

## Introduction

MAPNA Boiler and Equipment Engineering and Manufacturing (briefly MAPNA Boiler), having a brilliant history of more than 23 years in supplying industrial products and participating in the execution of country's big projects, is an industrial knowledge-based company, which is a subsidiary of MAPNA Group which runs on the path to value creation for clients, shareholders, and other beneficiaries through the design, supply, manufacturing, installation, erection, finance, after sales services, commissioning and project management in the field of different power plants boilers, oil, gas, and mining industries, fixed equipment for oil, gas, and petrochemical plants, water treatment and water desalination units in domestic and foreign markets.

Relying on the expert human resource, modern manufacturing facilities, and new technologies acquired from renowned companies of this field, and developed over years on, this company moves toward the achievement of sustainable development goals in the country's power, oil, and gas industries.

Recently toward the country's development plans, MAPNA Boiler has entered to the water and wastewater industries market and by developing the products in the field of potable water and waste water treatment of industrial and municipal regions, start its activity.

This company takes part as EPC and EPCF contractor in the execution of power plants, refineries, petrochemical complexes, water treatment and water desalination plants. More than 1000 experts are now working in this company that are distributed into the departments of designing, product development, research & technology and sales and business development arranged in the central building in Tehran and the departments of manufacturing, engineering, production, quality control, project execution, procurement and other departments in Haljerd and Elahieh complex and some of them are stationed in the sites of our projects.

Haljerd complex of MAPNA Boiler Company, locates in 12th. KM of Karaj-Qazvin road in 76,000 square meter area with a 35000 square meter closed workshop. Various required machineries including cutting, pressing, bending, rolling, welding, light & heavy duty lathe machines, heat treatment furnace and test facilities are equipped there.

Some of this equipment like heavy rolling, pipe induction bending machine and heat treatment furnace in terms of production tonnage and the level of technology, are unique across the country and even in the Middle East.

With the purpose of storing other materials and equipment able to be kept in open and sheltered spaces, Elahieh complex equipped in 210,000 square meters space, containing workshops allocating 15000 square meters for finishing, forming, and continuous pipe bending machines to support automatic bending and finishing of tubes and pipes in boilers harp, refineries finned pipe, industrial boilers wall's automatic welding and thermal power plants boiler.

All machineries and equipment gathered in these two factories empowered MAPNA Boiler to handle the construction, test, and assemble process in a complete and independent way. However this company gained an opportunity of accredited vendors to enhance its production agility.

In addition, according to the successful experience in installation, erection, and commissioning, the company has attempted to present comprehensive solutions for the satisfaction of customers' needs earning competitive advantages. MAPNA Boiler and Equipment Engineering and Manufacturing Company during recent years has managed to obtain ISO 9001, ISO 14001, ISO 45001, ISO 27001, and ISO 17025 certification. Also the company has kept trying an organized application of the contained approaches by implementing and developing technology management (TM), knowledge management (KM), and project management (PM) in accordance with PMBOK. In 2022 Mapna Boiler won the Simin national award of Organizational Excellence and Performance.



# Products and Services

## List of current products

- Heat Recovery Steam Generator (HRSG) in power plants
- Bi-drum Industrial / Package Water Tube Boilers
- Steam Thermal Power Plant Water Tube Boilers
- Combined Heat and Power (CHP) Steam Generators
- Stand-Alone (Fresh Air Firing) HRSGs
- Coal-Firing Boilers
- Deaerators
- Shell & Tube Heat Exchangers
- Pressure Vessels
- Stationary and Containerized Sea Water and Brackish Water Reverse Osmosis (SWRO & BWRO) Membrane Desalination Units
- Water Treatment Systems
- Industrial and Municipal Wastewater Treatment Systems
- De-oiling Units
- Medical and Industrial Containerized Oxygen Generators

## List of SERVICES

- Products After Sales Services and Supports
- Laboratory Services
- Operators Training
- Project Management Services
- Explosive cleaning & Deslagging system of boilers?????
- Online status monitoring system of boilers

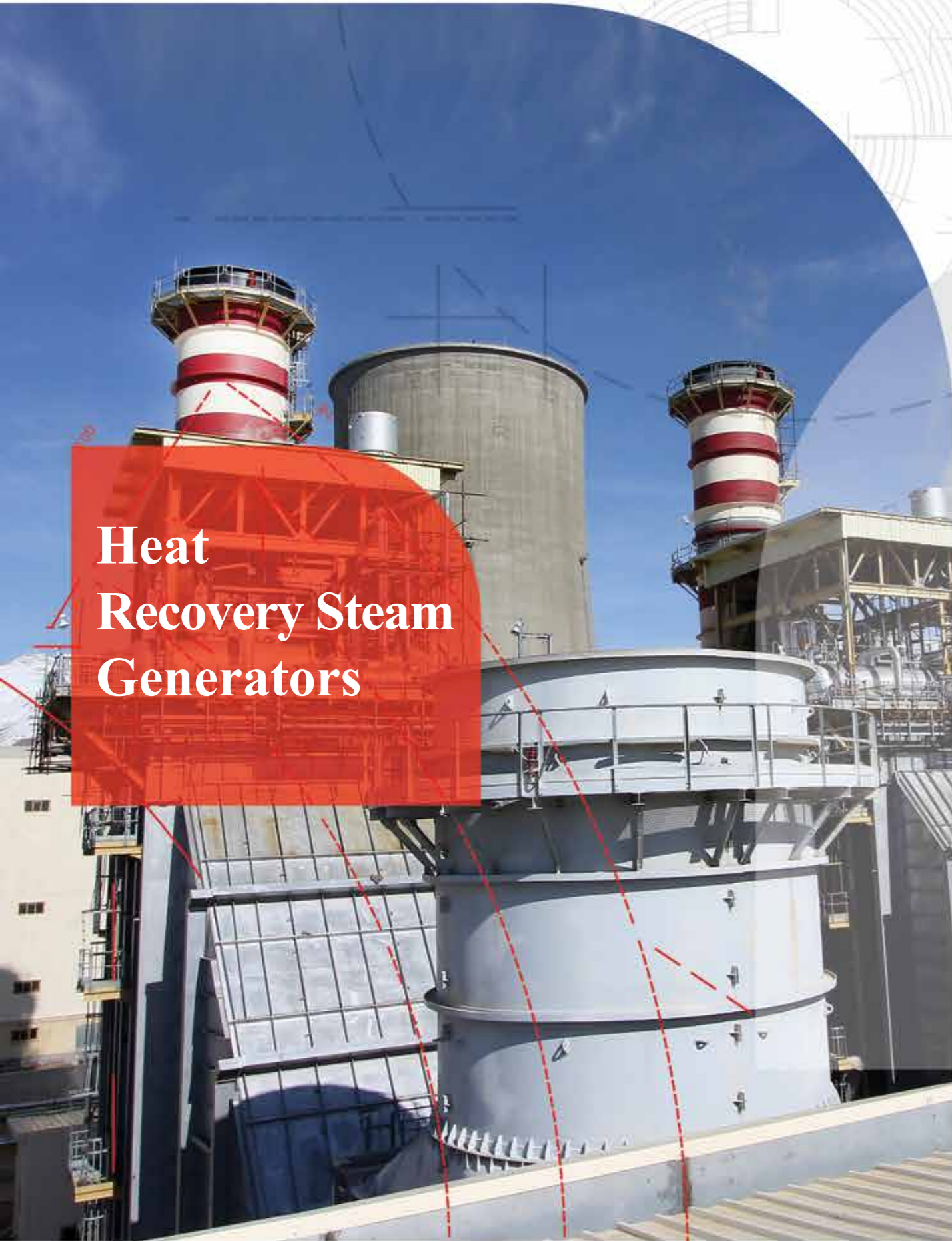


## List of NEW PRODUCTS:

- Municipal Solid waste incinerator boiler
- Dissolved Air Flotation pre-treatment system (DAF)
- Low-No burners of industrial boilers
- Closed feed water heat exchangers (Closed Feed Water Heater)
- Industrial Water Heat Recovery Boiler



# Heat Recovery Steam Generators



Heat Recovery Steam Generators (HRSG) are widely used for combined cycle power plants, in different industries such as, oil & gas, petrochemical plants, mining industries, steel industries, copper & aluminum production plants ,etc.

MAPNA Boiler is capable to design, supply, manufacture, install, erect, commission, offer consulting and after sales services for various types of HRSGs based on new technologies in the world.

The company's HRSG packages with peerless abilities in Iran can be installed downstream of E, F, and H-class or larger Gas Turbines. These packages are in different configuration such as Horizontal and Vertical-type, or single, double and triple pressure, having the option of Reheating package, and Supplementary Firing equipment. All components of the boilers (especially pressure parts) are built at MAPNA Boiler's factories using modern machineries and test equipment in compliance with the world's latest edition of applicable standards such as ASME.

Aiming at fulfilling new power generation market needs, the company signed a technology transfer and license agreement in 2016 with CMI (John Cockerill, Belgium) about large HRSGs packages downstream of F and H series Gas Turbines.



In case of gas turbine outage due to maintenance, our HRSGs can take the advantage of Fresh Air Firing system, consisting of air fan and burner in general, when the steam generators can keep producing steam independent of GT ,called Stand-Alone operation.

MAPNA Boiler is able to equip HRSGs with this system making the design and manufacturing of all the components required together in order to meet projects' demands.



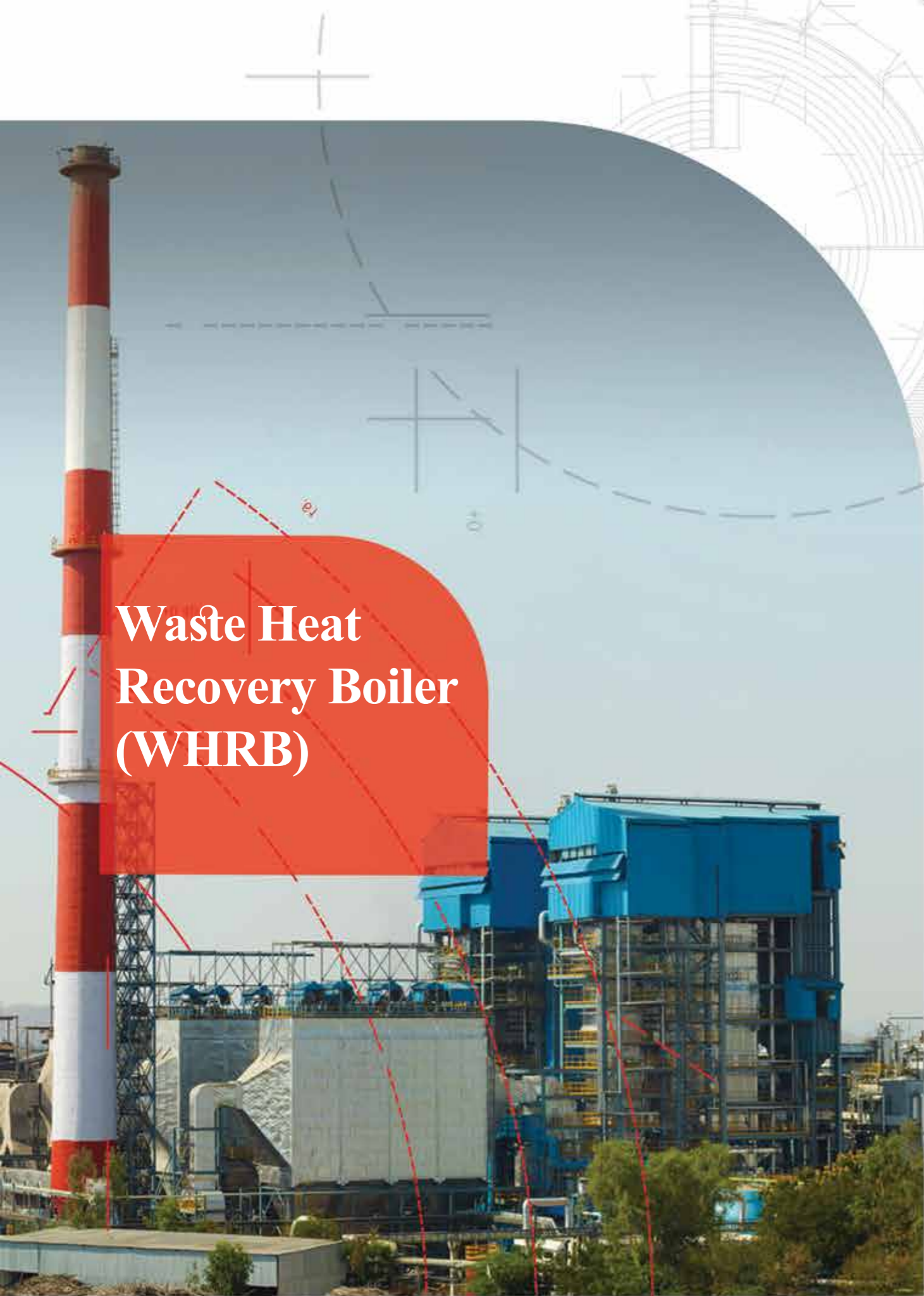
Furthermore, MAPNA Boiler's HRSG packages can be operated in power plants burning gas or gas oil in gas turbines.

In addition to being used in combined cycle power plants, HRSG packages can be used in cogeneration of electricity and heat (CHP) applications.

In this case, a part of the produced steam can be used for desalination of sea water in MED (Multi Effect Distillation) packages, or in case of petrochemical plants, the steam produced from the HRSG can be used for process purposes.

Qeshm water and power project is sample of a potable water production CHP project in which Mapna Boiler Company participated.

# Waste Heat Recovery Boiler (WHRB)



Waste heat recovery boilers (WHRB) are among the products of Mapna Boiler, which are available to various industries based on the technical knowledge of designing & construction of HRSG boilers in order to recover the waste heat of industrial processes. The recovered heat in these boilers can be used to produce hot water, saturated steam, superheat steam and even power generation cycle.

Considering the ever-increasing cost of energy and the increasing rate of energy efficiency, the maximum usage of fossil fuel energy is a vital issue in the production of competitive products. Currently, large amounts of energy in various industrial processes are discharged into the environment as waste heat through exhausts, which can be recovered and used. Different sectors of steel, oil, gas, petrochemical, cement, non-ferrous metals, mineral and chemical industries such as furnaces, reformers, preheaters and cooling systems have a very high potential for using waste heat recovery boilers which can prepare the energy of other sectors by heat recovering. Considering the variety of available energy sources in terms of temperature, flow rate, suspended particles, analyses and continuity of smoke flow, industrial heat recovery boilers can be designed and built in different dimensions and different details in a unique and completely exclusive way.



Sometimes the exhaust gas of industrial processes carry suspended particles and different pollutants, in this situation, WHRB packages are equipped with online cleaning systems, and various requirements are considered in the design of their thermal surfaces and the materials used.



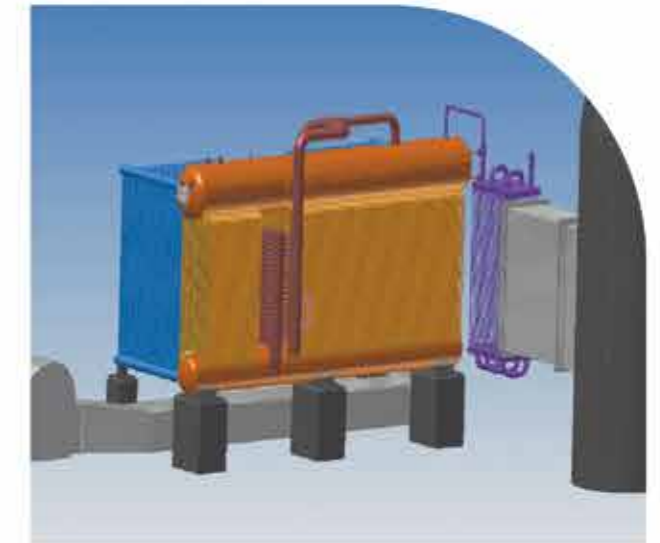
The use of WHRB packages, in addition to reducing fuel consumption in exchange for the energy produced, are solutions to reduce the share of carbon dioxide production in various industries, which is inevitable due to international goals.

# Water-Tube Industrial/Package Boilers

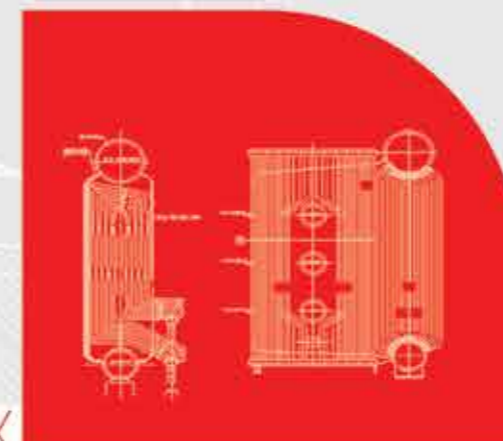
Industrial water tube boilers are used in power plants, petrochemical plants, refineries, food industries and mining in order to produce process steam. Mapna Boiler implemented desire of projects like 121 Unit of Gas Phases ,1,13,14,15 16,20 and 21 of South Pars Oil & Gas, or Fajar, Mobin, Damavand, Kangan, Razi and Dehloran Petrochemical plants, NGL3100, Khark, Isfahan, Refinery plants and Makran power and steam plant. For small-scale boilers, there are capabilities in the company to assemble the products in the workshops and transport them to operation sites.

The water tube boilers can accommodate the following features:

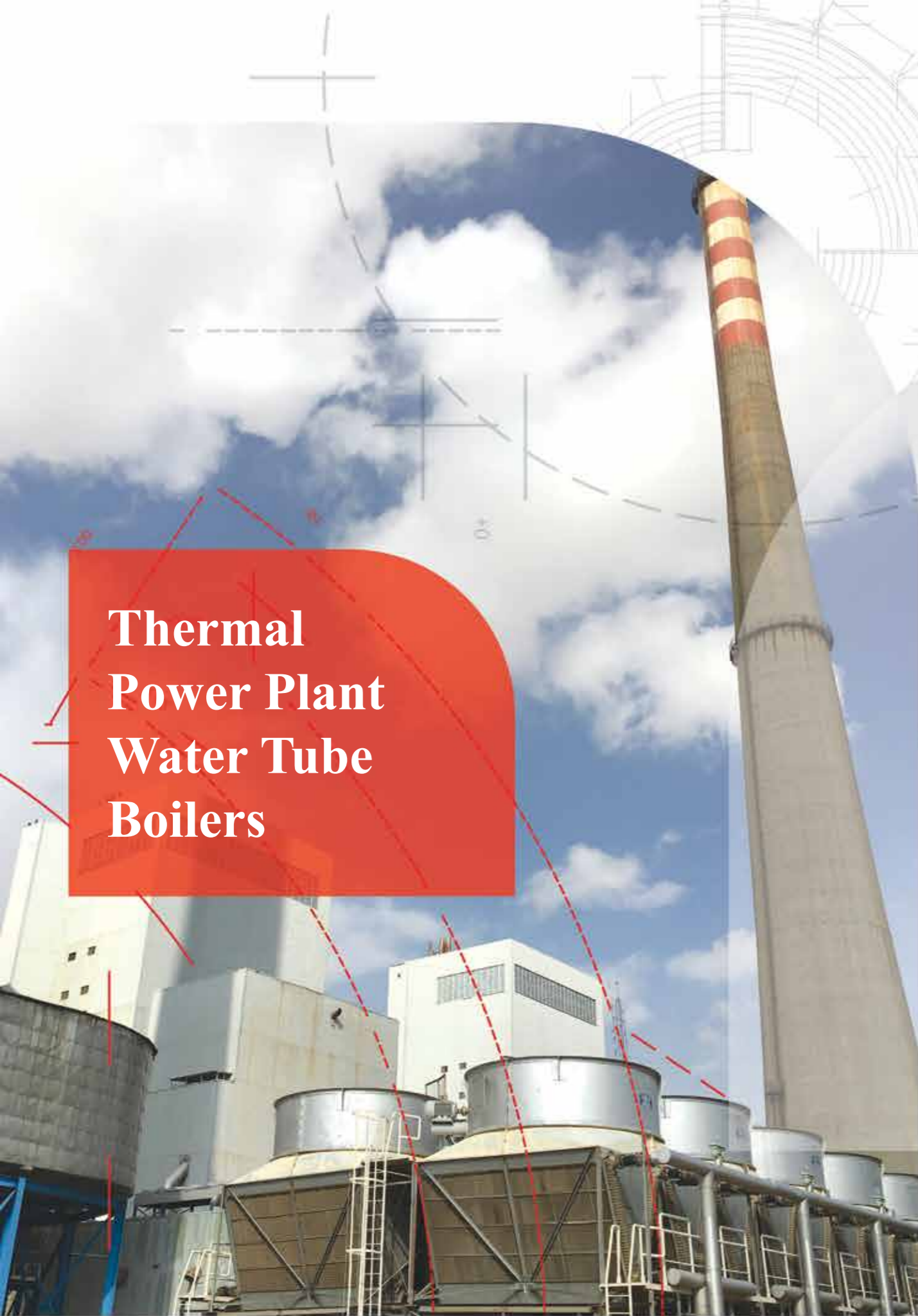
- Steam capacity up to 250 ton/hr
- Steam outlet pressure up to 115 bar
- Steam outlet temperature up to 525 °C



The boilers of our company have been completely optimized in terms of weight and dimensions by using up-to-date and efficient engineering software and are able to satisfy the request of employers with the highest efficiency.



# Thermal Power Plant Water Tube Boilers



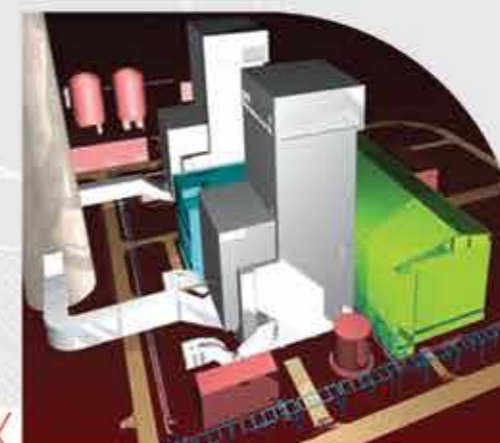
MAPNA Boiler and Equipment Engineering and Manufacturing Company is the first and only Iranian company in design and manufacturing of subcritical natural circulation thermal power plants water tube boilers producing up to 1100 (ton/hr) superheated steam to use downstream 325MWe steam turbines.

The most important design parameters of these boilers are as follows:

Superheater Steam Pressure	174 bar
Superheater Steam Temperature	540 °C
Superheater Steam Flow Rate	1100 ton/hr
Reheater Steam Pressure	38 bar
Reheater Steam Temperature	540 °C
Reheater Steam Flow Rate	880 ton/hr



To meet environmental regulations, Mapna Boiler can supply the system of Flue Gas Desulfurization (FGD) to reduce SOx compounds pollution.



# Deaerator

MAPNA Boiler has the capability of designing, supplying, manufacturing, installing, erecting, and commissioning of various horizontal and vertical deaerators up to 1400 ton/hr. The Deaerator of Spray-Tray type are used to enhancement of thermal efficiency and preventing corrosion in steam generation system by the removal of dissolved gases, especially O<sub>2</sub> and CO<sub>2</sub> from boiler's feed water.



The deaerators can bring down the oxygen content of the boiler's feed water to 7ppb ASME, ASTM, and HEI standards are used in designing and construction of these products.



# Shell & Tube Heat Exchangers



Shell and tube heat exchangers span a vast range of applications in the downstream and upstream industries of oil, gas, petrochemical, power plants and food industries. Relying on experts' knowledge and modern manufacturing tools and machines, MAPNA Boiler Company is ready to present services in the field of design, construction and maintenance (re-tubing) of such heat exchangers.

With utilization of heavy duty rolling machines, this company is capable to produce heat exchangers with shell thickness of up to 300 mm and varied in size and range of materials, including Carbon Steel, Stainless Steel, and High Alloy Steel compliant with TEMA and ASME standards.

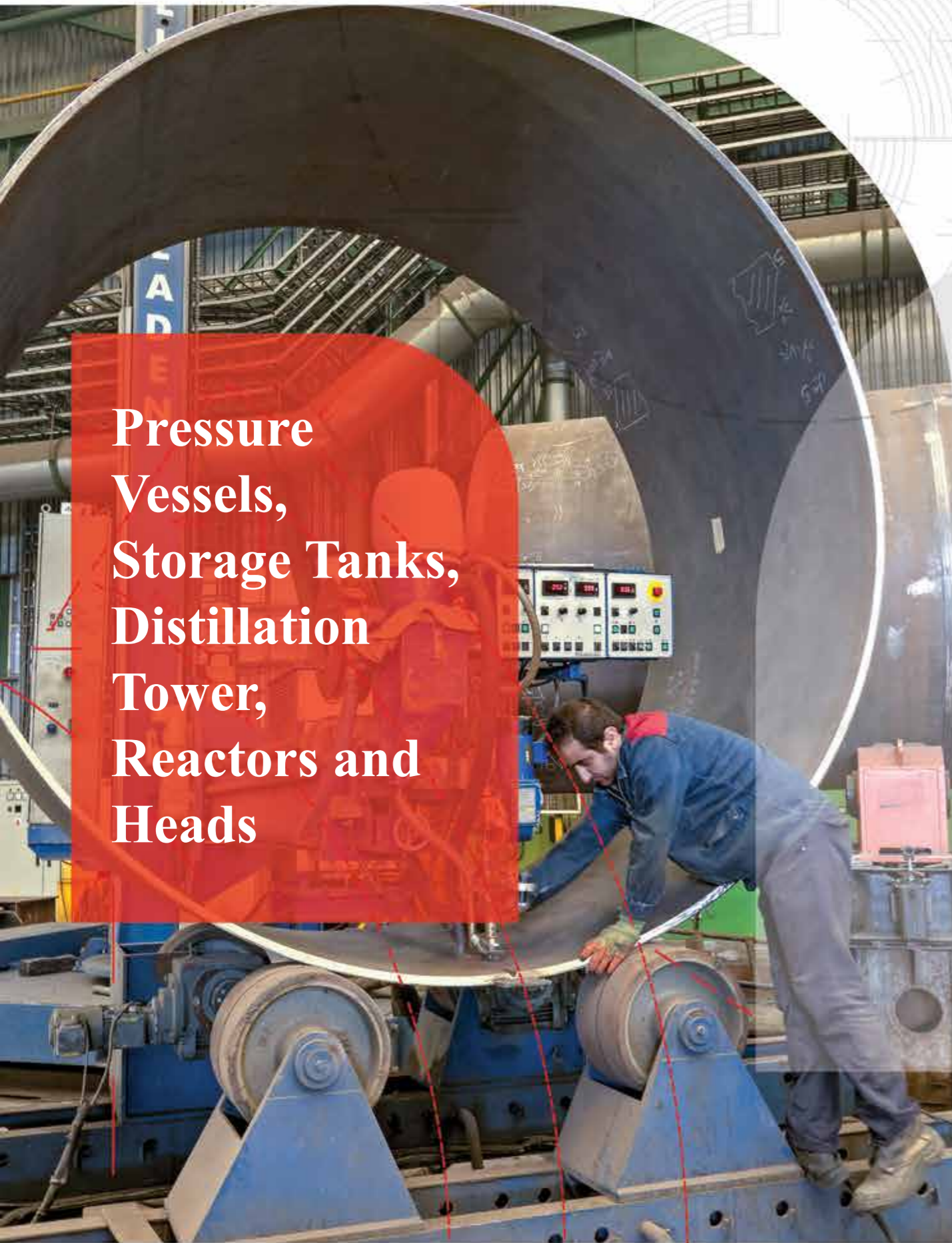


In refineries, Re-boilers are used as a type of shell and tube heat exchangers to reheat the condensate products at the bottom of Distillation Tower and return them vaporized to the distillation tower. Re-boilers are also designed and manufactured by MAPNA Boiler.





# Pressure Vessels, Storage Tanks, Distillation Tower, Reactors and Heads



MAPNA Boiler Company have been involved in the design and construction of various types of steel and alloy pressure vessels, up to 300 mm thickness, used in different industries like oil, gas, and petrochemical.



Mapna Boiler have various products in power plants, such as high pressure (HP), Intermediate pressure (IP), and Low Pressure (LP) drums,blowdown tanks, and flash tanks that, they are designed and manufactured according to ASME, BS, and API standards.



Atmospheric storage tanks for storing crude oil and re-finery products such as Gas,Oil and fuel oil in both types of the spherical and cylindrical and double wall are supplied by MAPNA Boiler based on API 650.

# Desalination & Water Treatment Systems



In line with MAPNA Group's goals MAPNA Boiler Company has taken on its activities for the design, supply, and construction of water desalination and water treatment plants in different industries leading to products which can be mentioned as:

- Condensate Polishing Plants (CPPs) and Water Treatment Plants (WTP) in Oil, Gas, and Petrochemical Industries and Power Plants.
- Pretreatment Dissolved Air Flotation (DAF) systems, Floating unit (sedimentation).
- Electro De-Ionization (EDI) Systems



- Desalination Units of Seawater and other Water Resources using Reverse Osmosis (RO) Method.
- Industrial Wastewater Treatment Plant
- Zero Liquid Discharge (ZLD) Systems



# Containerized Oxygen Generators

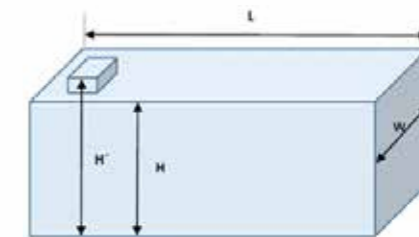


In order to fulfilling the role of social responsibilities, during pandemic of the Covid19, Mapna Boiler designed and manufactured container hospital oxygen generators (mobile), in which oxygen is separated from compressed air using the Pressure Swing Adsorption (PSA) method, which is one of the most up-to-date technologies in the world for oxygen production. The mentioned method is used in cases where high purity gas is needed (medical, industrial, etc.) and besides oxygen, it is also used to produce nitrogen.

- Advantages of the PSA method:
  - Cost-effective and Highly Practically Efficient
  - Low Operating Expenses
  - Easy-to-Use
  - High Safety Factor
  - Precise Purity
  - Low Pressure Drop
  - Long Lifetime
  - Suitable Size and Low Weight
  - Mobile (Containerized)



Capacity	600NL/min
Oxygen Purity	Min %3± %93
Filtration	Water Trap + Filters + Dryer + Antibacterial
Generation Method	Pressure Swing Adsorption (PSA)
Compressor Capacity	11.2m <sup>3</sup> /min
Adsorber	Zeolite 13X HP
Electrical	3phase - 125A
Total Weight	14000 kg
External Dimension	30ft x 9.5ft (10.8ft) x 7.8ft [6.1m x 2.9m (3.3m) x 2.4m]



L x H(H') x w      30 ft x 9.50 ft (10.8ft) X 7.8 ft  
 L x H(H') x w      6.1 m x 2.9 m (3.3 m) X 2.4 m

# Containerized Water Treatment and Desalination Systems



In order to cut down designing time duration and accelerate products delivery to customers, a varied package of water treatment and desalination packages with a wide range of capacities and applications have been made by MAPNA Boiler and Equipment Engineering and Manufacturing Company.

One of the common properties of these packages is the installation of equipment and skids inside a container. The containerization of package reduces installation and commissioning time besides the ease of transportation. Moreover, it meet's the need of special structure or building for equipment installation.

A suitable package of disinfection, pretreatment, main treatment, desalination, final treatment (Demineralized) and other systems will be suggest to clients depending on the kind, quality, iterance flow rate and demand of water.



Various pretreatment units are designed and available which consists of pressurized sand fi- lter, Ultrafi- lters (UFs), self-cleaning screen fi- lters and disk fi- lters. In all packages, desalination process is designed as reverse osmosis RO system and water Demineralization process by Electro Deionization system (EDI). All systems are supported by electric and control panels and the possibility of remote monitoring using GPRS technology, by client request is prepared. The optimization and flexibility to fit variety of inlet water conditions and client's needs have been attempted together for the design of the water package products. Auxiliary equipment like diesel generator (DG) for power generation will be available at client's request.

Operability in:

- Supply of Potable Water in Critical Situations for Small Cities
- Supply of Water at the time of Increased Seasonal Consumption Demand
- Supply of Process Water during the Commissioning of Industrial Units
- Supply of Industrial Water in times of Quality Change in Raw Water
- Supply of Emergency Water for Industrial Units in Production Outages
- Supply of Makeup Water in times of Quality Change in Potable Water or Industrial Water



General Classifi- cation of this packages is:

- Packages of treated water from brackish water, seawater, and treated wastewater for industrial use up to 400 m3/day in one container and up to 2000 m3/day in two containers.
- Packages of demineralized water from brackish water, seawater, and treated wastewater up to 12 m3/hr in one container and up to 40 m3/hr in three containers.
- Packages of potable water from brackish water and seawater up to 400 m3/day in one container and up to 2000 m3/day in two containers.



## Product Support and Aftersales Services

MAPNA Boiler and Equipment Manufacturing and Engineering Company presents clients a variety of aftersales services, containing supervision of installation and commissioning, periodic inspections, performance tests, spare parts delivery, regular maintenances ,overhauls, upgrading , renovating, supporting engineering consultations in the field of water chemistry. By experience of more than two decades' activity through the design and execution of power plants steam cycle, this company has provided extensive services for the cycle chemistry as:

- Study of boilers applied chemical regimes and present improving instructions if necessary
- Investigation of failures and corrosion history in boilers looking into data analysis and boiler performance conditions
- Sampling from different points of water/steam cycle to make more accurate estimation of the existing conditions
- Analysis of failed components in MAPNA Boiler's well-equipped quality control laboratory
- Root Cause Analysis (RCA) and reporting results
- Investigation of chemical injection/dosing systems performance and sampling to make certain of their accuracy
- Presenting maintenance instructions for replacement of failed components
- Supervision on thickness measurement of areas subject to failure and data analysis to emerge assured of desired condition
- Presenting operational instructions to avoid the reappearance of failures and providing of execution supervision
- Risk-Based Inspection (RBI)
- Fitness-For-Service (FFS) Assessment
- Consideration of chemical cleaning necessity and presenting associated instructions
- Data analysis of performance after improvements to be certain about the effectiveness of applied instructions
- Maintenance, renovation, and procurement of spare parts for existing systems
- Failure diagnosis and feasibility analysis for upgrading power plants water treatment systems including CPPs and WTPs
- Study, analysis, diagnosis, and improvement of power plant water and steam cycles
- Holding workshops and training programs for operators

Additionally, as clients' needs, Mapna Boiler Company provides training services for operators by compiling educational documents and sending experienced trainers to client's sites. Depending upon valuable experiences obtained as a result of performance test data collected from over hundred boiler units, teams of technical and engineering experienced specialists in the company are able to diagnose and –find roots of failures in case performance problems appear in a boiler and offer suitable solutions to eliminate the defects or prevent the occurrence of similar events.

In clients' interest leading to long-term maintenance contracts, MAPNA Boiler has the capacity to provide services for technical consultations, preventive maintenance programs, supervision of boilers operation, control, periodic inspections, and procurement of components and equipment and guarantee a permanent and constant operation of its boiler products.



## Laboratory & Technical Services

The laboratory of MAPNA Boiler Company is a strategic business unit which has been established with the mission of providing high-quality laboratory services. Intended to providing laboratory test services to power plants, oil, gas, petrochemical, and other related industries, this lab benefits from expert human resources as well as advanced equipment and succeeded to receive ISO 17025 certification from National Accreditation Center of Iran (NACI) in 2013 after passing required standards.

Provided services by this reference laboratory for different industries:

- Tensile and Proof Load Test
- Compression Test
- Shear Test
- Bending Test
- Impact Test
- Portable and non-portable Hardness Test (Rockwell, Brinell, Vickers)
- Break, Nick Break, and Fracture Tests
- Flattening, Flare and Flange Tests on tubes or pipes sample
- Spring Constant Test
- Quantometric Test for Iron-base and Copper-base Alloys
- Portable X-Ray Fluorescence (XRF) Analysis for Stainless Steel and Non-Ferrous Alloys



- Weld Metal Chemical Composition Test
- Metallographic and Microscopic Examination
- Welders training
- Weld Tests
- Non-Destructive Tests (NDTs) including VT, PT, UT, MT, RT, Phase Array
- Heat Treatment on Laboratory Samples
- Dimensional quantity calibration (types of meters, calipers, micrometers, etc.)
- Pressure quantity calibration (pressure gauges and transmitters)
- Validation of temperature and electrical quantities (types of pendulums, welding devices, etc.)
- Telemetry



