



FDAN

EQUIPMENT & ENGINEERING SUPPLY GMBH





WHAT WE DO

FDAN Equipment & Engineering Supply was established with the aim of providing technical engineering services in Oil, gas and petrochemical industry. We continued later by providing engineering and equipment procurement consulting services in the field. In this regards we are focused on equipment and raw materials such as Piping Material (pipes, fittings, Flanges, Valves), Instruments (Control valves), Rotary Machines (Pumps and Compressors) and Process equipment. As a result of the planning and efforts of our team, this company has left a reasonable record in the fields of design, engineering and supervision of the implementation of various projects, and its continuous and successful activities always has a deep commitment and attention to meet the needs of Clients and made it as main activities a priority to fulfill its obligations to customers and projects owners by creating value in quality, time and cost of projects.



FDAN Equipment & Engineering Supply Company relies on good relation to its clients and the experiences that we made with its teams in providing equipment and engineering supply with, consulting and supervision in Oil and Gas, Petrochemical and Energy industries.

This Consulting Engineering with specialized and experienced team and its scientific and experimental support, by using the latest technology and engineering methods and international standards and emphasizing the principle of customer satisfaction, meet the needs of engineering and industrial consulting and in a sustainable interaction With clients and partner companies, it has provided new solutions to solve the problems of various industries and has been able to gain a significant share in international markets and has succeeded in providing a wider and higher quality services to customers.

Diversity and quality of engineering consulting services along with the experienced staff of this Consulting Engineering and cooperation with leading international and regional companies has made it possible to provide consulting services at any level and has created suitable opportunities to provide capabilities.

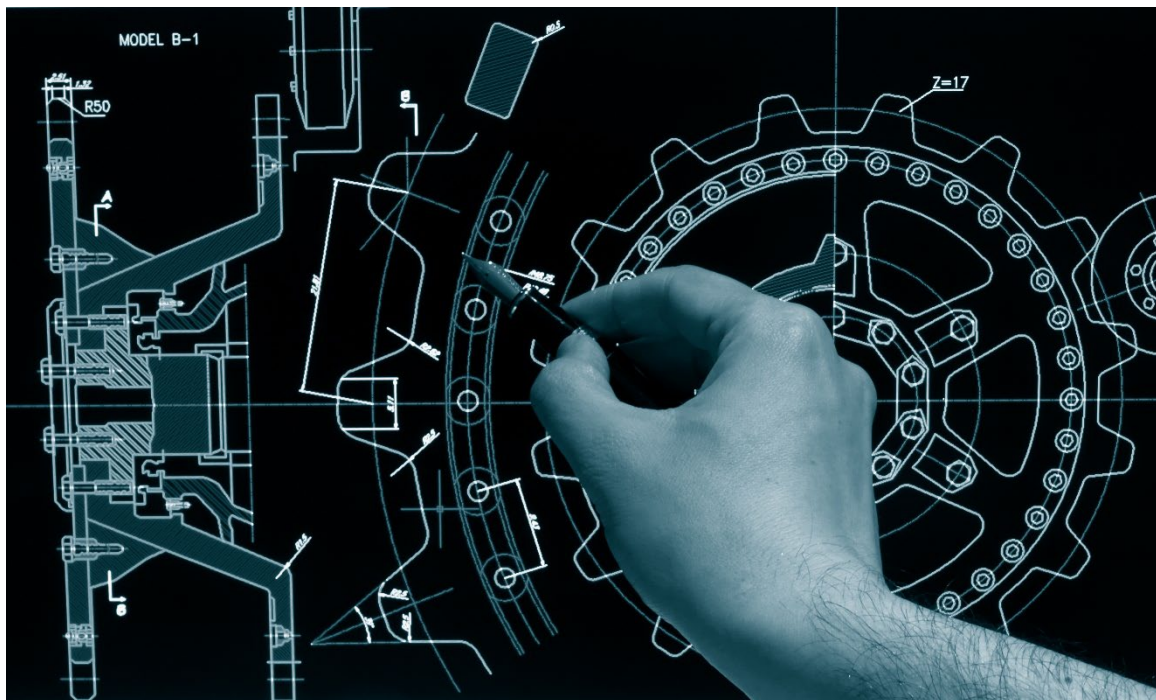
FDAN Equipment & Engineering Supply, with the aim of developing technical knowledge and transferring new technologies, has formed cross-sectional or long-term cooperation with reputable international companies and intends to establish a number of companies with the participation of local partner companies. In this regard, in order to focus on the target markets of the Far East, the company FDAN Global Limited was registered in Hong Kong, which subsequently gained significant experience and success in the East Asian market. In order to expand our business in China main land also we have started our operation by helping our chines new sister company "FDAN Shanghai Engineering Co. Ltd".



Services and Products

FDAN Equipment & Engineering Supply is able to provide a wide range of technical and engineering services by relying on the ability of professional team with years of experience in designing and providing engineering services for oil, gas, petrochemical projects. Also, the specialists of this department, with their continuous efforts in acquiring the latest knowledge and technology in this industry, are in charge of controlling and closely monitoring the technical specifications of the equipment being provided by the commercial department of this company.

- **Equipment and Material Supply**
- **Process Fixed Equipment,**
- **Process Packages**
- **Compounding & Extrusion – Application**
- **Pneumatic Conveyor System**
- **Engineering Services**





Equipment and Material Supply

FDAN Equipment & Engineering Supply was established to supply equipment and raw materials required for Oil, Gas and Petrochemical industries and projects. Relying on the capability of skilled Engineers and technical and commercial specialists, long term relation and experiences with well—known manufacturers, made able this company to achieve a suitable position in the field of equipment and material supply. In this regard, in order to optimize the process of activities, the company implemented and obtained the required standards in order to satisfy customers by providing timely and quality of standard goods.

The company's specialized divisions are focused on the supply of pipes and fittings, valves and control valves, pumps and compressors and fixed equipment. Our main target is to understand our Customers' needs and allocate and assign the reliable sources to them. For this purpose, the company has signed some Partnership/dealership agreement with reputable equipment manufacturers.

Flow Control and Regulation

- Manual (on/off) Valves
- Control Valve

Rotary Equipment:

- Process Pumps
- Compressors





Flow Control and Regulation

Manual Valves

Valves are a vital part of any piping system, which means that they play a key role control the flow in the oil, gas and petrochemical plant. We have been in contact with many valve manufacturers during the years of activities for many different types of applications, considering type of the valve, related manufacturing technology, materials and other specification. FDAN can supply you and your project valve a complete list of your inquiry with almost no technical deviation from manufacturer or available stock.



We are focused on valve industry in both direction of production and stockiest. We have the experience to provide a quotation by mixing of available stock and refer to production, considering your:

- Budgets
- Delivery time
- Technical requirements
- AVL (approved vendor list)

Manual Valves Types that we are supplying:

- Ball valve
- Gate valve
- Globe valve
- Butterfly valve
- Plug valve
- Needle valve
- Diaphragm or Membrane valve
- Knife valve
- Pinch valve
- Piston valve
- Solenoid valve
- Spool Valve



Control Valves

Considering that in general Control valves can be classified into two main types, based on the stem movement: Sliding and Rotary, and Apart from our experiences with manual valve, through dealing with control valves we have made established contacts with well-known actuators manufacturers. The majority of control valve manufacturers normally manufacturer the pneumatic actuators themselves and outsource the electrical actuator. We can supply your projects and inquires of different type of control valves by referring to the right manufacturers in order to meet your technical / commercial demands.



Control Valves Types that we are supplying:

- **Sliding Stem**
 - Globe valve
 - Angle body valve
 - Angle seat piston valve
- **Rotary**
 - Butterfly valve
 - Ball valve
- **Other**
 - Pinch valve
 - Diaphragm valve

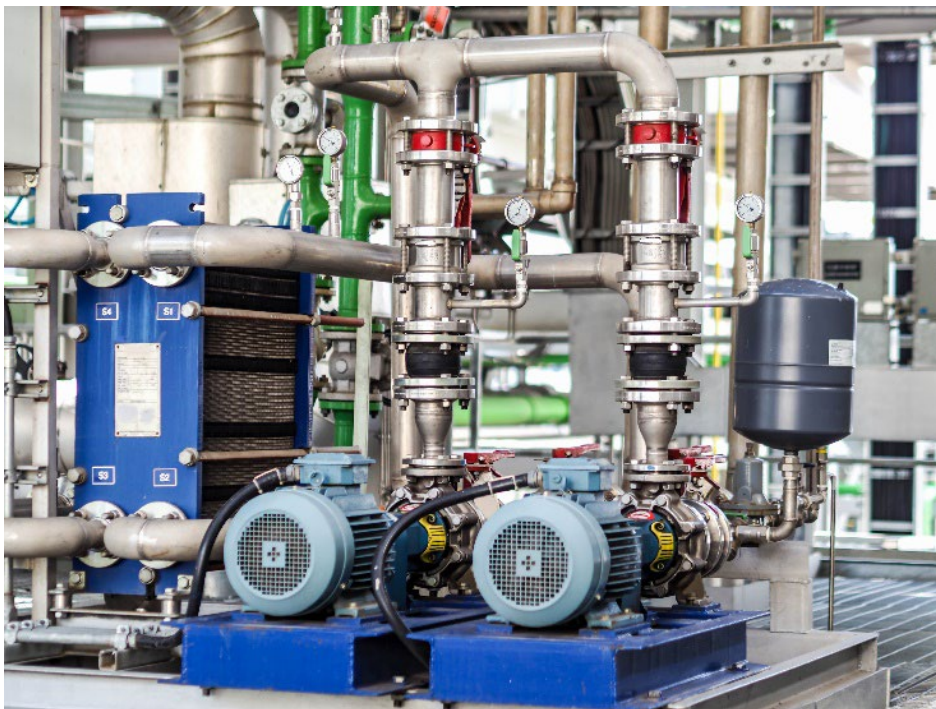


Rotary Equipment

Process Pumps

We are offering a broad range of process pumps by cooperating with limited well-known Pump manufacturers to meet and provide the Technical requirements or duties in different type of applications within the Oil & Gas, Petrochemical industry sector. Pumps are a source of energy consumers in production plant and we are focused on low consumption of energy and optimum operation in order to minimize the operation costs.

Positive-displacement, centrifugal and axial-flow pumps are covering the most demanding application in Oil & Gas, Petrochemical industry considering standards such as: ISO, API, Hydraulic Institute and ANSI/ASME. Additionally we offer fire protection pumps and systems designed and manufactured to meet the latest NFPA standards.



FDAN offers following different Types of Process Pumps:

- Centrifugal pumps.
- Reciprocating plunger pumps.
- Progressive Cavity pumps.
- Gear Pumps.
- Diaphragm pumps.
- Metering pumps



Rotary Equipment

Compressors in Oil and Gas Industry

We are supplying Compressors which are used for providing gas pressure required to transport gas with in pipelines and to provide required pressure in process or production. During years we have approached to some well-known compressor manufactures and provide their products in different projects. No need to remind that Compressors are one of the main investment in any plant. A non-functioning Compressor cause plant shut down or fall in production. We understand this importance and provide our clients the best durable solutions.



Compressor Types that we offer:

- Rotary Screw Compressor
- Reciprocating Air Compressor
- Axial Compressor
- Centrifugal Compressor
- Free Oil screw Compressor

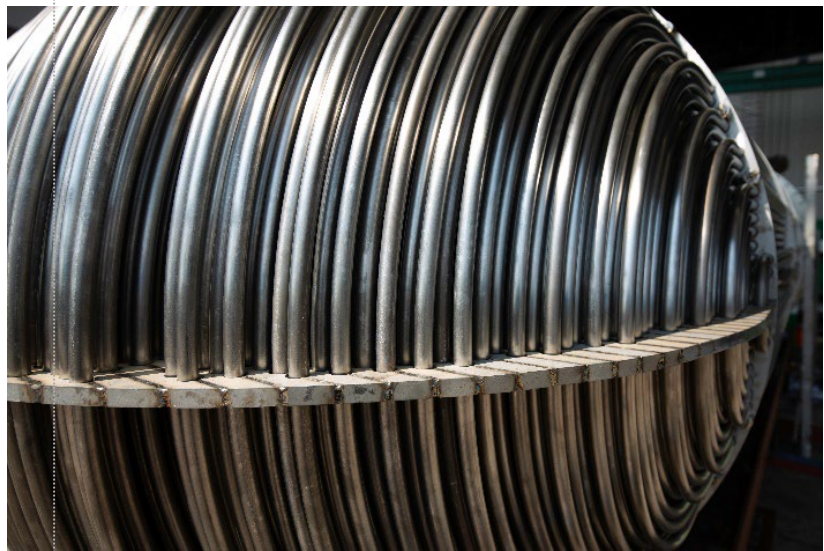


Process Fixed Equipment

FDAN Equipment & Engineering Supply, backed by its Expert Engineering Team is able to perform basic design and detailed design, final design and engineering, generating process and mechanical documents, and manufacture and commission the equipment. We understand your requirement and demand of the process and we are ready to offer our solutions to minimize energy consumption and maximum efficiency. Our target is to meet your technical requirements along with investment restrictions by offering the latest engineering practices.

Process Equipment

- Pressure Vessels (Drum)
- Heat Exchangers
- Storage Tanks
- Filtration Equipment
- Dry Gas Filters
- Filter Separators
- Gas Scrubber
- Multi Cyclone (Scrubbers)
- Filter Coalescers
- Process Columns
- 2/3 Phase Separator
- knockout drum
- Reactors
- Flare Stacks
- De-Oiler

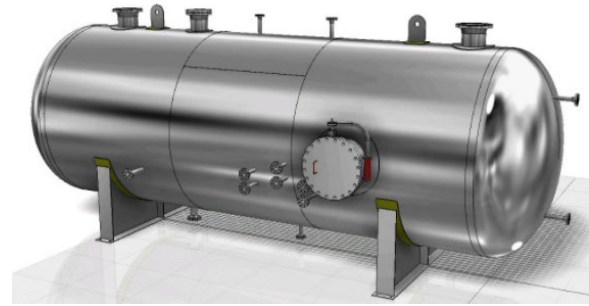




Process Fixed Equipment

Pressure Vessels

We design, engineer and manufacture pressure vessels according to EN 13445, ASME Boiler & Pressure Vessel Code (BPVC) Section VIII, BS 5500, AD Merkblätter in different applications. Quote, design and fabricate faster and smarter with the leading ASME pressure vessel software. COMPRESS saves Engineering hours, prevents mistakes, and helps shorten equipment delivery times. It combines comprehensive ASME® calculations with cost estimating, solid modeling, and automatic drawing generation.



We Quote, design and fabricate more efficient with the leading ASME pressure vessel software's like PV-Elite or COMPRESS, which save Engineering time, prevents mistakes, and helps more organize MTO' ordering, shorten equipment delivery times. It combines comprehensive ASME® calculations with cost estimating, solid modeling, and automatic drawing generation.



Heat Exchangers

FDAN offers design, engineering and manufacturing wide range of heat exchanger as follow:

- Shell and tube heat exchangers.
- Double pipe heat exchangers.
- Plate heat exchangers.

According to ASME TEMA.

Storage Tanks

We design, engineer and commission Oil storage tanks, some with capacities of more than 390,000 barrels (more than 16 million gallons), to store crude oil, intermediate stocks (partially refined), finished products, and chemicals.

- Fixed-roof tanks.
- External floating roof tanks.
- Internal floating roof tanks.
- Domed external floating roof tanks.
- Horizontal tanks.
- Pressure tanks.
- Variable vapor space tanks.
- LNG (Liquefied Natural Gas) tanks.





Process Fixed Equipment

Filtration Equipment

FDAN provides design, engineering and manufactures Filters which are used in just about every process equipment package within the oil, gas and petrochemical industry. Their function is to remove impurities in different process systems such as fuel gas, glycol dehydration units or glycol dehydrators, oil lubrication, and even the main inlet gas feed to a gas plant or compressor station.



Dry Gas Filters

We design, engineer and manufacture dry gas Filters which are mainly used to remove the remaining solid particles in gas pipelines (solid particles) especially in reducing pressure stations or compressor stations. The internals called “dry filter element” can be designed in different dimensions and aspects, considering the defined life cycle, and service interval, and can be replaced accordingly.

Filter Separators

FDAN designs and produces filter separators to separate solids and liquids from flow of (natural) gas. Specifically, to remove impurities such as pipe scale, water, iron sulfide, liquid hydrocarbons, compressor lube oil and sulfur products from the natural gas flow in pipeline.

- Flexible designs
- Custom sized vessels and internals
- Built to ASME code

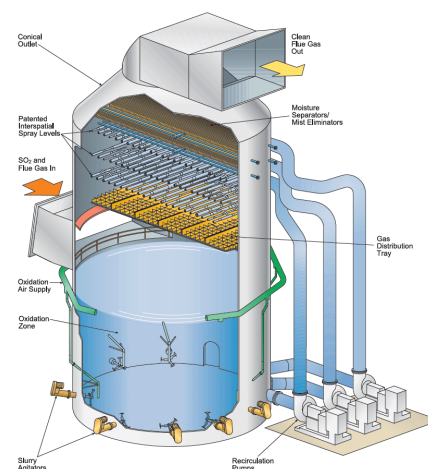




Process Fixed Equipment

Gas Scrubber

We design, engineer and manufacture Gas Scrubbers which work by spraying a liquid to flow of Gas in order to absorb the solid particles or unwanted chemical gaseous parts like NO_x, SO_x. In the next stage we can remove the sprayed liquid from the flow of Gas. There are some variations in design of scrubbers. For example, some scrubbers may use other chemicals such as lime or magnesium oxide to react with the SO₂ in the flow of gas.



Multi Stage Gas Filter (Multi Cyclone)

We provide a Multi Stage Gas Scrubber. We define normally 2 stage. In first stage we utilize a Multi-cyclone which based of centrifugal force removes solid particles and liquid droplets from a flow of gas. This equipment is stationary and this is the flow of gas that rotate during passing through the Cyclone tube. Higher efficiencies and lower pressure drop make Multi Cyclones a good candidates for removal of bigger particles and droplets. In the next stage, we remove the remaining solid particles and liquid droplets, which are smaller with dry gas filter or coalesce filter cartridges.

Filter Coalescer

We are offering Coalescing filter cartridges as a device used to produce larger droplets of liquid in flow of gas by agglomerating smaller ones. Then at the outer layer of these filters, we have the possibility to separate these larger droplets from the flow of Gas. This filters also has a possibility to trap the solid particles.

Interval of replacement, and numbers of filters are important operating cost functions.





Process Fixed Equipment

Process Columns

FDAN provides design and manufacture range of distillation column which is basically a tall vertical vessel in which crude oil or in general heavier products are heated and separated into its components. The first process in the refining of crude oil is fractional distillation which is carried out in a tall steel tower known as a distillation column.



2/3 Phase Separator

FDAN designs and manufactures in advanced application of physical separation 2-3 phase separator. A vessel that separates a multi-phase flow like the well fluids into liquid phase (oil and Water also get separated as well), gas and solids. A three-phase separator can be horizontal, vertical. This can be called free-water because it can separate gas, oil and free water and solid particles. We offer design, engineering and manufacturing different type of 2, 3 and even 4 phase separator.

knockout Drum

FDAN supply different knockout drums which are used to remove any oil or water from the relieved gases. Gas Flow travels upward at a designed velocity which minimizes the entrainment of any liquid droplets as it exits the top of the vessel.





Process Fixed Equipment

Petrochemical Reactors

We offer petrochemical reactors which are enclosed volume in which a petrochemical reaction takes place. In petrochemical engineering, it is generally understood to be a process vessel used to carry out a chemical reaction, which is one of the classic unit operations in petrochemical process analysis.



Flare Stacks

In oil and gas production units or petrochemical plants we offer different type of flare stacks which are primarily used for burning off flammable gas released by safety valves during unplanned over-pressuring of plant equipment. During plant or partial plant startups and shutdowns, they are also often used for the planned combustion of gases over relatively short periods.

De-Oiler

We are offering design, Engineering and Manufacturing different types of De-oiler in Oil, gas and petrochemical application.



Process Packages

During the past years' experiences, we have supervised design, engineering and erection of many process packages. We have been approach some process licensor and designers and we have executed some projects. Here are the list of packages that we have focused in the last years:

List of Process Packages

- NITROGEN Generation Package
PSA, Cryogenic
- Hydrogen Generation Package
- MOT (Mobile Oil Treatment)
- SRU (Sulfur Recovery Unit)
- Chemical Injection Packages
- Amine Treating Unit
- Sour water stripper
- Flare gas recovery
- Tail gas treatment unit
- Sulfur solidification unit



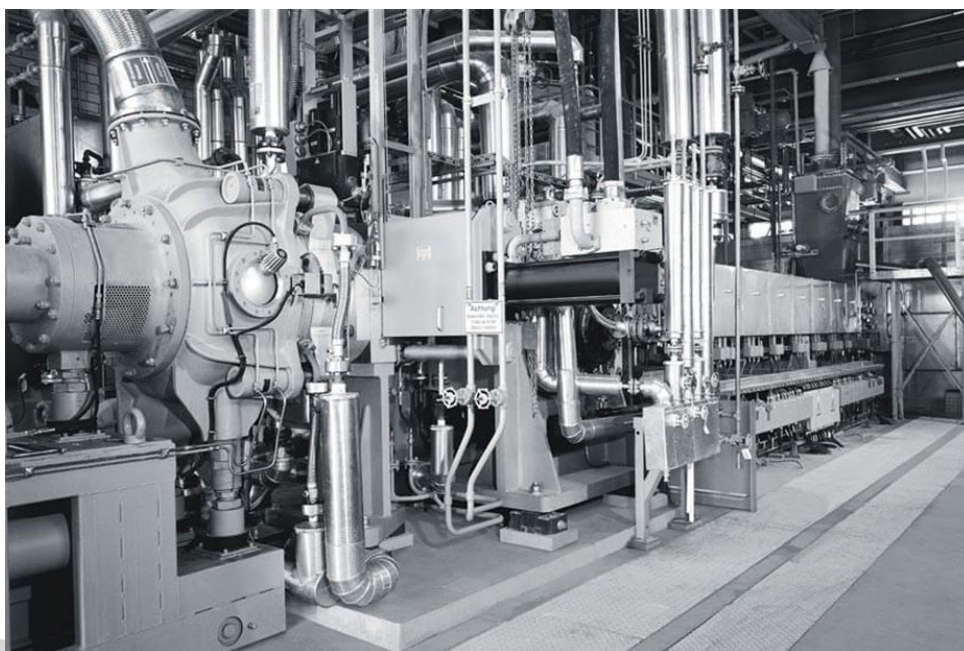


Compounding & Extrusion - Application

FDAN is in close contact with the industry leaders in compounding and extrusion, feeding and weighing and bulk material handling and FDAN is active in this market. We are reliable partner for global corporations and small and medium-sized projects in the petrochemical, plastics and chemical industries.

List of Equipment and Machines:

- EXTRUDER
- Pelletizing, Powder and Pneumatic Conveying System
- Bulk and powder process equipment
- Packing machine
- Automatic line with auto storage
- Unloader
- lost weight feeder and additives system
- HOMOGENIZATION SILOS





Compounding & Extrusion - Application

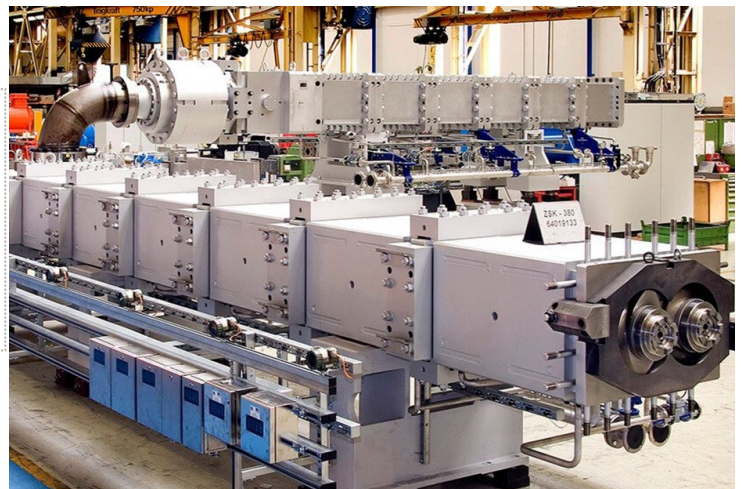
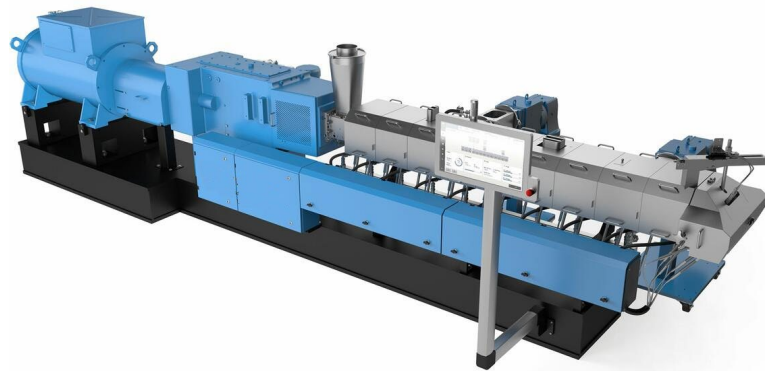
FDAN can provide Extrusion and Compounding is different application. The machines can be used for various applications in plastics production and recycling: for production (granulation) of plastics such as HDPE, LDPE, PP, ABS, PS and PVC, for the production of films, for recycling PET and also for upcycling various materials. In addition, new solutions for dosing , granulation and conveying can be offered, with which complete recycling systems can be implemented in combination.

List of Application:

- HDPE (High Density Poly Ethylene)
- MD/HDPE
- LDPE (Low density polyethylene)
- LLDPE (Linear Low Density Polyethylene)
- PP (polypropylene)
- Polystyrene
- Polyvinyl Chloride (PVC)
- Butadiene Rubbers (e.g. ABS, SBS, SBR)

Capacity of Design & Engineering:

- PP Throughput rates up to approx. 100 t/h
- LLDPE Throughput rates up to approx. 125 t/h
- HDPE Throughput rates up to approx. 135 t/h
- LDPE Throughput rates up to approx. 80 t/h





Pneumatic Conveyor System

FDAN's solution for pneumatic conveying system is designed to transfer dry bulk materials or powders through an enclosed conveying pipeline using pressure differential and gas flow (usually air), generated by an air movement device such as a fan, roots blower or compressor.

List of Application:

- HDPE (High Density Poly Ethylene)
- MD/HDPE
- LDPE (Low density polyethylene)
- LLDPE (Linear Low Density Polyethylene)
- PP (polypropylene)
- Polystyrene
- Polyvinyl Chloride (PVC)
- Butadiene Rubbers (e.g. ABS, SBS, SBR)



Design & Engineering:

- Lean Phase
 - Dilute Phase
 - Negative Pressure Lean Phase
 - Positive Pressure Lean
 - Medium Phase
- Dense Phase
 - Positive Pressure Lean Phase





Design and Engineering Services

FDAN Equipment & Engineering Supply, with support of its technical staff and strong engineering background, has the ability to perform consulting activities, basic design and detailed design, preparation of technical specifications for equipment. In general, the scope of activity of this company is related to the manufacture of equipment in the oil, gas, petrochemical and energy industries.

Engineering Services for:

- **Propane Dehydrogenation (PDH)**
In a propane dehydrogenation (PDH) process, propane is selectively dehydrogenated to propylene.
- **Polypropylene (PP)**
Polypropylene (PP) is a tough, rigid, and crystalline thermoplastic. It is made from propene (or propylene) monomer.
- **Acrylonitrile (ACN)**
Acrylonitrile is an organic compound with the formula CH_2CHCN and the structure $\text{H}_2\text{C}=\text{CH}-\text{C}\equiv\text{N}$
- **Acrylonitrile Butadiene Styrene (ABS)**
ABS plastic, is an opaque thermoplastic. It is an amorphous polymer comprised of three monomers, acrylonitrile, butadiene and styrene.

Scope of Work:

- Design Basis and PDP (Modification)
- Review of Detail Design for Pr
- Process Flow Diagrams and Heat & Material Balances
- Piping and Instrumentation Diagrams
- Process Equipment Data Sheet
- Instrument List
- Control Philosophy
- Effluent Stream List
- Quality Assurance and Laboratory Information
- Utilities Consumption

Basic Engineering Design

FDAN provides Basic Engineering Package services for each client. This package typically includes the following deliverables:

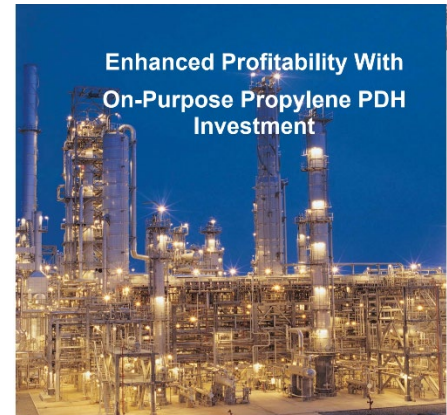
- Design Basis: Site-specific meteorological and ambient conditions as well as required characteristics of utility supply systems are summarized
- Process Description
- Process Flow Diagrams and Heat & Material Balances
- Piping and Instrumentation Diagrams
- Process Equipment Data Sheet
- Instrument List
- Control Philosophy
- Effluent Stream List
- Quality Assurance and Laboratory Information
- Utilities Consumption





Propane Dehydrogenation (PDH)

Propane Dehydrogenation (PDH)
Capacity: 160 - 600 KTA
Technology: Oleflex



Enhanced Profitability With
On-Purpose Propylene PDH
Investment

BENEFITS AND ADVANTAGES OF UOP OLEFLEX TECHNOLOGY.

Since its commercialization in 1990, numerous technology advancements to the Oleflex Process Unit have resulted in lower production costs, increased on-stream time, and larger economies of scale. The Oleflex Process offers an economically attractive and reliable source of propylene and optionally, hydrogen, with additional benefits and advantages discussed below:

Most Effective Use of Capital

Lowest Operating Cost

Minimal Coke Formation

Catalyst Performance

Most Reliable Technology

Environmentally Sound Catalyst System

Lowest Environmental Footprint and Ease of Permitting

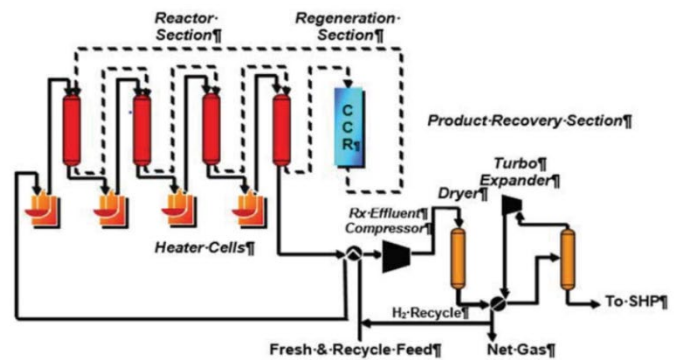
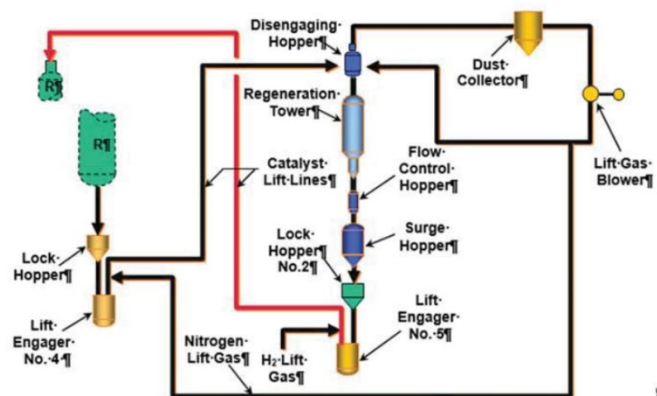


Figure 3-2.Oleflex-Regeneration Section Process Flow





Propane Dehydrogenation (PDH)

Proposed Oleflex Process

Figure 1-1 shows the proposed flowscheme for the Oleflex Unit with the once-through configuration **bolded** to highlight the main conversion pathway from propane to propylene. For a detailed process description see Section 3.

Figure E-1. Oleflex Process Flows

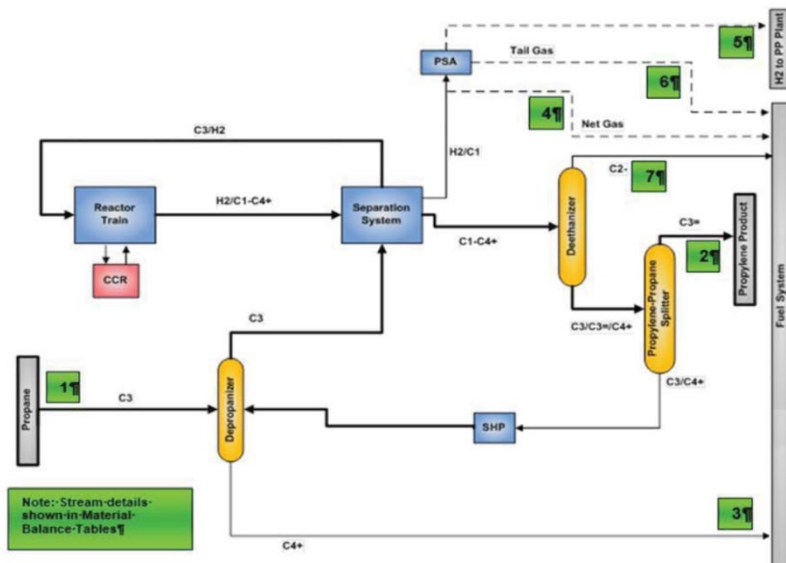
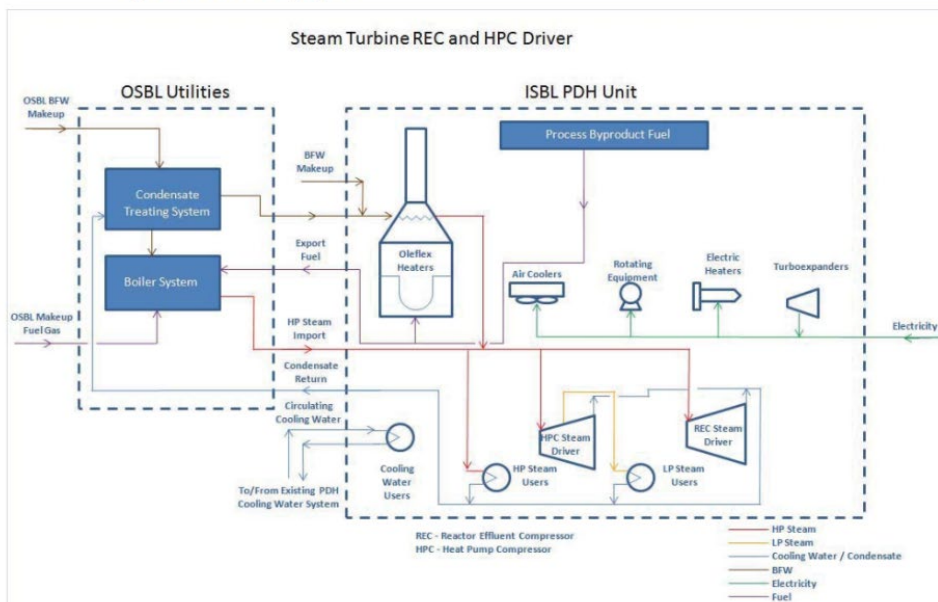


Figure F-1. Oleflex Utility System





Polypropylene (PP)

Process Description Polypropylene Plant

The proposed bulk process uses a loop reactor design is shown in Figure 1.1 and Figure 1.2. The plant consists of a catalyst feed system, a reactor system followed by monomer flash, recycle and stripping, and extrusion and compounding.

The process can operate with a single loop reactor to produce the full range of products, but plants with medium/large capacities are generally designed with two loop reactors in series. This gives the capability of producing bimodal resins to increase mechanical properties (e.g., for BOPP). Therefore, this design includes two loop reactors in series followed by the impact copolymer reactor (gas phase).

Monomer feed treatment normally includes guards to remove catalyst poisons (e.g. oxygen and sulfur containing compounds, etc.). Chemical grade propylene can be used directly in polymerization without preliminary propane removal. Propylene can be recovered directly from a liquid fraction of unreacted propylene/propane mixture purged from the plant to upstream facilities (such as the splitting unit).

In the process, fresh propylene is combined with recycle propylene from the flash step and fed to each reactor. A small pre-reactor (loop) is employed to initiate the polymerization (not shown). The catalyst

Hydrogen is also fed to the reactors to control molecular weight. The homopolymer reaction area consists of two loop reactors in series, each consisting of legs (4 to 6) depending on the capacity. The reactors are constructed of calmed (low temperature) carbon steel and operate at 75 to 80°C (167 to 176°F) and 40 to 45 barg (580 to 650 psig). This is a higher and wider operating window than in the past, allowing for better catalyst performance, giving, for example, polymers with higher crystallinity combined with high isotacticity. Catalyst activities are typically 40 thousand to 50 thousand tons of polymer produced per ton of catalyst. Activities of up to 100 thousand tons per ton have been achieved for some experimental grades/catalysts trials at semi-commercial scale.



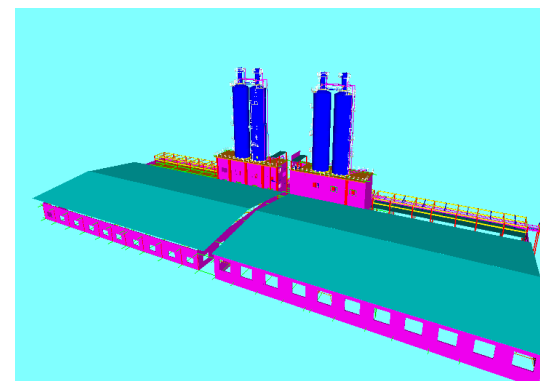
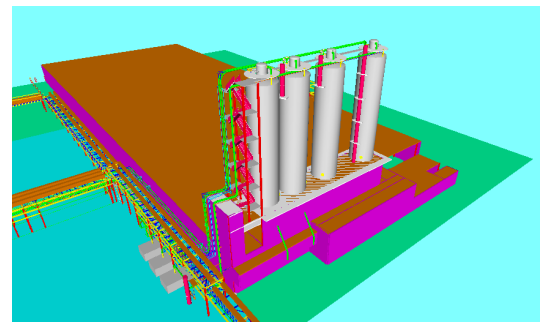


Polypropylene (PP)

In each reactor, a pump circulates the reaction slurry mixture, containing 55 percent solids, at high velocity to avoid solids settlement and improve heat transfer. Cooling water is circulated through the jacket for heat removal. The total reactor residence time is 1.4 hours for impact copolymer production. For homopolymer production, the residence time is about one hour. Product transition time may vary from one to two hours (maximum) for homopolymer transitions, to a maximum of six hours for the worst-case transition between homopolymer and butene-1 copolymer families.

Part of the circulating mixture is withdrawn from the reactor and flashed through a heated, jacketed pipe into a high-pressure degasser, which is operated at about 18 barg (260 psig), where the powder separates from the monomer. The monomer vapor leaving the flash tank is condensed against cooling water and is pumped back to the reactor.

The polymer powder from the degasser, still containing some monomer, flows to a low-pressure flash filter or to a copolymer reactor if high impact copolymer is being produced. The low-pressure filter operates at 0.7 barg (10 psig). The recovered vapors are compressed to 18 barg (260 psig) and are combined with the high-pressure monomer vapor for condensation and recycle to the reactor. For the production of impact copolymer.



In high impact copolymer production, the powder from the high-pressure degasser (with active polymerization catalyst) enters a gas phase reactor where ethylene and additional propylene are added. Cooling is provided by means of a gas recirculation loop. This reactor is operated at 10 to 14 barg (140 to 200 psig) and at 70 to 80°C (158 to 176°F) and is constructed of carbon steel. The proposed plant operates two fluid-bed, gas phase copolymer reactors in series for the production of low blush copolymer (not shown). Levels of up to 35 to 36 weight percent of rubber phase in the polymer are commercially achieved by using a single-stage copolymer reactor system, even if a two-gas phase reactor configuration can provide a better production rate for specialty impact copolymer products.

The polymer from the low-pressure filter (with a monomer content of 1,000 to 2,000 ppm) is sent to a monomer stripping system for the removal of residual monomer. Here, steam strips all hydrocarbons, which are recovered, dried, and recycled back to the low-pressure degassing step or made available to the battery limits for credit for propane purge when using polymer grade propylene. Wet polymer

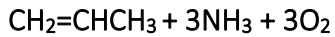
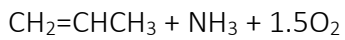


Acrylonitrile (ACN)

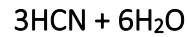
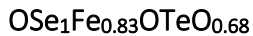
Acrylonitrile is a chemical compound with the formula C_3H_3N . This pungent-smelling colorless liquid often appears yellow due to impurities. It is an important monomer for the manufacture of useful plastics.



Amoxidation Reaction :



silica supported oxides of selenium, iron, tellurium



Conversion of 1st reaction is 90%

Conversion of 2nd reaction is 2 %

Convert mole fraction to mass fraction

Mole fraction(x) = mole of i / total mole

Mass fraction (w) = mass of i / total mass

$$X * M_w = \text{mass of } i / \text{total mole} \quad \text{---(1)}$$

$$\sum X * M_w = \text{total mass} / \text{total mole} \quad \text{---(2)}$$

$$(1) / (2) = \text{mass fraction}$$





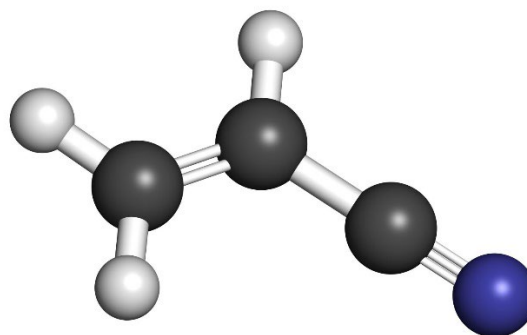
Acrylonitrile Butadiene Styrene (ABS)

Acrylonitrile Butadiene Styrene (ABS) and Other Specialist Styrenics

Acrylonitrile Butadiene Styrene (ABS) is an ideal material wherever superlative surface quality, colorfastness and luster are required. ABS is a two phase polymer blend. A continuous phase of styrene-acrylonitrile copolymer (SAN) gives the materials rigidity, hardness and heat resistance. The toughness of ABS is the result of sub microscopically fine polybutadiene rubber particles uniformly distributed in the SAN matrix.

History

Styrene Acrylonitrile copolymers have been available since the 1940's and while its increased toughness over styrene made it suitable for many applications, its limitations led to the introduction of a rubber (butadiene) as a third monomer and hence was born the range of materials popularly referred to as ABS plastics. These became available in the 1950's and the variability of these copolymers and ease of processing has led to ABS becoming the most popular of the engineering polymers.

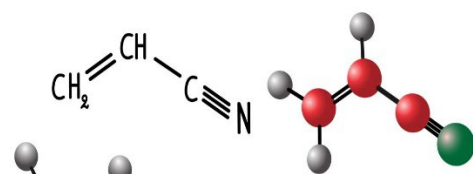


ABS is an ideal material wherever superlative surface quality, colorfastness and luster are required. ABS is an extremely cost-effective material for components with stringent service requirements, or where there is weight-saving potential.

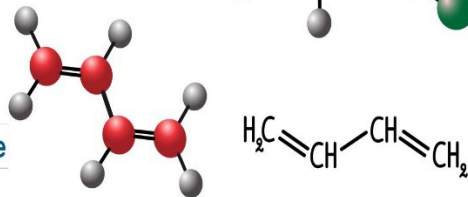
ABS standard grades have been developed specifically to meet the requirements of major customers. ABS is readily modified both by the addition of additives and by variation of the ratio of the three monomers Acrylonitrile, Butadiene and Styrene: hence grades available include high and medium impact, high heat resistance, and electroplatable. Fibre reinforcement can be incorporated to increase stiffness and dimensional stability. ABS is readily blended or alloyed with other polymers further increasing the range of properties available. Fire retardancy may be obtained either by the inclusion of fire retardant additives or by blending with PVC. The natural material is an opaque ivory color and is readily colored with pigments or dyes. Transparent grades are also available.

A variety of grades are available for different applications, the material is typically injection molded or extruded.

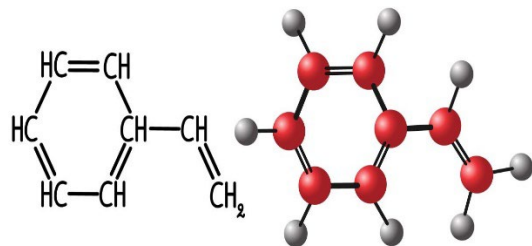
A Acrylonitrile



B 1,3 - Butadiene



S Styrene





Acrylonitrile Butadiene Styrene (ABS)

Physical Properties

Tensile Strength	40-50	Mpa
Notched Impact Strength	10 - 20	Kj/m ²
Thermal Coefficient of expansion	70 - 90	x 10 ⁻⁶
Max Cont. Use Temp	80 - 95	°C
Density	1.0 - 1.05	g/cm ³

4 Chemical Resistance

Dilute Acid	Very Good
Dilute Alkalis	Very Good
Oils and Greases	Very Good
Aliphatic Hydrocarbons	Moderate
Aromatic Hydrocarbons	Poor
Halogenated Hydrocarbons	Poor
Alcohols	Poor (variable)

Applications

Because of its good balance of properties, toughness/strength/temperature resistance coupled with its ease of molding and high quality surface finish, ABS has a very wide range of applications. These include domestic appliances, telephone handsets computer and other office equipment housings, lawn mower covers, safety helmets, luggage shells, pipes and fittings. Because of the ability to tailor grades to the property requirements of the application and the availability of electroplatable grades ABS is often found as automotive interior and exterior trim components

Typical Usage

Automotive

Automotive construction places particularly high requirements on the materials used. Under extreme stresses they have to be dimensionally stable and must not warp, even when faced with great temperature variations.

Electrical and Electronic (E&E)

Electrical and electronics industries increasingly require surfaces which are not only highly scratch- and wear-resistant but also decorative and easy to maintain. ABS's excellent antistatic performance is a particular advantage here.

Office Equipment

Attractive products with elegant design and high quality create a feeling of well-being at home and in the office. ABS can create exciting and varied color schemes. Grades can also be electroplated, emboss-stamped or metallized.

Depending on the molding equipment used. Surfaces can be matt, glossy or satin



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