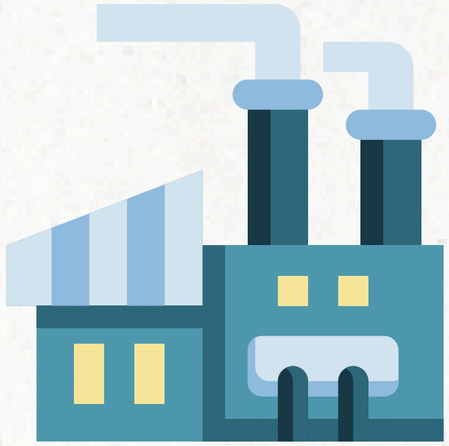
SAJAL MITTAL

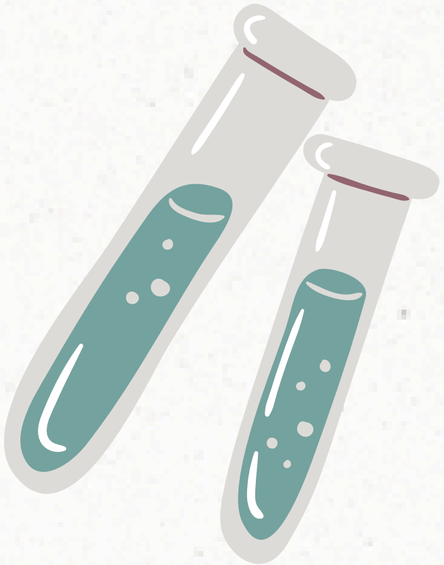
SAMYAK KASLIWAL

BHAVYA SINGH

INTRODUCTION

KhoyaKhoya Chemicals is a leading chemical producing company that has been providing high-quality chemicals to industries around the world for over 20 years. We specialize in the production of a wide range of chemicals, including solvents, surfactants, and specialty chemicals, which are used in various applications such as adhesives, coatings, and lubricants.





Our state-of-the-art manufacturing facilities and experienced team of chemists enable us to produce chemicals that meet the highest standards of quality and safety. We are committed to continuous improvement and invest heavily in research and development to develop new and innovative products that meet the evolving needs of customers and parallel to that working on sustainable development

PROCESS AND TECHNOLOGIES

RAW MATERIAL PROCESSING

The following technology is involved in the raw material processing :

- Mixing and Blending
- Size Reduction
- Drying
- Extraction
- Chemical Modification

PRODUCTION OF CHEMICALS

The following technology is involved in the chemical production :

- Chemical Reactors
- Distillation and Separation
- Filtration
- Crystallization
- Automation

REACTION TECH

We use the following technology in the reactions involved during production of chemicals:

- Process Intensification
- Catalytic Converters
- Temperature modifiers

EXHAUST

Exhaust involves the technology used during and before ejection of waste materials. They are:

- Membrane Filtration
- Bioremediation
- Carbon Capture and Storage
- Sustainable Materials
- Green Chemistry

01 RAW MATERIAL PROCESSING

1. **Mixing and Blending**: Raw materials are often blended and mixed together to create a uniform mixture that can be processed further. This may involve the use of mixers, blenders, or other mechanical devices to achieve the desired mixture.
2. **Size Reduction**: Raw materials may need to be reduced in size to facilitate processing. This may involve crushing, grinding, or milling the materials to create a finer powder or particle size.
3. **Drying**: Raw materials may need to be dried to remove moisture before they can be processed further. This may involve using dryers, ovens, or other heat sources to remove moisture from the raw material.
4. **Extraction**: Extraction is a process used to separate components from a mixture based on their solubility. This technology is commonly used to extract specific chemicals or compounds from natural sources or other raw materials.
5. **Chemical Modification**: Raw materials may need to be chemically modified to create the desired end product. This may involve chemical reactions, such as polymerization or oxidation, to transform the raw materials into a new chemical compound.

02 PRODUCTION OF CHEMICALS

1. **Chemical Reactors**: Chemical reactors are vessels designed to hold chemical reactions. The reactors are typically equipped with stirrers, heating or cooling systems, and sensors to monitor reaction conditions such as temperature, pressure, and pH.
2. **Distillation and Separation**: Distillation and separation technologies are used to purify chemicals and separate them from impurities. These technologies use differences in boiling points or solubility to separate and purify chemicals.
3. **Filtration**: Filtration is a process used to separate solid particles from a liquid or gas. This technology is commonly used to remove impurities from chemicals before they are processed further.
4. **Crystallization**: Crystallization is a process used to purify chemicals by allowing them to form crystals. This technology is commonly used to purify salts, acids, and other chemicals.
5. **Automation**: Many chemical production processes are highly automated, using computer systems to control and monitor reaction conditions, raw material inputs, and product output.

03 REACTION TECHNOLOGY

1. **Activated Carbon:**Activated carbon is a commonly used catalyst in water treatment industries. It has a large surface area that can absorb a wide range of impurities, such as organic compounds, pesticides, and chlorine.
2. **Zeolites:** Zeolites are crystalline materials that can be used as catalysts to remove impurities like ammonia, heavy metals, and some organic compounds from water.
3. **Alum:** Alum is a commonly used coagulant that is added to water to form large clumps of suspended particles, which can then be easily removed by filtration.
4. **Photocatalyst:** Photocatalysts like titanium dioxide are used to remove impurities from water by using light to initiate a chemical reaction that breaks down contaminants into harmless substances
5. **Iron-Based Catalysts:** Iron-based catalysts like iron sulfate and iron chloride are used to remove impurities like arsenic and phosphorus from water.

04 EXHAUST

1. **Scrubbers :** Scrubbers are used to remove pollutants from industrial exhaust gases. They work by spraying a liquid (usually water) into the gas stream, which captures the pollutants and removes them from the air.
2. **Catalytic converters:** Catalytic converters are used to reduce the emissions of harmful gases such as nitrogen oxides (NOx) and carbon monoxide (CO) from combustion processes. They work by converting these gases into less harmful compounds through a chemical reaction.
3. **Vapor recovery systems:** Vapor recovery systems are used to capture and recover volatile organic compounds (VOCs) that would otherwise be released into the atmosphere during production processes. They work by condensing the VOCs into a liquid, which can then be reused or disposed of safely
4. **Baghouses:** Baghouses are used to capture and remove particulate matter from industrial exhaust gases. They work by passing the exhaust gases through a series of filter bags, which trap the particulates.

ADVANCED TECHNOLOGY REQUIRED

Process Intensification: This technology reduces the use of energy and materials in chemical processes, which results in lower waste production and emissions.

Catalytic Converters: Catalytic converters are used to reduce the amount of harmful emissions released by combustion engines. They work by converting harmful gases like carbon monoxide and nitrogen oxides into less harmful substances.

Membrane Filtration: Membrane filtration technology uses a membrane to separate pollutants from wastewater, which results in a reduction in the amount of pollutants released into the environment.

Bioremediation: Bioremediation is the use of microorganisms to break down pollutants in soil and water. This technology can be used to treat contaminated soil and water in chemical industries.

Carbon Capture and Storage: Carbon capture and storage (CCS) technology captures carbon dioxide emissions from industrial processes and stores them underground or in other storage facilities, preventing them from entering the atmosphere.

Sustainable Materials: Chemical industries are adopting sustainable materials such as bioplastics and biodegradable products to reduce the amount of waste and pollution generated.

MAJOR POLLUTANTS

Particulate matter (PM):	Volatile organic compounds (VOCs): .	Nitrogen oxides (NOx):	Sulphur dioxide (SO2):
Particulate matter is a mixture of tiny solid and liquid particles that can cause respiratory problems and other health issues. Chemical industries can emit PM through processes such as grinding, milling, and combustion. The percentage of PM emitted can vary depending on the industry and process, but can range from less than 1% to over 50%.	VOCs are organic chemicals that can easily evaporate into the air and contribute to air pollution. Chemical industries can emit VOCs through processes such as drying, distillation, and solvent use. The percentage of VOCs emitted can range from less than 1% to over 90%	NOx is a family of compounds made up of nitrogen and oxygen that can contribute to air pollution and the formation of smog. Chemical industries can emit NOx through processes such as combustion and high-temperature reactions. The percentage of NOx emitted can range from less than 1% to over 30%.	SO2 is a gas that can contribute to acid rain and respiratory problems. Chemical industries can emit SO2 through processes such as combustion and chemical reactions involving sulfur-containing compounds. The percentage of SO2 emitted can range from less than 1% to over 20%.

VOC CONTROL

Process Optimization	Recovery and Reuse	Control Equipment	Maintenance and Monitoring	Employee Training
:Chemical plants can optimize their processes to reduce the amount of VOCs generated. This can be achieved by reducing the use of solvents or replacing them with less volatile alternatives, using lower VOC-emitting raw materials, and optimizing the production process to minimize VOC emissions.	Chemical plants can use recovery systems to capture VOCs before they are released into the atmosphere. These captured VOCs can be reused in the production process, reducing the amount of VOCs that need to be emitted.	Chemical plants can install control equipment such as thermal oxidizers, catalytic oxidizers, and adsorption systems to capture and destroy VOC emissions. These technologies use high temperatures, chemical reactions, and adsorption to remove the VOCs from the exhaust gases.	Regular maintenance and monitoring of production equipment can help to identify leaks and other sources of VOC emissions. This allows for prompt repair and replacement of faulty equipment, preventing the escape of VOCs into the atmosphere.	Employee training and awareness programs can help to ensure that all employees are aware of the risks associated with VOC emissions and the steps they can take to minimize emissions.

NEW CHEMICALS REQUIRED

ION EXCHANGE RESINS

Ion exchange resins are used to remove heavy metals and other contaminants from industrial wastewater by exchanging the ions in the water for other ions in the resin.

BIOLOGICAL TREATMENTS

Biological treatments such as bioremediation and bioaugmentation use microorganisms to break down pollutants and convert them into less harmful substances.

CARBON OXIDISERS

Chemical oxidizers such as hydrogen peroxide and ozone are used to break down organic compounds and pollutants into less harmful substances.

ACIDS AND BASES

Acids and bases are used to adjust the pH of wastewater to levels that are more conducive to treatment and to neutralize acidic or basic pollutants.

Coagulants and Flocculants:

Coagulants and flocculants are used to treat wastewater by clumping together small particles and solids, making them easier to remove from the water.

ACTIVATED CARBON

Activated carbon is a highly porous material that is effective at adsorbing pollutants such as organic compounds, chlorine, and volatile organic compounds (VOCs) from industrial wastewater and air streams.

METHODS TO MONITOR KEY POLLUTANTS

Visual Observations:
Visual observations can provide a quick and easy way to monitor the emission of pollutants. This can involve simply observing the color, odor, or smoke emitted from the facility.

Continuous Emissions Monitoring: Continuous emissions monitoring involves the use of specialized equipment to monitor the concentration of various pollutants in real-time. This can include gas analyzers, particulate monitors, and continuous emission monitors.

Emission Factors: Emission factors are mathematical models that use data on the chemical and physical characteristics of a facility and its processes to estimate the amount of pollutants that are likely to be emitted. These models can be based on historical data or industry standards and can provide estimates of pollutant emissions over time.

Ambient Air Monitoring: Ambient air monitoring involves the measurement of pollutant concentrations in the air surrounding the facility. This can be done using stationary or portable monitors and can provide information on the overall impact of the facility on the environment.
Water Monitoring: Water monitoring involves the measurement of pollutant concentrations in the water discharged from the facility. This can be done using specialized equipment to measure parameters such as pH, turbidity, and dissolved oxygen.

Stack Testing: Stack testing involves the collection of samples of emissions from the stack or chimney of a facility. This can involve the use of isokinetic samplers, which draw in a representative sample of the emissions, or other specialized equipment.

EFFECTS OF DISCHARGE ON ENVIRONMENT

SOIL CONTAMINATION

Chemical waste can leach into the soil, contaminating the land and making it unsuitable for agriculture or other purposes.

BIODIVERSITY LOSS

Chemical waste can disrupt ecosystems, leading to the loss of species and biodiversity.

CLIMATE CHANGE

Some chemicals, such as chlorofluorocarbons (CFCs), can deplete the ozone layer, leading to global warming and climate change

WATER POLLUTION

Chemical waste can enter rivers, lakes, and groundwater, polluting the water supply and harming aquatic life.

AIR POLLUTION

Chemical waste can release toxic gases into the air, causing respiratory problems and other health issues for humans and wildlife.

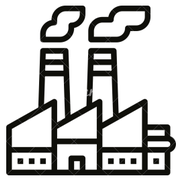
HEALTH PROBLEMS

Exposure to chemical waste can cause a range of health problems, including cancer, birth defects, and neurological disorders.

UTILITY OF RECOVERED WATER

Recreation:

Recovered water can be used for recreational purposes, such as boating or fishing, in areas where water is scarce.



Industrial reuse:

Recovered water can be used for non-potable purposes within the chemical industry, such as cooling water or process water, reducing the demand for freshwater.

Agricultural irrigation:

Treated recovered water can be used for crop irrigation, providing a sustainable and reliable source of water for agriculture.

Wetland restoration:

Treated recovered water can be used to restore wetlands and other natural habitats that have been damaged by human activity.

Drinking water:

With appropriate treatment, recovered water can be used as a source of potable water, particularly in regions where freshwater supplies are limited.

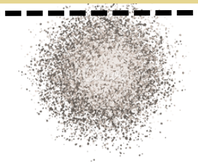
Groundwater recharge:

Recovered water can be used to replenish groundwater aquifers, which are often depleted in arid regions.

WATER TREATMENT PRODUCTS

There are several waste products generated by other industries that can be used in the treatment of water. These waste products can be used in various treatment processes, such as coagulation, flocculation, adsorption, and biological treatment. These waste products can provide a cost-effective and sustainable alternative to traditional water treatment chemicals and can also help reduce the environmental impact of these industries. However, it is important to ensure that these waste products are treated and handled safely to prevent any adverse effects on human health and the environment. Here are some examples of waste products from other industries that can be used in the treatment of water:

Fly Ash:



Fly ash is a waste product generated by coal-fired power plants.
It can be used as a coagulant in water treatment to remove impurities such as organic matter and heavy metals.

Rice Husk Ash:

Rice husk ash is a waste product generated during the combustion of rice husks. It can be used as an adsorbent to remove impurities such as heavy metals, dyes, and organic compounds from water.

Tannery Wastewater Sludge:

Tannery wastewater sludge is a waste product generated by the leather industry. It can be used as a coagulant in water treatment to remove impurities such as color, organic matter, and heavy metals.

Sugarcane Bagasse:

Sugarcane bagasse is a waste product generated by the sugar industry. It can be used as a biological filter medium in wastewater treatment plants to remove organic matter.

Brewery Wastewater:

Brewery wastewater is a waste product generated by the brewing industry. It can be used in anaerobic digestion processes to generate biogas, which can be used as an energy source, and to remove organic matter and nutrients from water.

Spent Coffee Grounds:

Spent coffee grounds are a waste product generated by the coffee industry. They can be used as an adsorbent to remove impurities such as lead, copper, and chromium from water.

FIXED CAPITAL NEEDS,SPACE REQUIREMENT AND RUNNING COST

Production capacity:

The production capacity of the chemical plant is the primary factor that determines the fixed capital investment and space requirement. The greater the production capacity, the larger the capital investment and space requirement will be.

Raw materials:

- The type and volume of raw materials required will determine the space required for storage and handling, as well as the cost of transportation and storage.

Equipment and technology:

The choice of equipment and technology used in the chemical plant will also impact the fixed capital investment and space requirement. Advanced technology and state-of-the-art equipment may require more investment and space but could lead to more efficient production and lower running costs in the long run.

Infrastructure and utilitie

The availability and cost of infrastructure and utilities such as power, water, gas, and waste management systems will impact the running costs of the chemical plant.

Market demand

The expected market demand for the chemical products will determine the production capacity, which in turn affects the fixed capital investment and space requirement.

Regulatory requirements

Regulatory requirements related to safety, health, and the environment may impact the design and space requirement of the chemical plant, as well as the running costs due to compliance and monitoring.

Thank You!