

DATASHEET

HYDROTREATING AND HYDROCRACKING PILOT PLANT



(* Picture Shown for representation purpose only, Actual product may vary in size appearance, etc.)

2023
RESEARCH & DEVELOPEMENT

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HYDROTREATING AND HYDROCRACKING PILOT PLANT

HYDROTREATING (HT)

This technology removes undesirable materials from petroleum feedstocks by selectively reacting these streams with hydrogen in a catalyst bed at elevated temperatures and pressures

HYDRODEMETALLIZATION (HDM):

This process removes metals out of petroleum crudes. Generally, nickel and vanadium are present in crudes that may also contain silicon, lead and arsenic. These metals are poisonous for downstream operations and must be removed by hydrocleaving. The cleaved metals are deposited on the sacrificial catalysts that must be periodically replaced.

HYDRODENITRIFICATION (HDN):

This process catalytically removes nitrogen out of the petroleum crude. There are two broad categories of nitrogen compounds -- basic nitrogen associated with six-member rings and neutral nitrogen associated with five-member rings. The inherent complexity of nitrogen compounds makes denitrification a difficult proposition. The NH_3 that is generated must be subsequently removed.

HYDRODESULFURIZATION (HDS):

This process catalytically removes sulfur out of the petroleum crude. There are two broad categories of sulfur compounds -- basic sulfur associated with six-member rings and neutral sulfur associated with five-member rings. The inherent complexity of sulfur compounds makes desulfurization a difficult proposition. The H_2S that is generated must be subsequently removed.



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HYDROCRACKING (HC)

This process removes metals out of petroleum crudes. Generally, nickel and vanadium are present in crudes that may also contain silicon, lead and arsenic. These metals are poisonous for downstream operations and must be removed by hydrocleaving. The cleaved metals are deposited on the sacrificial catalysts that must be periodically replaced.

Hydrocracking can increase the yield of gasoline components and also creates a 25% gain in volume.

Hydrocracking is the most severe form of hydrotreating. In this process, the feedstock oil flows over a high activity catalyst at temperatures $>650^{\circ}\text{F}$ and pressures $>1,000$ psig. Hydrocracking can increase the yield of gasoline components and also creates a 25% gain in volume. The cracking/hydrogenation combination results in products whose average gravity is lower than the feed. Hydrocracking produces high quality gasoline (jet fuel and diesel fuel) from heavy gas oils. Hydrocracking is simple. It is cat cracking in the presence of hydrogen. The hydrogen and the catalyst are complementary in several ways. First, the catalyst causes cracking which needs heat to keep it going. This step is an endothermic process. On the other hand, as the cracking proceeds, the hydrogen saturates (fills out) the molecules – an exothermic process that gives off the heat to keep the process going.



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HYDROTREATING AND HYDROCRACKING PILOT PLANT

Modern petroleum refining operations have to meet tight specifications in terms of sulfur and nitrogen levels, olefin and aromatic content and heavy metals such as vanadium and arsenic. Over the last half century, a variety of hydroprocessing technologies have been developed to enable refiners to meet the continuous tightening specifications imposed upon the industry. All hydroprocessing technologies consume hydrogen and typically convert heavy oil fractions into lighter and more valuable products.

Hydrotreating: HT

Hydrotreating: HT Hydrogenation
Hydrodemetallization: HDM
Hydrodenitrification: HDN
Hydrodesulfurization: HDS



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APPLICATIONS



- Production of cleaner fuels: Hydrotreating is used to produce gasoline, diesel fuel, and jet fuel that meet strict environmental regulations. For example, hydrotreating is used to remove sulfur from diesel fuel, which reduces air pollution.
- Upgrading heavy crudes: Hydrotreating and hydrocracking can be used to upgrade heavy crudes into lighter, more valuable products. This is done by breaking down the heavy molecules into lighter, more valuable molecules.

Production of petrochemicals: Hydrotreating and hydrocracking can be used to produce petrochemicals, which are the building blocks of many plastics, synthetic fibers, and other products.

Hydrotreating and hydrocracking are essential processes in the petroleum refining industry. They help to produce cleaner fuels, upgrade heavy crudes, and produce petrochemicals.

BENEFITS

- Production of cleaner fuels: Hydrotreating is used to produce gasoline, diesel fuel, and jet fuel that meet strict environmental regulations. For example, hydrotreating is used to remove sulfur from diesel fuel, which reduces air pollution.
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SPECIFICATIONS OF THE PILOT PLANT

Reactors	2 Nos Provided for Each
Liquid Feed Injectors	Provided 2 Nos.
Gas feed Injectors	Provided 3 Nos.
High Pressure Separation Section	Provided
Stripping Column Section	Provided
Product Storage Section	Provided
Liquid Knockout Vessel	Provided 2 Nos.
Gas Scrubber and Wet Test Meter	Provided (Location: Product Tank)
Skid MOC	SS 316
Oil Feed Pump	Provided 4 Nos.
Fixed Bed Reactors	Provided 4 Nos.
Feed Tank	4 Nos.



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SPECIFICATIONS OF THE PILOT PLANT

Mass Flow Controllers for Gas	8 Nos Provided
Mass Flow Controllers for Liquid	Provided 2 Nos.
Pressure Control Valves	Provided 3 Nos.
Level Control Valves	Provided 2 Nos.
Pressure Regulators	Provided
Manual Valves for Control	Provided
Thermocouples	Provided as required
Pressure Transmitters	Provided (Location: Product Tank)
High Pressure Separatiuon Vessel	2 Nos. Provided
Low Pressure Separatiuon Vessel	2 Nos. Provided
DCS control cabinet; DCS controllers.	Provided
Wet test flow meters	2 Nos Provided



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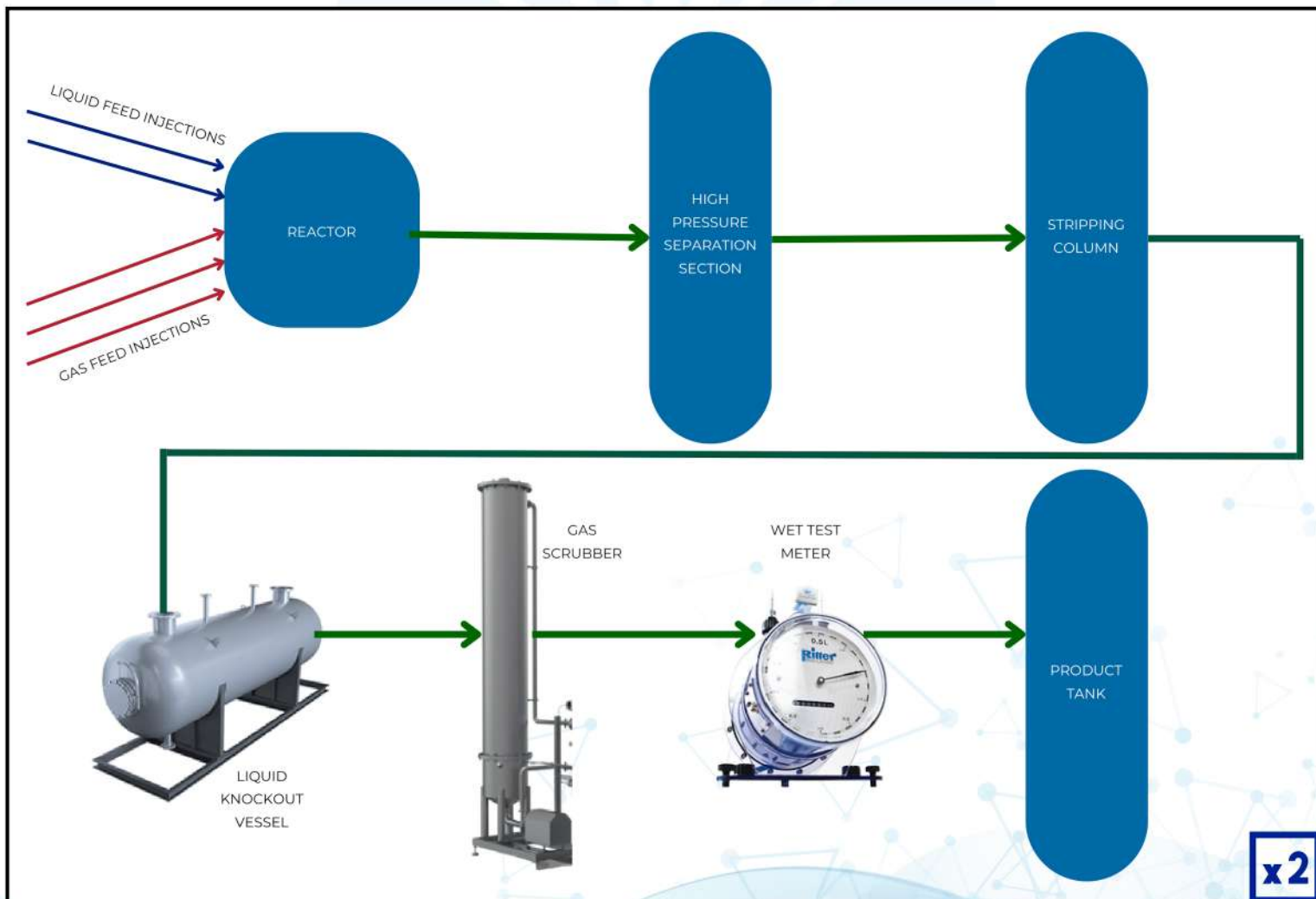
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BASIS OF DESIGN & SKID COMPONENTS

This pilot plant skid consists of two units of hydrotreating/hydrocracking (HT/HC) pilot plant. Each unit has 2 reactors with two liquid feed injections and three gas feed injections. After the reactors; there are high pressure separation section; a stripping column section and product storage section. At the last section; there are a liquid knockout vessel; gas scrubber; wet test meter and product tank.



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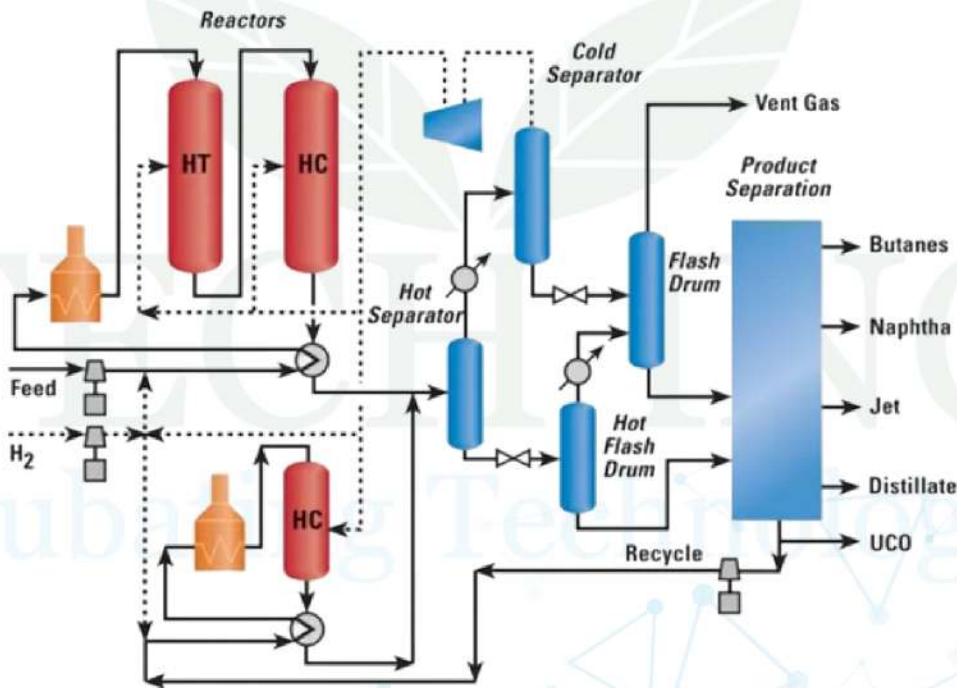
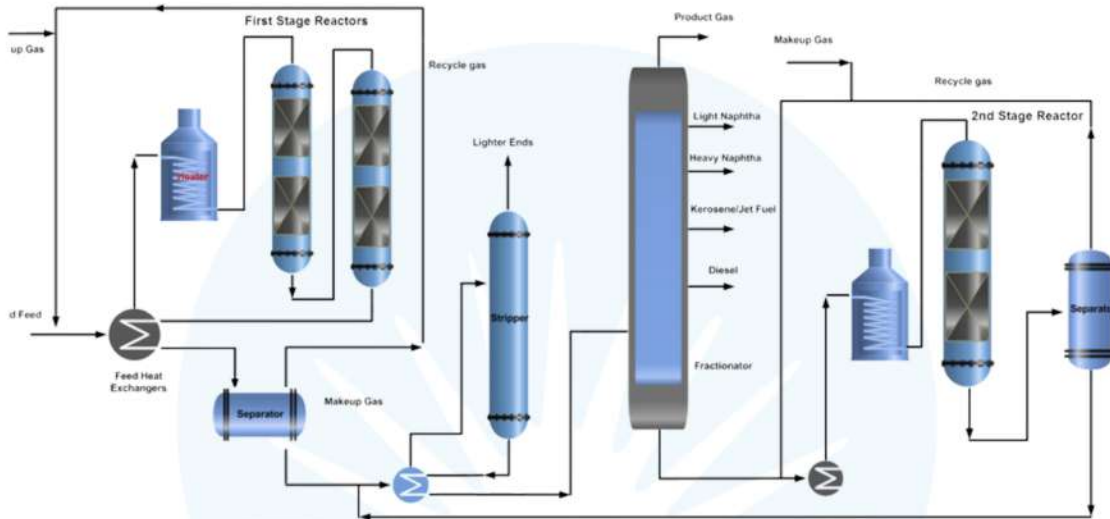
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SAMPLE PROCESS & INSTRUMENTATION DIAGRAM OF HYDROTREATING AND HYDROCRACKING



Final P&I shall be decided mutually between buyer and Tech Inc. and manufacturing shall commence only on express approval of buyer.



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HYDROTREATING AND HYDROCRACKING PILOT PLANT

PREVIOUS PILOT PLANTS BY TECH INC.



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HYDROTREATING AND HYDROCRACKING PILOT PLANT

COMPONENTS AND BRANDS THAT SHALL BE USED BY TECH INC.



LIQUID MASS FLOW CONTROLLER
FROM BRONKHORST,
NETHERLANDS



LIQUID MASS FLOW METER
FROM BRONKHORST,
NETHERLANDS



GAS MASS FLOW CONTROLLER
FROM BRONKHORST,
NETHERLANDS



WET GAS FLOW METER FROM
RITTER GERMANY



THERMOCOUPLE FROM WATLOW,
USA



SWAGELOK FITTINGS



SWAGELOK REGULATORS



SWAGELOK CHECK VALVES



SWAGELOK PRESSURE RELIEF
VALVES



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COMPONENTS AND BRANDS THAT SHALL BE USED BY TECH INC.



DCS FROM SCHNEIDER, GERMANY



PANEL/CABINET FROM RITTAL SWITZERLAND



REPUTED INDUSTRIAL LAPTOP



PRESSURE GAUGE FROM WIKA, GERMANY



TEMPERATURE CONTROLLERS FROM WATLOW, USA



SS TUBING FROM SWAGELOK



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HYDROTREATING AND HYDROCRACKING PILOT PLANT

- * MA-2023 PP; Scope of Work
- * MA-2023 PP; Basis of Design
- * MA-2023 PP; General Control System Requirement

Tech Inc., Chennai, India, shall endeavour to meet all requirements of the buyer - Saudi Aramco.

- Major electric equipment shall include reactor furnaces; preheaters; heat tracing tape
- The skid also shall include an electric cabinet; DCS control cabinet; DCS controllers.
- The pilot plant skid shall be provided with DCS control system.

The pilot plant shall be mainly used to perform hydrotreating or hydrocracking catalyst evaluation.

- Tech Inc. shall submit preliminary drawings on receipt of PO
- Tech Inc. shall submit certified drawings, literature, photographs and parts data on approval of preliminary drawings after PO
- Tech Inc. shall submit operating/maintenance manuals, test certificates and installation certificates prior to final installation



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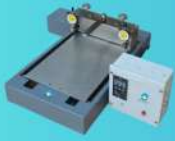


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**FLATSHEET MEMBRANE
CASTING MACHINE**

**FLATSHEET MEMBRANE
CASTING MACHINE WITH
HEATING FACILITY**

**FLATSHEET MEMBRANE
ROLL CASTING MACHINE**

**FLATSHEET MEMBRANE
ROLL CASTING MACHINE
WITH HEATING FACILITY**

**HOLLOW FIBER
MEMBRANE CASTING
MACHINE**

MEMBRANE TESTING EQUIPMENT

MEMBRANE TEST SKIDS



MD TEST SKID



MBR TEST SKID



RO TEST SKID



**PERVAPORATION
TEST SKID**



FO TEST SKID



UF TEST SKID

MEMBRANE STIRRED CELLS



**HIGH PRESSURE
STIRRED CELL**



**LOW PRESSURE
STIRRED CELL**

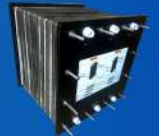
MEMBRANE TEST CELLS



**HOLLOW FIBER
TEST CELL**



FO TEST CELL



STACK CELL



MD TEST CELL



**PERVAPORATION
TEST CELL**



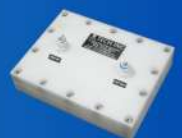
STACK CELL



RO TEST CELL



**CIRCULAR TEST
CELL**



**DERLIN RO
TEST CELL**

MEMBRANE CHARACTERIZATION EQUIPMENT



**CONTACT ANGLE
MEASUREMENT**



**MEMBRANE STRENGTH
TESTER**



**CAPILLARY FLOW
POROMETER**

MEMBRANE MATERIALS

CHEMICALS

- PES
- PVDF
- PS
- CA/CTA
- PAN

ADDITIVES

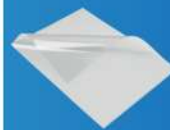
- PVG
- PEG
- GRAPHENE OXIDE
- CNT
- TiO₂
- LiCl

SOLVENTS

- NMP
- DMAC

MEMBRANES

- MICRO FILTRATION FS & HF
- ULTRA FILTRATION FS & HF
- NANO FILTRATION FS & HF
- REVERSE OSMOSIS FS & HF
- FORWARD OSMOSIS FS & HF
- MEMBRANE DISTILLATION FS & HF
- MBR FS & HF
- GAS SEPARATION FS & HF



FLATSHEET



**HOLLOW
FIBER**

SPACERS



FEED SPACER



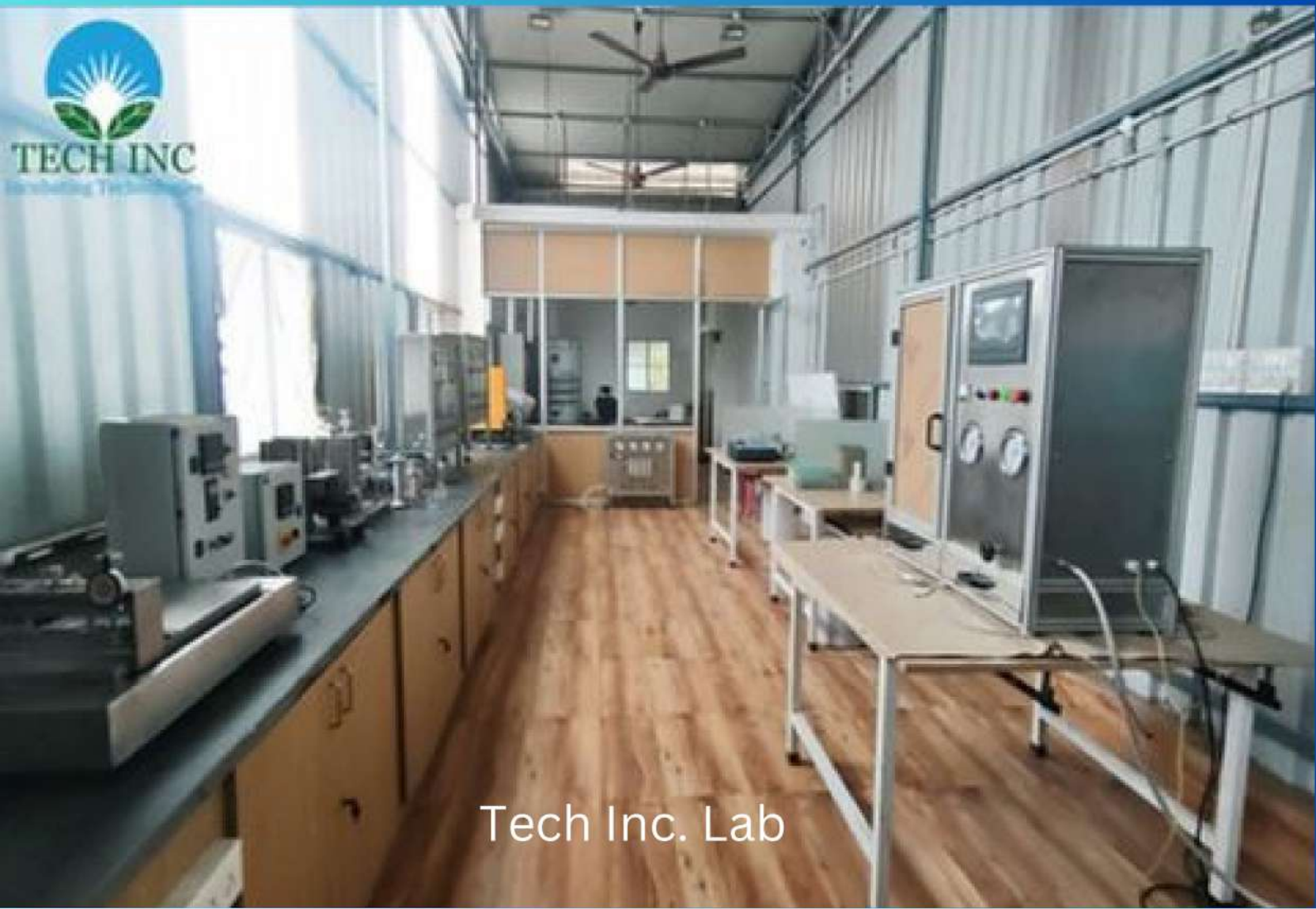
PERMEATE SPACER

SUPPORT SHEETS





Tech Inc. Office



Tech Inc. Lab

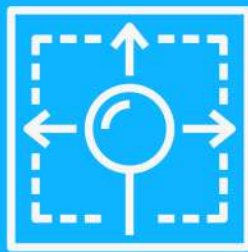
TechInc in Numbers



Workforce



Capacity



Factory FootPrint

>65,000 Sq.ft



Our Facilities



Chennai, India

Facility 1 - Main Factory

Facility 2 - Equipment Factory

Facility 3 - Fabrication Factory

Facility 4 - Office



Knowledge and Product Chart

Membranes

Hydrophilic Membranes

- MicroFiltration MF
- UltraFiltration UF
- NanoFiltration NF
- Forward Osmosis FO

Hydrophobic Membranes

- Membrane Distillation MD
- CO2 Sequestration CO2

COUNTRIES OF INSTALLATION



OUR PRODUCTS

MEMBRANE MAKING EQUIPMENTS
MEMBRANE TESTING EQUIPMENTS
MEMBRANE CHARACTERIZATION EQUIPMENTS
TEST CELLS
FILM COATING
AUTO SDI KIT
SILTON SDI
BATTERY COATING
POROMETERS
POROSIMETERS
PERMEAMETERS
FILTERS
CHEMICALS
MEMBRANES
SPACERS
SUPPORT SHEETS
POWDERS
MEMBRANES & MODULES

Contact Us



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