PEXOMASS

Why us?

25+ Years of Service & Industrial Expertise

Quality Focused

Client - Centric Approach

Global Reach & Network

Skilled Innovation and R & D

PRODUCT CATALOGUE

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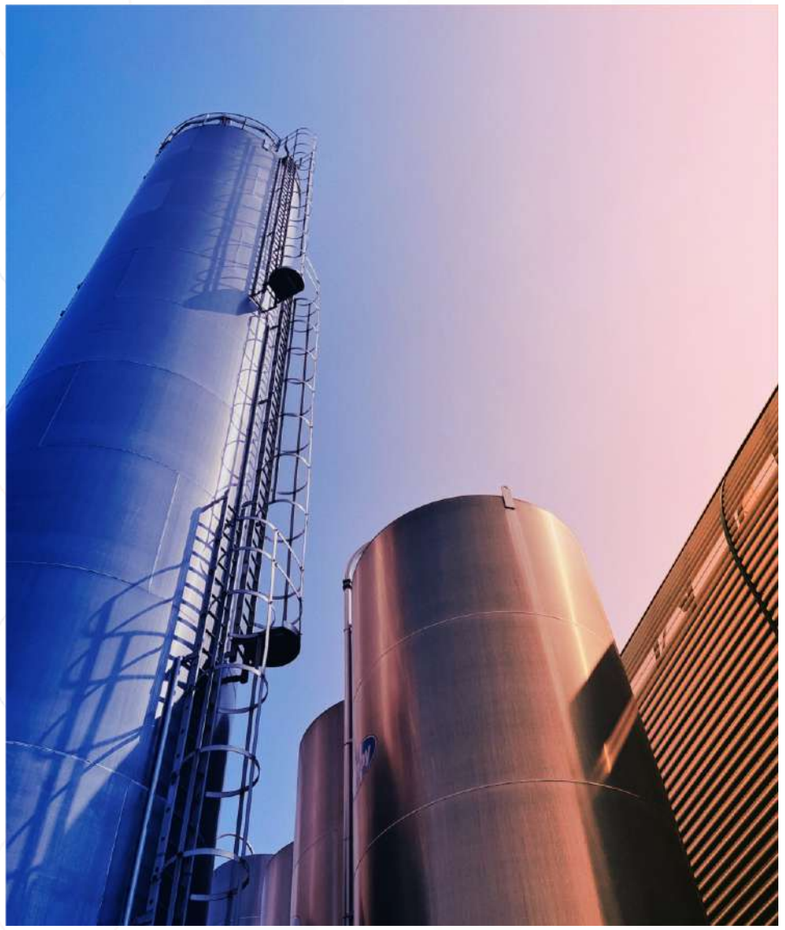
Our Product & Service Portfolio :

PEXOMASS

At **PEXOMASS®** , We have 25 years of experience in designing, engineering, and manufacturing high-quality equipment for the chemical and pharmaceutical sectors. Our in-depth understanding of the intricate requirements of these industries positions us as a reliable partner for your equipment needs.



EXPERTISE

Our team of skilled engineers and professionals brings years of expertise in designing equipment that adheres to industry standards.

QUALITY FOCUSED

We are committed to delivering equipment of the highest quality, ensuring safety, reliability, and durability.

INNOVATION

We stay updated with the latest technological advancements to integrate innovative features into our equipment.

CLIENT CENTRIC APPROACH

Your success is at the core of our operations. We work closely with you to understand your needs and provide solutions that align perfectly.

GLOBAL REACH

With a strong distribution network, we have successfully served clients across the globe, establishing us as a trusted name internationally.

OUR VISION

To make PEXOMASS HEAVY INDUSTRIES PVT. LTD a world class manufacturer and preferred choice of worldwide customers for our Process Control , Contamination Control, Storage & Material Handling Equipments by putting all out efforts employing best business experiences through relationship built on integrity, success built on performance, fueled by a commitment for continual improvement personally & professionally and make PEXOMASS a brand to reckon with in the world.

REACTORS

A chemical reactor is a device or system used to facilitate and control chemical reactions. It is designed to provide an environment where raw materials, also known as reactants, are transformed into desired products through chemical processes. Chemical reactors are used extensively in various industries, including chemical manufacturing, petrochemicals, pharmaceuticals, food production, and more.

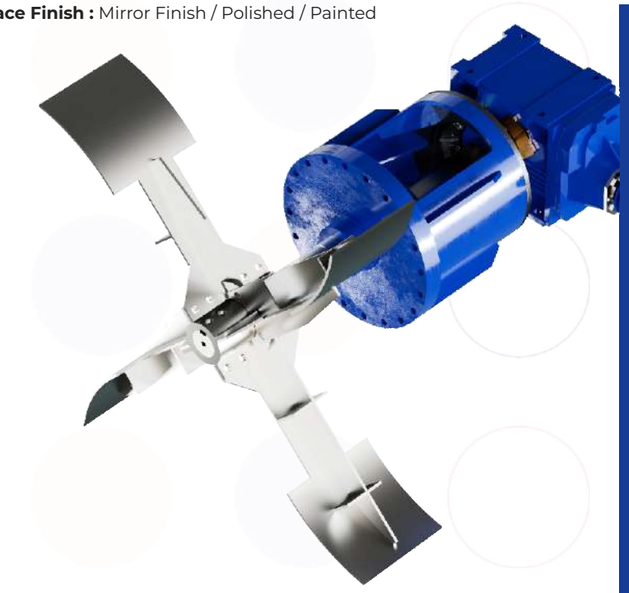
Chemical reactors prepared of three types - designs & in configurations. each of one suited to specific type of reactions and process requirements.

Batch Reactors: These reactors are used for small-scale reactions where reactants are mixed in a vessel, allowed to react, and then the products are collected after the reaction is complete. Batch reactors are often used for research, development, and production of small quantities of specialty chemicals.

Continuous Stirred-Tank Reactors (CSTR): In these reactors, reactants are continuously fed into a stirred tank, where the reaction takes place. The products are continuously withdrawn, maintaining a steady-state operation. CSTRs are commonly used in large-scale chemical manufacturing processes.

Plug Flow Reactor (PFR) : In a PFR, from time to time called continuous tubular reactor (CTR) one or more fluid reagents are pumped from side to side a pipe or tube. The chemical reaction proceeds as the reagents travel from side to side the PFR. In this kind of reactor, the varying reaction rate create a gradient with admiration to detachment traverse; at the inlet to the PFR the rate is extremely high, but as the concentrations of the reagents diminish and the attention of the invention increases the reaction rate slows.

- **Equipment Capacity :** up to 50 m^3 (kl)
- **Material of Construction :** Stainless Steel 316L / 304 / 316 / 321, Mild Steel, Carbon Steel, Hastelloy, etc.
- **Protective Layers :** Glass Lined, PTFE / PP / Halar Coating, Hard Chrome Plating, Custom Protective Chemical Coats, Etc.
- **Agitator / Mixing Mechanism :** Type as required, upto 1000 RPM
- **Motor / Gearbox :** Standard Make / Customized / as required.
- **Jacket / Limpet Coil :** Customized as per Requirement.
- **Baffle Plates / Seals / Nozzles :** as required.
- **Surface Finish :** Mirror Finish / Polished / Painted



Application :
1. Chemical Manufacturing Industry
2. Petrochemicals Industry
3. Pharmaceuticals Industry
4. Food & Beverage Industry

The choice of reactor type depends on factors such as reaction kinetics, temperature, pressure, safety considerations, desired product yields, and efficiency. Engineers and chemists carefully select and design the appropriate reactor for a given chemical process to ensure optimal conversion rates, selectivity, and yield while adhering to safety and environmental regulations.

HEAT EXCHANGER

A Heat Exchanger or condenser is a device used to convert a vapour or gaseous substance into a liquid state through the process of condensation. It is commonly used in various industrial and scientific applications, particularly in heat exchange systems and processes involving vaporization and cooling. Condensers are crucial components in systems where the conversion of vapour to liquid is necessary for efficient operation or further processing.

The basic principle of a condenser involves the removal of heat from a vapour, causing it to lose thermal energy and transition into a liquid state. This process involves transferring the heat from the vapour to a cooling medium, typically air or a circulating fluid like water.

There are different types of condensers used in various applications:

- **Surface Type :** This type of condenser is commonly used in steam power plants and other industrial processes. It consists of a shell-and-tube arrangement where steam is condensed on the outer surface of the tubes, and cooling water circulates inside the tubes. The steam releases heat to the cooling water, resulting in condensation and the formation of liquid water.

- **Shell and Tube Type :** Similar to the surface condenser, this type uses a shell-and-tube configuration, but it's not limited to steam applications. It's used for various fluids and gases that need to be condensed. The vapour flows through the tubes, and the cooling medium (usually water) surrounds the tubes in the shell.

- **Air-Cooled Type :** In situations where water availability is limited or costly, air-cooled condensers are used. These condensers use air as the cooling medium. Fins and tubes are designed to enhance heat transfer from the vapour to the surrounding air.

- **Evaporative Type :** This type of condenser combines the condensation process with evaporative cooling. It's commonly used in refrigeration systems and industrial processes. The hot vapour is condensed by direct contact with a spray of water, which then evaporates, removing heat and enhancing the condensation process.

- **Jacketed Type :** In laboratory settings, a jacketed condenser is often used for distillation and reflux processes. It consists of a glass tube surrounded by a water jacket. Vapour rises through the central tube, and cooling water in the jacket causes condensation.

Condensers are used in a wide range of applications, including:

- **Steam power plants:** To condense steam back into water after it has passed through the turbine.
- **Refrigeration systems:** To liquefy refrigerant gases for efficient cooling.
- **Chemical processing:** To recover volatile solvents or cool reaction products.
- **Distillation:** To condense vaporized liquids back into a liquid state during distillation processes.
- **Air conditioning:** To remove heat from the air by condensing refrigerant gases

AGITATORS

Agitators are equipment used to homogenize media inside a tank. They work by rotating immersed impellers at a controlled speed, also called revolutions per minute (RPM). The work exerted by the impeller induces the flow and shear of the media inside the tank, causing a single or multi-component media to homogenize. The flow of the media is kept at a uniform rate and pattern.

Agitators can perform diverse functions in any industrial plant, which include:

- Homogenizing solutions and suspensions to achieve a uniform consistency
- Maintaining solutions in a mixed state and preventing concentration gradient
- Dispersing a gas into a liquid solvent
- Promoting chemical reaction inside a reactor
- Maintaining a consistent temperature of the solution inside a vessel
- Promoting heat transfer to a jacket

Agitators can handle liquid, gaseous, and solid (e.g., granules, powders) media. They can also work with slurries, suspensions, and highly viscous liquids. However, selecting the appropriate agitator type, sizing, and design for the specific nature of media is crucial. Viscosity and sensitivity to shear stress are essential considerations when selecting an agitator. Agitators are widely used in many industries, including food and beverage, pharmaceutical, agricultural, biotechnology, paint, and water treatment industries.

The terms “agitators” and “mixers” are often used interchangeably, but they technically do not mean the same thing. Mixers are equipment that rapidly blends two or more components together. these components may be of the same or different phases (e.g., solid-liquid, liquid-liquid, gas-liquid). When a component enters a mixer, it is often in a “pure” state and leaves combined with other components. On the other hand, agitators maintain homogeneity and equilibrium in an existing mixture. They prevent the formation of concentration and temperature gradients and ensure uniform consistency in a mixture.

Components of Agitators :

- Motor & Gear Drive,
- Shaft/Power Transmission,
- Impeller

Types of Flow Patterns :

- Axial Flow
- Radial Flow
- Tangential Flow
- Spiral Flow

Types of Agitator :

- Paddle Type
- Anchor Type
- Helical / Double Helical Ribbon Type
- Screw Type
- Propeller Type
- Turbine Type (Straight Blade / Pitched / Rushton / Smith / Curve)
- Retreat Curve Type
- Hydrofoil Type
- Dispersion Blade Type
- Coil Type

Configurations of Agitators :

- Top Entry
- Bottom Entry
- Side Entry

SCRUBBERS

A scrubber tank, often referred to as a "scrubber vessel" or simply a "scrubber," is a piece of equipment used in various industries to remove pollutants, contaminants, or unwanted substances from gas streams or exhaust gases. The primary purpose of a scrubber tank is to clean or purify the gas by physically or chemically interacting with the contaminants, effectively reducing their concentration before the gas is released into the environment.

Scrubber tanks can come in various designs and configurations based on the specific application and the type of pollutants being targeted. Some common types of scrubbers include:

- **Wet Scrubbers :** Wet scrubbers use a liquid (often water) to capture and remove pollutants from the gas stream. The gas is passed through the liquid, and the pollutants are absorbed or dissolved into the liquid. Wet scrubbers are effective for removing particles , gases, and odorous compounds.
  - **Venturing Scrubber:** This type of wet scrubber uses the velocity difference between the gas and the liquid to create a pressure drop that facilitates the capture of pollutants.
  - **Packed Bed Scrubber:** In this design, the gas passes through a bed of packing material that is wetted with liquid. Contaminants are absorbed onto the wet surfaces of the packing.

- **Dry Scrubbers :** Dry scrubbers use a solid sorbent or a reactive chemical to remove pollutants from the gas stream. .

  These scrubbers are often used when the gas stream has high temperatures or is unsuitable for direct contact with water.
  - **Dry Sorbent Injection Scrubber:** Dry sorbent are injected into the gas stream, and the pollutants are chemically adsorbed onto the sorbent particles.
  - **Spray Dry Scrubber:** This design involves spraying a fine mist of alkaline solution into the gas stream to neutralize acidic gases.

- **Gas Scrubbers :** Gas scrubbers are used to remove specific gases, such as sulphur dioxide (SO2), hydrogen sulphide (H2S), ammonia (NH3), and other noxious gases. They typically involve chemical reactions that convert the harmful gases into less harmful compounds.

  Scrubber tanks are commonly used in various industries, including:

  - **Industrial Processes:** Scrubbers are used to control emissions from manufacturing processes, chemical production, metal refining, and more.
  - **Power Generation:** In coal-fired power plants, scrubbers are used to remove sulphur dioxide, a major contributor to acid rain, from flue gases.
  - **Waste Incineration:** Scrubbers help reduce pollutants and particulate matter from waste incineration processes.
  - **Oil and Gas Industry:** Scrubbers are used to remove hydrogen sulphide and other sulphur compounds from natural gas streams.
  - **Chemical Processing:** Scrubbers can be used to neutralize or capture harmful gases produced during chemical reactions.

ANF / ANFD

ANFD stands for "Agitated Nutsche Filter Dryer." It is a specialized equipment used in the pharmaceutical, chemical, and fine chemical industries for solid-liquid separation, filtration, washing, and drying of solid materials in a single process vessel. ANFD combines the functions of a filter, agitator, and dryer into a single unit, making it a versatile piece of equipment for various processes.

Working Principle

- **Filtration & Separation :** The ANFD consists of a cylindrical vessel with a filter plate and a filter medium (often a filter cloth) covering the perforations. This allows the liquid component of the slurry to be separated from the solid material. The slurry containing the solid material and the liquid is fed into the vessel. The liquid passes through the filter medium and the perforations, leaving the solid material behind on the filter cloth.
- **Washing :** If necessary, the solid material can be washed to remove any impurities or unwanted components. The washing liquid is introduced into the vessel and agitated to ensure thorough contact with the solids.
- **Agitation :** The vessel is equipped with an agitator (usually a paddle or a ribbon) that rotates and agitates the contents. Agitation prevents the formation of a compact cake on the filter medium and aids in uniform drying.
- **Drying :** After the filtration and, if applicable, washing stages, the drying process begins. The vessel is heated, and the agitator continues to rotate, ensuring that the solid cake is exposed to heat & air. As the vessel is heated, the moisture in the solid cake evaporates, and the solid material gradually dries. The agitator prevents the cake from sticking to the filter medium and ensures even drying.
- **Discharge :** Once the drying process is complete, the dried solid cake can be discharged from the vessel. The agitator can aid in breaking up the cake, making it easier to remove.
- **Cleaning & Maintenance :** After the process is finished, the ANFD is cleaned to prepare it for the next batch. This involves removing any remaining material from the vessel, filter medium, and agitator.

Components of ANFD

- Vessel
- Agitator
- Filtration System
- Drying System
- Discharge Mechanism

Advantages of ANFD

- **Process Efficiency:** Combining multiple process steps (filtration, washing, and drying) in a single vessel reduces the need for transferring materials between different equipment, leading to better process efficiency.
- **Time and Cost Savings:** It saves by reducing the need for separate equipment & minimizing material handling.
- **Minimized Contamination Risk:** As the entire process takes place within a closed vessel, it reduces the risk of product contamination and exposure to environments.
- **Occupational Safety:** By containing potentially hazardous or toxic materials within the closed vessel, ANFDs enhance operator safety.

The advantages include efficient filtration, washing, and drying in a single unit, minimizing the need for multiple pieces of equipment and reducing processing time. It's particularly useful for heat-sensitive materials or processes that require maintaining product quality. ANFDs find applications in various industries, such as pharmaceuticals, chemicals, dyes, pigments, food processing, and more, where the separation, washing, and drying of solid materials are essential steps in the production process.

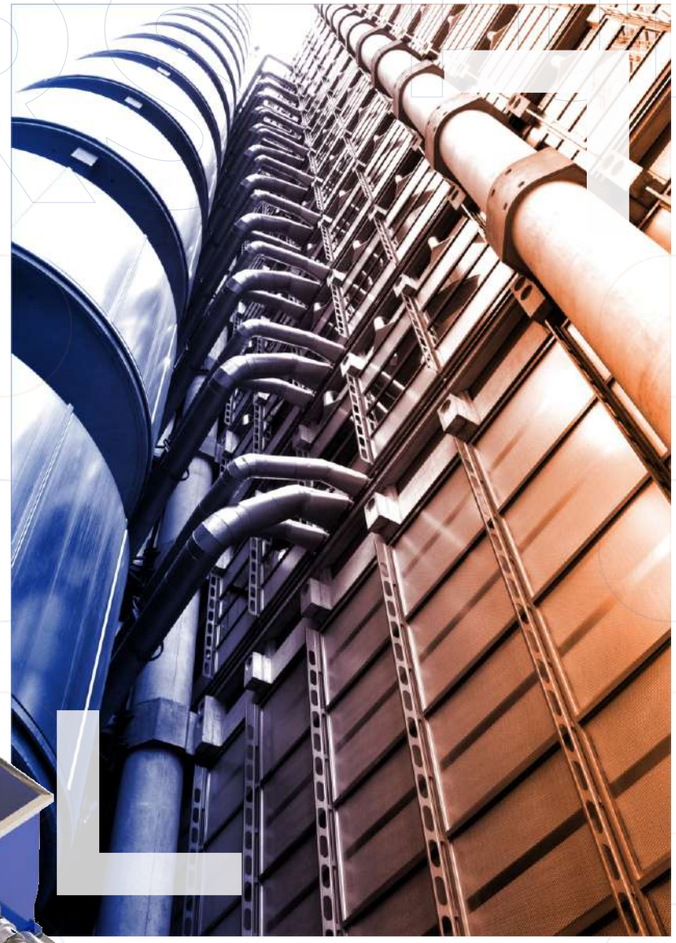
MIXERS

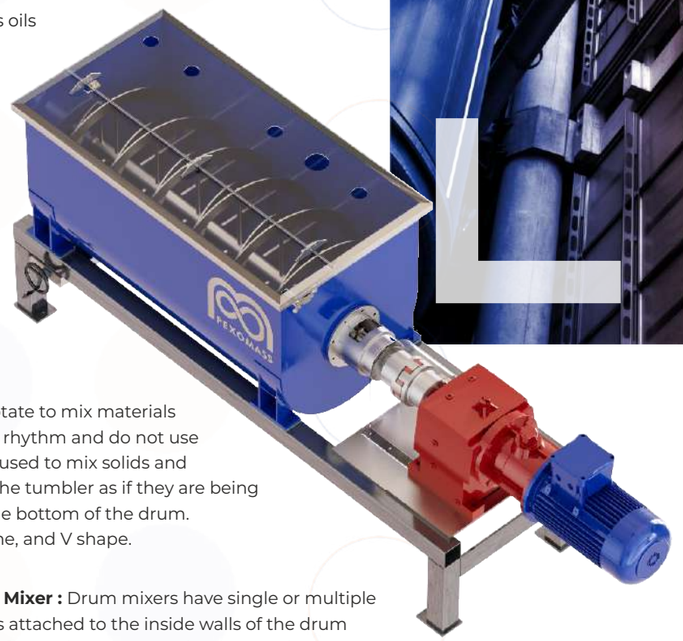
A mixer is a complex and precision piece of equipment that blends, emulsifies, homogenizes, and combines various types of ingredients that are essential to a manufacturing or production process. Mixing is part of the production of commercial and industrial products including pharmaceuticals, cosmetics, and foods each of which require precision control for mixing of unlike and dissimilar chemicals and materials.

The quality of a mixer is determined by its repeatability and the consistency of its mixing. The challenge of the process is the properties of the materials being mixed since each variation and difference requires special handling. The initial steps of mixing involves a thorough in depth study of the materials such that the mixing process will be successful. As with many industrial functions, mixing requires a customization of equipment to exactly meet the needs and conditions of the manufacturing process.

General Type of Mixer used for Application Material

Paddle Mixer	Viscous semi-solid material
Ribbon Blender / Mixer	Food, chemicals, powders
Tumbler Mixer	Bakery materials
Drum Mixer	Low and medium viscosity material, such as slurry or cement
Emulsifier Mixer	Immiscible liquids, such as oils
Static Mixer	Gasses and liquids

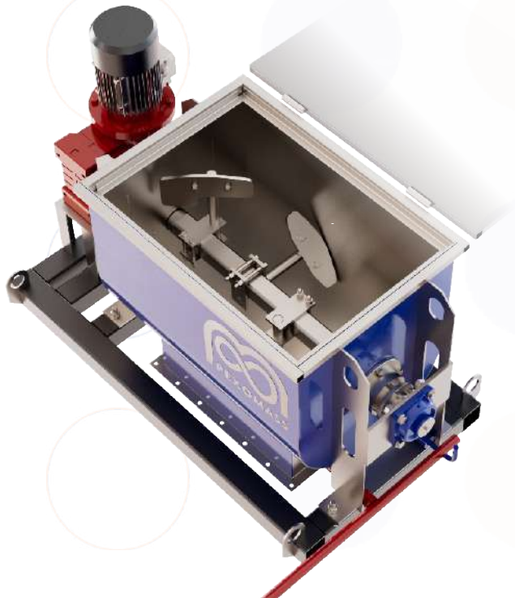




Paddle Mixer : These types of mixers are utilized in the mixing of solids, viscous or slurry liquid mixing, and wet-dry mixing. They consist of a central shaft axis for the holding of the blades. They are frequently utilized in dry mixing, but they can also accommodate liquid-solid mixing.

Ribbon Mixer / Blender : Ribbon Mixers are a specific type of powder blenders that consist of two parts mounted on a central shaft . The mixing medium often consists of inner and outer helical ribbons that are designed to move material both inwards and outwards.

Tumbler Mixer : Tumbler mixers are diffusion mixers that rotate to mix materials and include air in the mixing process. They have a tumbling rhythm and do not use impellers as part of the mixing process. Tumbler mixers are used to mix solids and powders and, in special cases, liquids. Solids are rotated by the tumbler as if they are being stirred as gravity is constantly pulling the mixture back to the bottom of the drum.
The configurations of tumbler mixers include octagonal, cone, and V shape.



Drum Mixer : Drum mixers have single or multiple blades attached to the inside walls of the drum with a frame that supports the drum as it rotates.
As the drum rotates, the blades on the interior walls lift the ingredients and raise them to the upper wall of the drum. At the apex of the rotation, the ingredients fall back to the underside of the drum to repeat the process.

Emulsifier Mixer : These types of mixers are utilized in mixing immiscible liquids. Examples of two substances that are completely not miscible are oil and water. In the cases when there is a requirement of a totally homogenized and emulsified mixture like in making sunscreen, lipstick, lotion, and mixing cosmetics, an emulsifier is utilized.

Static Mixer : Static mixers have a mixing element that has the shape of a twisted ribbon, helix, or other form that is placed in a cylinder. They do not have any moving parts because the mixing element disrupts and blocks the flow of liquids or gases that are forced through one end of the cylinder. As liquids or gases flow through the cylinder of a static mixer, the shape of the element causes turbulence that mixes the materials by breaking down their molecules. Static mixers disperse gases into immiscible liquids to form a homogenous solution. They are not used for mixing solids, granules, or powders.

PULVERIZERS

A pulverizer or grinder is a mechanical device for the grinding of many different types of materials. For example, a pulverizer mill is used to pulverize coal for combustion in the steam-generating furnaces of coal power plants. Pulverizers are commonly used in the coal industry but can be suited for a variety of applications. The main purpose of these machines is to process materials and act as size reduction equipment. A pulverizer reduces materials like Limestone and gypsum at high speeds resulting in smaller particle sizes.

Typically, Pulverizers are sorted into three major groups:

- Grinding Mills
- Crushers
- Impactors.

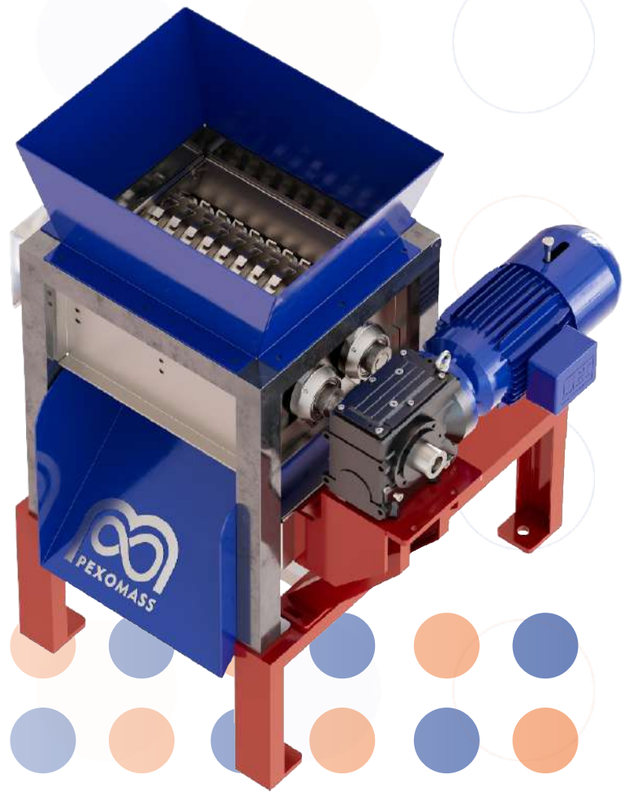
Note that within these groups are many specific types of pulverizers, defined by their application, such as coal pulverisers, concrete pulverizers, food pulverizers, and plastic pulverizers.

- **Grinding Mills :** Grinding mills break down materials using friction, which they generate via grinding media. Any number of coarse materials may serve as grinding media, but some, such as brass, bronze, ceramics, flint, and non-sparking lead, are more common than others.
  The sub-types are as,
  - Ball Mill
  - Hammer Mill
  - Tube Mill
- **Crushers :** Crushers are used to crush large, dense materials like rock and stone, until it is dust or gravel. Usually, they are used to simplify the differentiation of materials or to reduce materials and/or prepare them for recycling or disposal. The most common type of crusher is the jaw crusher.
  - Jaw Crusher
  - Blake Crusher
  - Dodge Crusher
  - Universal Crusher
- **Impactors :** Impactors are quite like crushers, except that they reduce materials differently. Instead of crushing, which uses pressure generated by two opposing forces, they use impaction, a process that transmits force via collision. To carry out impaction, impactors, or impact crushers, contain the material to be crushed inside a cage, with which they facilitate collisions.
  As the material gets smaller, it falls out of openings on the bottom, side, or end of the cage.
  Along with the above common pulverizer types are those types that are less common, but more specialized, such as,
  - Gyratory crushers
  - Cone Crusher
  - MPS Mills
  - Bowl Mills

Pulverizer machines may have different components depending on their kind. However, in general, they work using entry feed, a rotating element (e.g. rotating cylinder), a crushing element (e.g. steel balls), and an exit feed. Some pulverizers also have temperature control and air flow components (air precleaner, air compressors, etc.) that help dry newly crushed material. To promote safety, they frequently feature accessories like automatic shut-off programming, shields, sensors, and guardrails.

When helping you select a pulverizer or when designing a custom pulverizer for you, pulveriser suppliers consider factors like feed quantity, the breaking behavior of the material you will be sending through the feed, its initial texture (coarse, fine, etc.), its level of abrasion resistance, its initial hardness, its initial cleanliness (any contaminants it may carry), and the required finished texture and fineness of the material you are grinding.

Based on these factors, pulverizer manufacturers can decide on the right pulverizer configuration for you, whether your pulverizer should run continuously or in batches, whether or not your pulverizer requires an airflow component, the right pulverizer speed, and what grinding tools are best for you.



DRYERS

An industrial dryer is a high powered complex device designed to remove moisture from machinery products, materials, food products, and mixtures. They are large rugged durable industrial pieces of equipment capable of drying high volumes of product efficiently with exceptional precision & control.

Drying can be defined as the vaporization of absorbed moisture from wet materials. It is a heat and mass transfer process that is completed using a variety of mechanisms. The basis of the process is the transfer of heat from the material to be dried, which causes the absorbed water to vaporize that is transferred to and carried by the surrounding air or inert gas.

During the drying process, the humidity or moisture content of the surrounding air increases. The weight of the dried material decreases while the moisture free weight is constant. Some of the purposes of drying are:

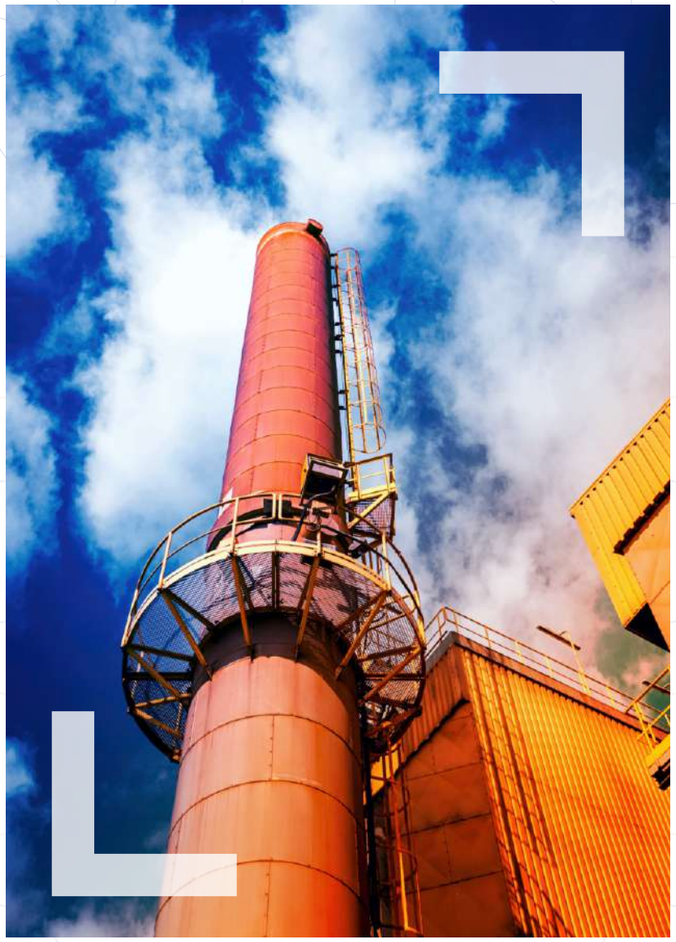
- The prevent of the growth of bacteria, molds, and other microbes on food and pharmaceutical products.
- To protect materials from rust and corrosion
- To improve and maintain the positive properties of a material
- To prepare materials for further processing, storage, handling, and transportation
- To enhance functionality, usability, and the value of a product

Dryers are used in food, pharmaceutical, agricultural, sugar, pulp and paper, textiles, wood, metallurgical, metal fabrication, and automotive industries.

Heat Transfer Categories of Dryers

Conductive heat transfer is a process where materials to be dried are heated through a board, object, or jacket. With convective heat transfer, the drying process is direct without the use of a board or coils. The two drying processes are classified as direct and indirect where conductive heating is indirect &convective heating is direct.

- Direct Dryer
- Food Dryer
- Radiant Dryer
- Microwave Dryer
- Infrared Dryer
- Indirect Dryer
- Air Dryer
- Conveyor Dryer
- Rolling Bed Dryer



DRYERS

Batch or Continuous Mode Industrial Dryers

Batch Dryers : The term batch dryer is a general descriptor that covers several versions of high volume dryers capable of efficiently drying large numbers of parts in one single cycle. Batch dryers can have conveyor systems where parts pass through on webbed belts that allow heated air to flow around the parts through the webs in the dryer. Other forms of batch dryers have a drying chamber with brackets to hold baskets of parts. It is form of dryer that is manually operated but has a control system that monitors the drying chamber.

Some forms of batch dryers have drying zones where parts pass through a series of heated areas to slowly and evenly dry parts. This type of dryer design is automated, which makes it possible for parts to be unloaded by robotic mechanisms, a characteristic that radically differentiates this form of batch dryer from other forms of drying processes.

Batch dryers process a fixed volume of material at particular drying duration. A high volume, number, or quantity of materials passes through the drying chamber. The quantity is limited by the holding capacity of the dryer. The dried materials are unloaded automatically or manually to make room for the next batch. Batch dryers are used in relatively low production volumes. Typical forms of batch dryers are tray dryers, drum dryers, or rotary dryers.

Continuous Dryers : A continuous dryer is designed to continually dry a constant flow of products, which may be grains, completed parts, pharmaceuticals, or various forms of food products. As with other forms of dryers, continuous dryers take several forms and can include transport chains, carts, rotary pumps, and conveyor belts. The drying process includes the movement of materials through dryer chamber that has different zones that provide chemical and physical drying processes to hold baskets of parts. It is form of dryer that is manually operated but has a control system that monitors the drying chamber.

The first zone on a continuous dryer raises the temperature of the material to diffuse any moisture circulating around the product. As the product moves through other zones, the diffusion increases from the surfaces of products and into the air in the dryer. During the process, the temperature of each zone is carefully controlled to prevent damage to the product or material.

Continuous dryers are highly efficient and do not need to be cooled at the completion of a drying cycle. This is realized in production process savings since batches can be fed without having to change the controls of the dryer. Continuous dryers include gas burners, monitors for temperature and moisture, moisture outlets, recuperative burners, and a steering system with a control panel.

There are many benefits related to the use of continuous dryers that assist in the efficiency of a business. Continuous dryers have a very high throughput rate that makes it possible to process a high volume of material in a short time. The success of the process can be measured by the low moisture content of products at the end of the process, which makes it possible to immediately ship dried products.

Types of Continuous Dryers

- Tunnel Dryers
- Rotary Dryers
- Drum Dryers
- Fluidized Bed Dryers
- Agitated Vacuum Dryers
- Disc Dryers
- Spray Dryers
- Flash Dryers

Types of Batch Dryers

- Tray Dryers
- Vacuum Dryers
- Freeze Dryers
- Bin Dryers
- Pan Dryers

The difference between the various types of dryers is based on the mechanism used to remove moisture as well as the many different sizes & capacities. Small capacity industrial dryers are used for R&D and research laboratories, which remove a few grams of moisture. Large scale industrial dryers handle tons of wet feed per hour.

The many varieties of industrial dryers make choosing the right dryer with the appropriate type, size, & specifications for a given application a process that has to be carefully planned & considered. Each of the types of dryers offers capabilities & features that can affect the quality & performance of the final product.

CENTRIFUGE

An industrial centrifuge is a mechanical device that uses centrifugal force (g-force) to separate substances or particles of different densities within a liquid or mixture. Industrial centrifuges offer a wide range of applications, such as separation, clarification, and filtration of various substances. These industrial centrifuges are widely used in various industries and applications, including beverage, dairy, bio-diesel, food processing, renewable resources, chemical, biotechnology, pharmaceutical, marine, energy, oil & gas, environmental, mining, and others. Industrial centrifuges are versatile machines designed to separate solids and liquids or separate different liquids based on their densities and other physical properties. Centrifuge equipment is used for the following key centrifuge applications:

- **Solid-Liquid Separation:**
  Industrial centrifuges excel at separating solid particles from liquid suspensions.
- **Liquid-Liquid Separation:**
  Industrial centrifuges are utilized to separate immiscible liquids, such as oil and water, or to separate different liquid components based on their specific gravities.
- **Particle Size Classification:** Industrial centrifuges can effectively classify particles based on their sizes.
- **Solids Dewatering:** In industries dealing with sludge or other solid wastes, industrial centrifuges provide efficient dewatering capabilities.

Major Factors Affecting Sedimentation and Separation

Viscosity, density (specific gravity), particle size and shape are all important factors to be considered in both gravity settling and centrifugal separation. Stokes Law provides a basic formula for predetermining the theoretical rate of sedimentation under the force of one gravity. It states that a particle moving through viscous liquid attains a constant velocity or sedimentation rate.
The sedimentation rate can be very slow for particles whose density is close to that of the liquid, for particles whose diameter is small, or where the viscosity is high.

The equation for Stokes's Law of Sedimentation

$Vg = d^2 (P_p - P_l) / 18n \times G$

where:
Vg = Gravitational Settling Velocity (m/s)
d = Particle Diameter (m)
P_p = Particle Density $(kg/m)^3$
P_1 = Liquid Density $(kg/m)^3$
G = Gravitational Acceleration (kg/ms)
n = viscosity of the liquid $(m/s)^2$

Gravity sedimentation relies on the force of gravity to separate particles based on their settling rates. This method of separation is slow compared to centrifugation and may require longer settling periods to achieve the desired separation. High-density minerals settle more rapidly than low-density minerals. Lower temperatures will increase viscosity, decreasing the fall velocity. The particle will be initially accelerated due to gravity, but eventually, the gravitational and drag forces reach an equilibrium, resulting in constant "terminal fall velocity."

CENTRIFUGE

Replacing the gravitational acceleration with the acceleration generated by the rotating centrifuge results in faster sedimentation. Centrifugal acceleration can be thousands of times greater than that of gravity; therefore, the sedimentation centrifuge rate is thousands of times greater. Sedimentation centrifuge (centrifugation) is preferred when rapid and efficient separation is required. Industrial centrifuge equipment utilizes centrifugal force for quick and precise separation.

Basket Centrifuge : With basket centrifuges, the liquid is inserted into an internal basket. The basket then rotates at a high velocity, forcing higher-density materials to the interior wall, where they are trapped by a snap-in cloth filter media. Materials that contain a lighter specific density, on the other hand, pass through the filter mesh screen (cloth or series of screens) and exit the bowl through a series of punctures on the wall of the basket. For example, in the case of solids and liquids, the liquid will pass through the filter and perforations while the solid material will remain inside the basket. The speed of a basket centrifuge is limited to a specific amount of revolutions per minute, or RPMs.

Decanter Centrifuge : The industrial decanter centrifuge design is often called a continuous scroll discharge centrifuge. It generally rotates about a horizontal axis. A decanter centrifuge features an elongated cylinder with a conveyor in the center. The cylinder spins at a different velocity, which in turn pushes denser material to the exterior wall. The conveyor then distributes these solids to the opposite end of the decanter centrifuge, where it is discharged.

- **Two - Phase Decanters (Solid/Liquid Separation)**
- **Three - Phase Decanters (Solids/Liquid/Liquid Separation)**

Disc Stack Centrifuge: It operates much in the same way as a basket centrifuge, with one substantial difference. The inner centrifuge bowl is equipped with a disc stack (conical discs) in the center by an inlet. The bowl discs (conical discs) are stacked on top of each other, providing a high additional separation surface area. The result is a smoother and faster separation process, greater capacity, and higher RPMs than a traditional basket centrifuge. Typical industries include biotech pharmaceuticals, dairy, environmental, chemicals, oil and gas, energy and utilities, food and beverage, industrial machinery, marine and transportation, pulp and paper, and steel.

Self-Cleaning Centrifuges

Chamber Bowl Separator : it is used for polishing liquids in the chemical and pharmaceutical industries, particularly when, in addition to the clarified liquids, solids must be simultaneously recovered and/or must be obtained in the form of a dry cake. Additionally, they are used when because of the erosive character of the solids, continuous centrifuges cannot be employed.

Clarifier : A clarifying centrifugal separator is used for separating solid particles from a liquid. The clarifier separator is equipped with a stack of bowl discs (conical discs) for creating a large equivalent clarification area in a relatively small bowl volume.

Nozzle Separator : A nozzle centrifuge is a continuously operating machine that clarifies liquids while concentrating solids. A built-in centripetal pump discharges the clarified liquid. The concentrated solids are discharged continuously through nozzles.

Purifier : A purifying centrifugal separator is a machine in which two liquids of different densities are separated from each other. The solids may also be separated at the same time.

Peeler Centrifuge : It is equipped with a screen designed to handle batch processes. After a slurry batch is injected into the centrifuge, the material is then passed through the screen, which prevents the denser solids from seeping through. This cake of materials is then peeled off by the arm and discharged from the device. Typical applications include bulk chemicals, fine chemicals, pharmaceuticals, plastics, and food industries.

Pusher Centrifuge : As with a basket centrifuge, spinning the bowl of a pusher centrifuge causes the liquid inside to exit out of a side wall. However, once the basket is devoid of liquid, a pusher centrifuge has a dedicated arm that scrapes the interior and pushes the solid material from the rear of the basket, which in essence, allows the basket to process the next batch immediately. Also called a horizontal basket centrifuge, a pusher centrifuge is designed as a continuous filtration centrifuge for solid and liquid separation.

Tubular Centrifuge : A tubular centrifuge consists of an extended vertical bowl that is primarily used for continuously separating liquids from liquids. As the centrifuge bowl spins, liquid of a lesser specific density is contained within the middle, whereas liquid of a greater specific density is routed to the exterior walls. Naturally, to maintain separation, each liquid is provided with its own discharge point. Any small solids contained therein must be removed through a manual process.

SOLVENT RECOVERY PLANT

A solvent recovery unit, also known as a solvent recovery system or solvent recycling unit, is a piece of industrial equipment designed to recover and reuse solvents that are used in various manufacturing processes. Solvents are often used to dissolve, disperse, or extract substances in industries such as pharmaceuticals, chemicals, paints, coatings, & electronics manufacturing. However, solvents can be expensive to purchase and dispose of, and their improper handling can lead to environmental and health concerns.

A solvent recovery unit works by distilling and separating the solvent from the contaminants, impurities, and residues it has picked up during the manufacturing process. Here's how a typical solvent recovery process might work:

Collection: The used solvent, which may contain dissolved materials, is collected from the manufacturing process. This solvent is often referred to as "dirty" solvent.

Distillation: The collected dirty solvent is heated in a distillation chamber. Solvents have lower boiling points than many of the contaminants they may have picked up during use. As the solvent vaporizes, it rises and is collected in a separate chamber.

Separation: The vaporized solvent is condensed back into a liquid state by cooling it down. Since the contaminants have higher boiling points, they are left behind in the distillation chamber. This separation process helps to purify the solvent.

Recovery: The purified solvent is then collected and can be reused in the manufacturing process. The recovered solvent is often referred to as "clean" solvent.

Benefits of Using a Solvent Recovery Unit Include:

Cost Savings: Recycling and reusing solvents can significantly reduce the need to purchase new solvents, leading to cost savings.

Environmental Impact: Proper solvent recovery helps reduce the amount of hazardous waste generated and decreases the overall environmental impact of the manufacturing process.

Regulatory Compliance: Many industries have regulations and guidelines for the proper handling and disposal of solvents. Using a solvent recovery unit can help companies stay compliant with these regulations.

Resource Efficiency: By reusing solvents, companies can conserve natural resources used in solvent production.

Improved Sustainability: Solvent recovery is part of a more sustainable approach to manufacturing, which is becoming increasingly important for companies looking to improve their environmental footprint.

Plant Process Hierarchy

Dirty Solvent > Distillation Chamber > Condensation Chamber > Clean Solvent

It's important to note that different industries and processes may require specific solvent recovery units tailored to their needs. The design and capacity of these units can vary based on factors such as the type of solvents used, the volume of solvent waste generated, and the level of purification required

MULTI - EFFECT EVAPORATOR

A multi-effect evaporator is a type of industrial equipment used for concentrating solutions by evaporating the solvent (usually water) from a liquid mixture. It utilizes the principle of heat transfer to efficiently remove water or other solvents from a liquid, resulting in a more concentrated solution or a solid product. Multi-effect evaporators are commonly used in various industries, including food and beverage, pharmaceuticals, chemicals, and wastewater treatment.

The term "multi-effect" refers to the fact that these evaporators consist of multiple evaporator vessels, or "effects," that are interconnected. The heat generated in one effect is used to drive the evaporation process in subsequent effects, increasing energy efficiency. This is achieved through the use of steam or another heat source that transfers heat from one effect to the next.

Operating Principle: Multi-effect evaporators operate on the principle of utilizing the latent heat of vaporization to remove solvent from a liquid mixture. As the liquid is heated, it reaches its boiling point, and the solvent vaporizes. The vapour is then condensed and collected, leaving behind a more concentrated solution or solid product.

Multiple Effects: A multi-effect evaporator consists of multiple stages (effects) arranged in a series. Each effect operates at a lower pressure than the previous one, allowing the liquid to boil at successively lower temperatures. The vapour produced in one effect serves as the heat source for the subsequent effect.

Energy Efficiency: One of the main advantages of a multi-effect evaporator is its energy efficiency. The heat from the vapour generated in one effect is used to drive the evaporation process in the next effect, reducing the need for external energy sources.

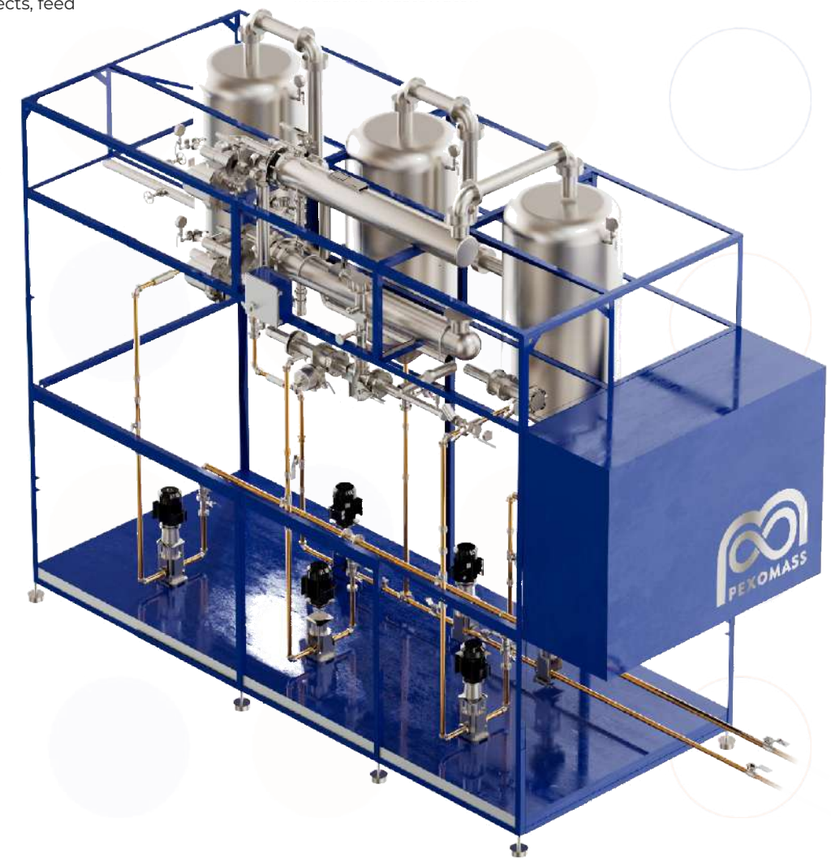
Types of Multi-Effect Evaporators:

- **Forward-Feed Multi-Effect Evaporator:** In this design, the feed is introduced into the first effect, and the concentrated solution flows from one effect to the next in sequence.
- **Backward-Feed Multi-Effect Evaporator:** The feed is introduced into the last effect, and the concentrated solution flows in reverse order through the effects. This arrangement is often used when scaling up or when dealing with heat-sensitive materials.
- **Design Considerations:** Multi-effect evaporator design involves considerations such as the number of effects, feed composition, operating pressures, temperature differences, and material compatibility. The design aims to achieve the desired concentration level while minimizing energy consumption.
- **Energy Sources:** Multi-effect evaporators typically use steam as a heat source. The steam is condensed in each effect, releasing latent heat that drives the evaporation process.
- **Evaporation Systems:** Multi-effect evaporators are often part of larger evaporation systems that may include other components like condensers, pumps, and separators.

Overall, multi-effect evaporators play a crucial role in concentrating solutions and recovering valuable materials from liquid mixtures while optimizing energy usage.

Applications:

- **Food and Beverage Industry:** Concentration of fruit juices, milk, and other liquid products.
- **Pharmaceutical Industry:** Concentration of pharmaceutical solutions, extracts, and formulations.
- **Chemical Industry:** Concentration of chemical solutions and recovery of solvents.
- **Wastewater Treatment:** Concentration and treatment of industrial wastewater.



EFFLUENT TREATMENT PLANT

Effluent Treatment Plant (ETP) is a facility designed to treat industrial wastewater, also known as effluent, before it's discharged into the environment or municipal sewage systems. The purpose of an ETP is to remove pollutants, contaminants, and harmful substances from the wastewater to ensure that it doesn't harm the environment or human health. The specific content and components of an ETP can vary based on the industry, the types of pollutants present in the wastewater, and local regulations. However, here are some common components and processes you might find in an ETP :

Primary Treatment:

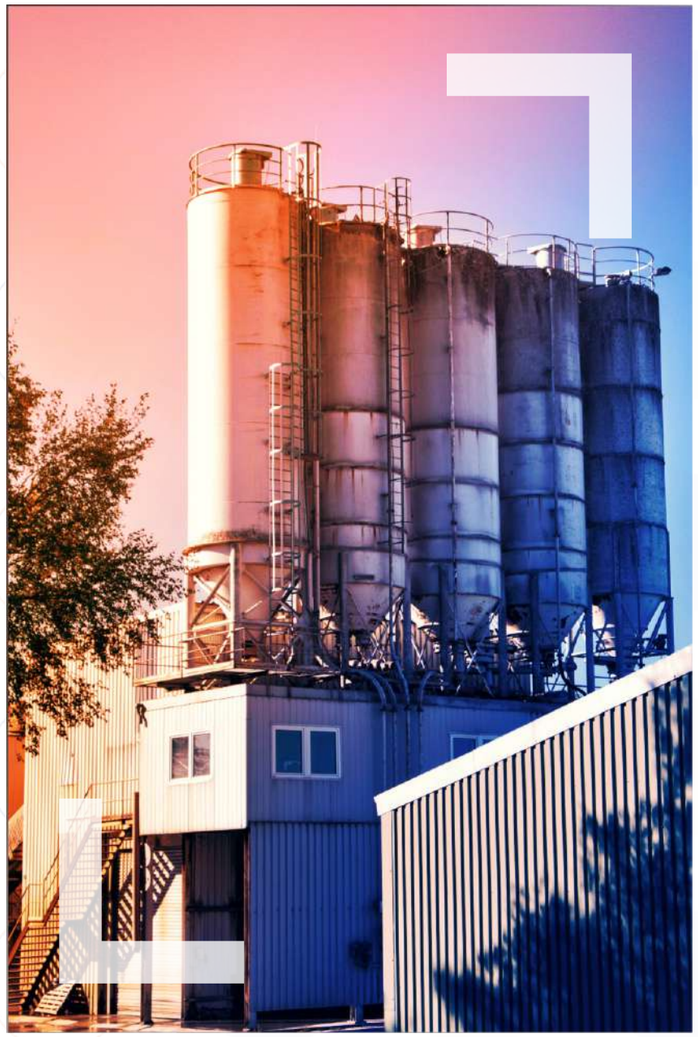
- **Screening:** Large debris & solid particles are removed using screens.
- **Grit Removal:** Small particles like sand and gravel are settled out to prevent damage to equipment.

Secondary Treatment:

- **Biological Treatment:** Microorganisms are used to break down organic pollutants in the wastewater. Common methods include activated sludge process, aerobic and anaerobic digestion, and trickling filters.

Tertiary Treatment:

- **Chemical Treatment:** Chemicals are added to the water to further remove fine suspended particles and remaining contaminants.
- **Filtration:** Water is passed through filters like sand, carbon, or membranes to remove remaining solids and pollutants.
- **Nutrient Removal:** Some ETPs might remove excess nutrients like nitrogen and phosphorus using chemical precipitation or biological processes.



Disinfection:

Chlorination: Chlorine or other disinfectants are added to kill harmful bacteria and pathogens. However, this step might not be necessary if the effluent is discharged to a municipal sewage system for further treatment.

Sludge Treatment and Disposal:

Sludge Dewatering: The solids that accumulate during the treatment processes are dewatered to reduce volume.

Sludge Disposal: Dewatered sludge can be incinerated, disposed of in landfills, or used for agricultural purposes if it's treated and safe.

Monitoring and Control:

Process Monitoring: Sensors and instruments are used to measure parameters like pH, turbidity, and flow rate to ensure the treatment processes are effective.

Automation: Many ETPs use automation and control systems to optimize treatment processes and respond to changing conditions.

Compliance and Reporting:

Effluent Quality Monitoring: Regular testing of the treated effluent to ensure it meets regulatory standards before discharge.

Reporting: ETP operators often need to submit reports to regulatory authorities regarding their effluent quality and compliance.

It's important to note that the design and operation of an ETP should be tailored to the specific characteristics of the wastewater and the regulatory requirements of the region. Many industries are required to have ETPs to mitigate the environmental impact of their operations and adhere to water quality standards.

SEWAGE TREATMENT PLANT

A Sewage Treatment Plant (STP) is a facility designed to treat domestic wastewater, also known as sewage or sanitary wastewater, before it's discharged into the environment or back into municipal water bodies. The primary goal of an STP is to remove contaminants and pollutants from the sewage to protect public health and the environment. Here's an overview of the components and processes commonly found in an STP :

Preliminary Treatment:

- **Screening:** Large solid objects like sticks, rags, and plastics are removed using screens.
- **Grit Removal:** Smaller heavy particles like sand and gravel are settled out to prevent damage to downstream equipment.

Primary Treatment :

- **Sedimentation:** Wastewater is allowed to sit in a tank, allowing heavier solids to settle at the bottom as sludge while lighter substances float to the top as scum.

Secondary Treatment:

- **Aeration and Biological Treatment:** Beneficial microorganisms (activated sludge) are introduced to break down organic matter in the wastewater. Aeration provides the necessary oxygen for microbial activity.
- **Aerobic vs. Anaerobic Treatment:** Some STPs use aerobic treatment, where oxygen is supplied to the microorganisms, while others use anaerobic treatment, which occurs in the absence of oxygen.

Tertiary Treatment:

- **Filtration:** Additional solids and fine particles are removed by passing the wastewater through sand, gravel, or other filtration media.
- **Disinfection:** Chemicals like chlorine or ultraviolet (UV) light are used to kill remaining pathogens and harmful microorganisms in the treated water. Additional solids and fine particles are removed by passing the wastewater through sand, gravel, or other filtration media.

Sludge Treatment and Disposal:

- **Sludge Thickening:** The sludge from primary and secondary treatment is often thickened to reduce its volume.
- **Sludge Digestion:** Biological processes (aerobic or anaerobic) break down organic matter in the sludge, reducing its volume and producing biogas.
- **Dewatering:** Further removal of water from the digested sludge to produce a more manageable material.
- **Sludge Disposal:** The dewatered sludge can be incinerated, landfilled, or used for agricultural purposes if treated and safe.

Effluent Quality Monitoring:

- **Regular Testing:** The quality of the treated effluent is monitored to ensure it meets regulatory standards before discharge.

Control and Automation:

- **Process Monitoring:** Instruments and sensors are used to measure parameters like pH, dissolved oxygen, and flow rate to optimize treatment processes.
- **Automation:** Many modern STPs use automation and control systems to manage the treatment processes efficiently.

VAPOUR RECOVERY UNIT

A vapour trap unit, also known as a vapour recovery unit or vapour control Unit, is a device used to capture and control the emissions of volatile organic compounds (VOCs) and hazardous air pollutants(HAPs) that are released into the atmosphere during various industrialprocesses. These emissions are often generated during the storage,transfer, and loading/unloading of volatile liquids such as gasoline,crude oil, chemicals, and other petroleum products.

The main purpose of a vapour trap unit is to prevent the release of harmful pollutants into the environment and to comply with environmental regulations and air quality standards. Here's how it generally works:

- **Capture:** Vapour trap units are installed at facilities like refineries, chemical plants, and distribution terminals. They are strategically placed at points where volatile liquids are transferred or handled.
- **Recovery:** The unit captures the vapours and gases emitted during processes like loading and unloading of tank trucks, railcars, and storage tanks. These vapours are often a mixture of hydrocarbons and other volatile compounds.
- **Processing:** The captured vapours are then routed through the vapour trap unit, which processes and separates the VOCs from the gases. This is often done through processes like condensation, adsorption, or absorption.
- **Storage or Destruction:** Depending on the specific design of the unit, the recovered VOCs can be either stored for later use or disposed of through controlled combustion or other environmentally friendly methods.
- **Emission Reduction:** By capturing and processing these vapours, vapour trap units significantly reduce the emissions of VOCs and HAPs, helping industries to minimize their environmental impact and adhere to air quality regulations.

Vapour trap units are designed to be efficient, reliable, and safe. They play a crucial role in improving air quality and reducing the negative environmental and health effects associated with the release of volatile organic compounds into the atmosphere. The technical specifications of a vapour trap unit can vary depending on the specific application, industry, and regulations it needs to comply with. However, here are some common technical specifications and features that you might find in a typical vapour trap unit:

SCRUBBER SYSTEM

There are numerous industrial processes in which pollutant gases are produced that must be treated before being emitted into the atmosphere. An effective technique consists of subjecting the gases to a gas-liquid absorption process. The gases to be treated enter through the bottom of one or more absorption or scrubber towers, partially filled with a liquid (e.g. water, acid solution, alkaline solution, sodium hypochlorite or potassium permanganate) or a combination of liquids, which absorb the pollutants present in the gas.

The gas leaves the scrubber without the pollutants being present and may be emitted into the atmosphere. Pollutants that are satisfactorily eliminated through a gas-liquid absorption process are SO2 and the NOX of the combustion gases, the hydrogen sulphide from wastewater treatment plant, COV, carbon monoxide, etc.

For the decontamination of the gas to be exhaustive, the system must be designed such as to maximize the transfer of material from the gas phase to the liquid phase:

- The contaminant and the liquid must be compatible; i.e. the solubility of the former in the second must be sufficiently high.
- The contact surface must be large enough for there to be no limitation of transfer of the contaminant to the absorbent liquid.
- The contact of the contaminants present in the gaseous flow with the liquid depends on the type of absorption tower.

As it passes through the scrubbing tower, polluted air is washed at low speed inside a large contact surface. It is very important to use the correct type of absorbent during this process to ensure greater gas / liquid contact. Once purified, the air goes to the next stage or is released directly into the atmosphere.

- The air passes through a compact column in a large contact surface.
- The wash solution is continuously sprayed with the centrifugal pump through the nozzles and automatically replaced as required by ARRS.
- Automatic water filling system (AWRS) ensures that the working level of the liquid is maintained.
- The base of the column is a wash solution tank.

Types of Filling Columns :

- Packed or Filled Tower
- Perforated Plate Tower
- Spray towers

Main Characteristics :

- Wash Water Ramp
- Control Panel
- Bottom drain and automatic exhaust valve
- Three-point level control for purge control: reintegration
- Manhole for inspection and maintenance operations
- Recharge of chemical reagent systems and make-up water (ARRS and AWRS)
- Lower tank to contain the wash water with service accessories
- Centrifugal Water Circulation Pump, vertical or horizontal axis, made of stainless steel or polypropylene

PRESSURE VESSELS

A pressure vessel is a container designed to hold gases or liquids at a pressure substantially different from the ambient pressure. These vessels are used in a wide range of industrial applications where the contained fluids need to be kept at specific pressures to facilitate processes such as storage, reactions, or transportation. Pressure vessels are constructed to ensure safety, reliability, and structural integrity under the conditions of pressure and temperature they will be subjected to.

Pressure vessels are found in various industries, including:

- **Chemical Industry:** Used for chemical reactions, mixing, and storage of volatile or corrosive substances.
- **Oil and Gas Industry:** Employed for storing and transporting various petroleum products, gases, and chemicals.
- **Power Generation:** Steam boilers and nuclear reactor vessels are examples of pressure vessels used in power plants.
- **Pharmaceutical Industry:** Used for processes involving high-pressure reactions and sterilization.
- **Food and Beverage Industry:** Pressure vessels are used for various processes, such as pasteurization and brewing.
- **Aerospace Industry:** Spacecraft and aircraft often incorporate pressure vessels for maintaining cabin pressure and storing fuels.

Pressure vessels are designed and manufactured in accordance with industry-specific codes and standards. Common codes include ASME Boiler and Pressure Vessel Code, PED (Pressure Equipment Directive), and others depending on the region and industry.

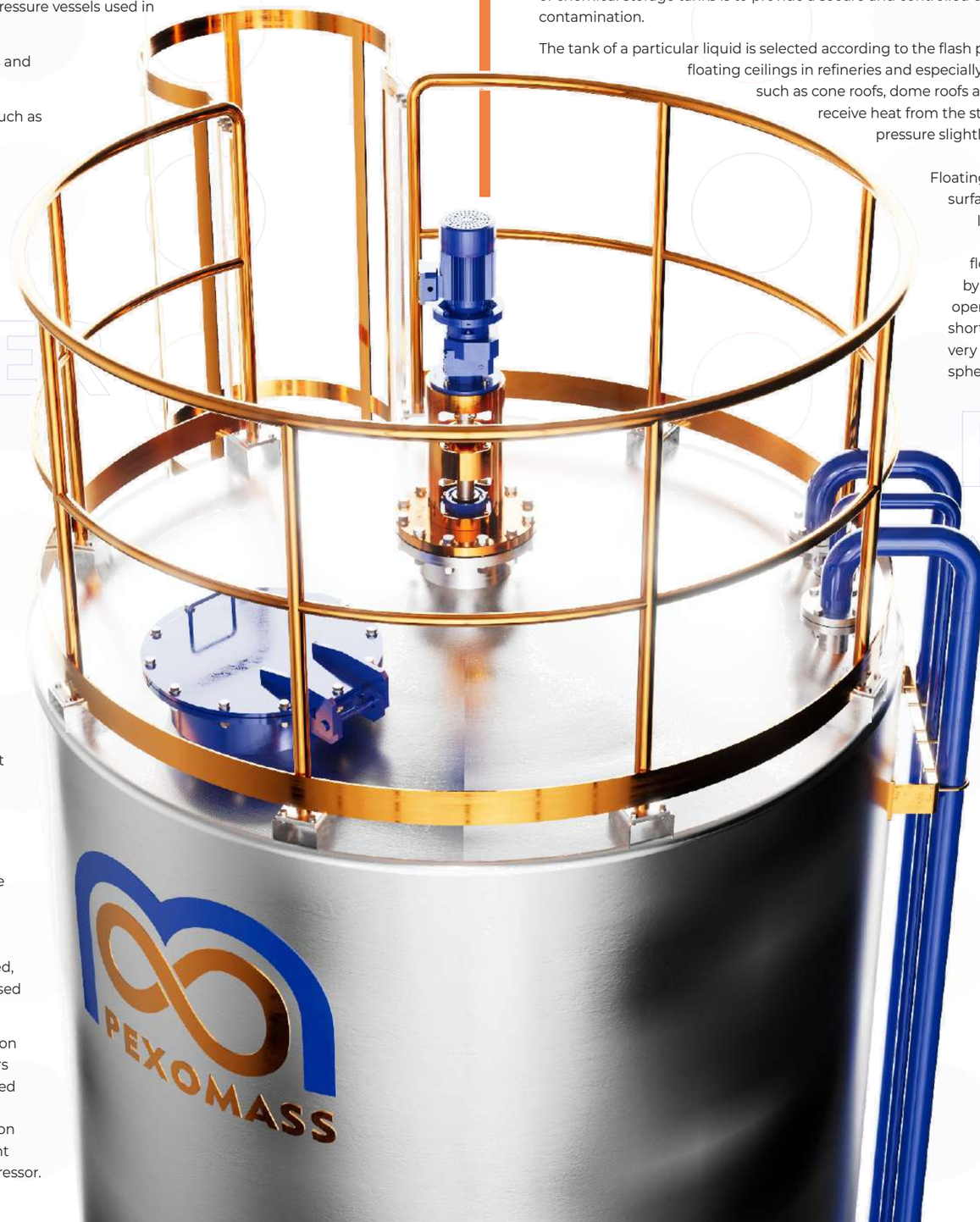
AIR RECEIVER TANKS

Air receivers, commonly referred to as vessels or tanks are used to store compressed air before it enters into the piping system and or equipment. In simpler terms, air receivers act as a buffer mechanism between the compressor and the fluctuating pressure caused by the changing demand.

Minimizing pressure fluctuations/drops: An air receiver can be used to minimize pressure fluctuations that could have an impact on the production process and the quality of your end product. Selecting the right air tank for your compressor requires you to be mindful of two values: your compressor's output pressure and what your application needs at the point of use. Note that the compressed air stored in your air receiver is only useful as long as its pressure is sufficient for the process which uses it. This is why it is important to consider the duration (in minutes) that the air receiver can supply air at the necessary pressure for your end-user / equipment

Meeting short term peak air demands: If the demand for compressed air changes drastically throughout the day, it is important to account for the spikes in the demand to ensure the system pressure does not drop below an acceptable level. An air receiver provides storage to meet short term peak air demands that the compressor cannot meet. Depending on the time of day, the shift pattern or even unusual demand, your air requirement may vary. It is important to fully understand the application and the amount of CFM or liters/second of air required, as well as the expected peaks of your system, as it dictates what flow of compressed air is needed to avoid shortages for any part of your process.

Energy considerations: Using an air receiver can help reduce energy consumption of your compressed air system by enabling load/unload (fixed speed) compressors to operate on a longer cycle and with tighter pressure bands. Having properly sized tank and more air than is required will reduce the potential of trim compressor starting up to meet increased flow demand, which can have substantial savings on your energy consumption. This will also prevent pressure fluctuation and frequent motor starts, while providing steady pressure and extending the life of the compressor.



STORAGE TANKS

A storage tank is a tank designed for storing liquid substances. Although it is mainly used in the petroleum industry (petrol tanks) , it can also be used in other industries, for example, it is used in the food industry (oil storage tanks) and the fertilizer industry. A storage container is a container that holds liquids, compressed gases or liquids used for short or long term hot or cold storage. The design and construction of storage tanks are carried out according to international standards. Stored products usually consist of petroleum derivatives or chemicals used in the industry. The most preferred standards for storage tank fabricators are API 650 and API 620 standards published by the American Petroleum Institute.

A chemical storage tank is a container designed to safely store and hold various chemicals, liquids, or gases. These tanks are used in a wide range of industries, including chemical manufacturing, petrochemicals, pharmaceuticals, water treatment, agriculture, and more. The primary purpose of chemical storage tanks is to provide a secure and controlled environment for storing chemicals while preventing leaks, spills, and environmental contamination.

The tank of a particular liquid is selected according to the flash point of that substance. Usually, there are tanks with fixed ceilings and tanks with floating ceilings in refineries and especially for liquid fuels. Fixed-roofed tanks have a very high flash point. There are shapes such as cone roofs, dome roofs and umbrella roofs. It is insulated to prevent the clogging of some materials that receive heat from the steam coils in the tank. Dome-roofed tanks are used for tanks with a storage pressure slightly higher than that of the atmosphere, for example, used in slop oils.

Floating roof tanks are generally external floating roof tanks and are divided into internal surface roofed types. Floating roof tanks are used for gasoline with low flash point liquids such as ethanol. These tanks are nothing more than cone-roofed tanks with a floating roof that moves up and down with the level of liquid in them. This floating roof traps steam from low-flashpoint fuels. Floating roofs are supported by legs or cables on which they sit. One of the best types found in mining areas are open-roofed type tanks, usually for storing ore slurries. These are the simplest and shortest-lasting storage tanks to produce. As for fuels, because their flash points are very low, LPG, hydrogen, hexane, nitrogen, oxygen, etc. tanks for storage are usually spherical.

PIPING & MANIFOLDS

Within industry, piping is a system of pipes used to convey fluids (liquids and gases) from one location to another. The engineering discipline of piping design studies the efficient transport of fluid.

Process piping and power piping are typically checked by pipe stress engineers to verify that the routing, nozzle loads, hangers, and supports are properly placed and selected such that allowable pipe stress is not exceeded under different loads such as sustained loads, operating loads, pressure testing loads, etc., as stipulated by the ASME B31, EN 13480, GOST 32388, RD 10-249 or any other applicable codes and standards. It is necessary to evaluate the mechanical behavior of the piping under regular loads (internal pressure and thermal stresses) as well under occasional and intermittent loading cases such as earthquake, high wind or special vibration, and water hammer. In cryogenic pipe supports, most steel become more brittle as the temperature decreases from normal operating conditions, so it is necessary to know the temperature distribution for cryogenic conditions. Steel structures will have areas of high stress that may be caused by sharp corners in the design, or inclusions in the material.

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TURNKEY PROJECTS

A “Turnkey Engineering Project” refers to a project in which a company or organization provides a complete and ready-to-use solution for a specific engineering task or project. This typically includes design, construction, procurement, installation, testing, and commissioning of the project. The client essentially receives a “turnkey” solution that is fully operational and doesn’t require further development or modification.

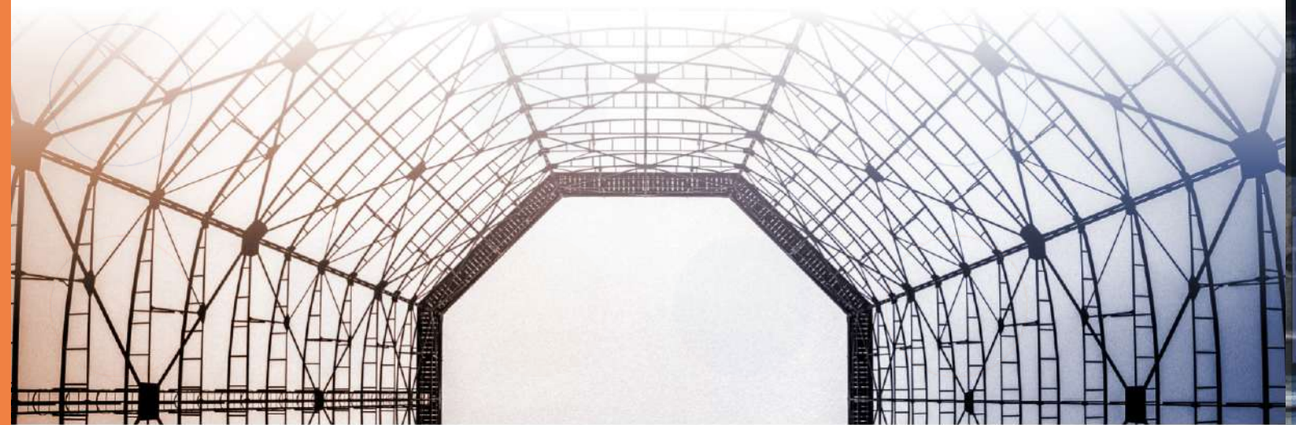
- **Project Assessment and Planning:** The first step involves understanding the client's needs, objectives, and specifications for the project. This may include feasibility studies, cost estimates, and project planning.
- **Design and Engineering:** The engineering firm or contractor develops detailed design plans and engineering specifications for the project, ensuring that it meets all technical and regulatory requirements.
- **Procurement:** The Company procures all the necessary materials, equipment, and components needed for the project. This can involve sourcing from suppliers, managing logistics, and ensuring timely delivery.
- **Construction and Installation:** The construction phase involves the actual building and installation of the project. This includes site preparation, construction work, and the installation of equipment and systems.
- **Testing and Quality Assurance:** Once construction is complete, the system is thoroughly tested to ensure it functions as designed. Quality control and assurance processes are implemented to meet project specifications and safety standards.
- **Commissioning:** The project is commissioned, meaning it is made fully operational. This includes fine-tuning, adjustments, and system integration to ensure everything works seamlessly.
- **Training:** The client's personnel are trained to operate and maintain the newly implemented system or project.
- **Handover:** The completed project is hand over to the client with all necessary documentation, including manuals, maintenance schedules, and warranties.
- **Post-Project Support:** Some turnkey solutions may also include ongoing maintenance and support services to ensure the long-term performance and reliability of the project.

Turnkey engineering projects are commonly used in various industries, including construction, manufacturing, energy, and infrastructure development. They offer clients a streamlined and hassle-free approach to implementing complex engineering solutions, as they don't need to manage multiple contractors or handle the various project phases themselves. Instead, they can rely on a single entity to deliver a fully functional solution

Equipment calibration is a crucial process in various industries to ensure that measuring instruments and equipment provide accurate and reliable measurements. Calibration is essential for quality control, compliance with industry standards, and maintaining the accuracy of data and results.

Calibration should be carried out by trained and qualified technicians who have the necessary expertise and access to calibrated reference standards. In summary, equipment calibration is a systematic and documented process that ensures measuring instruments and equipment perform accurately and reliably, providing trustworthy data and maintaining quality standards. Regular calibration is essential to prevent errors, meet compliance requirements, and ensure the integrity of measurement results.

The frequency of equipment calibration depends on several factors, including the instrument's criticality, how often it's used, environmental conditions, and industry regulations. Some instruments may require daily, monthly, or annual calibration, while others may need calibration only when they show signs of drift or wear.



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