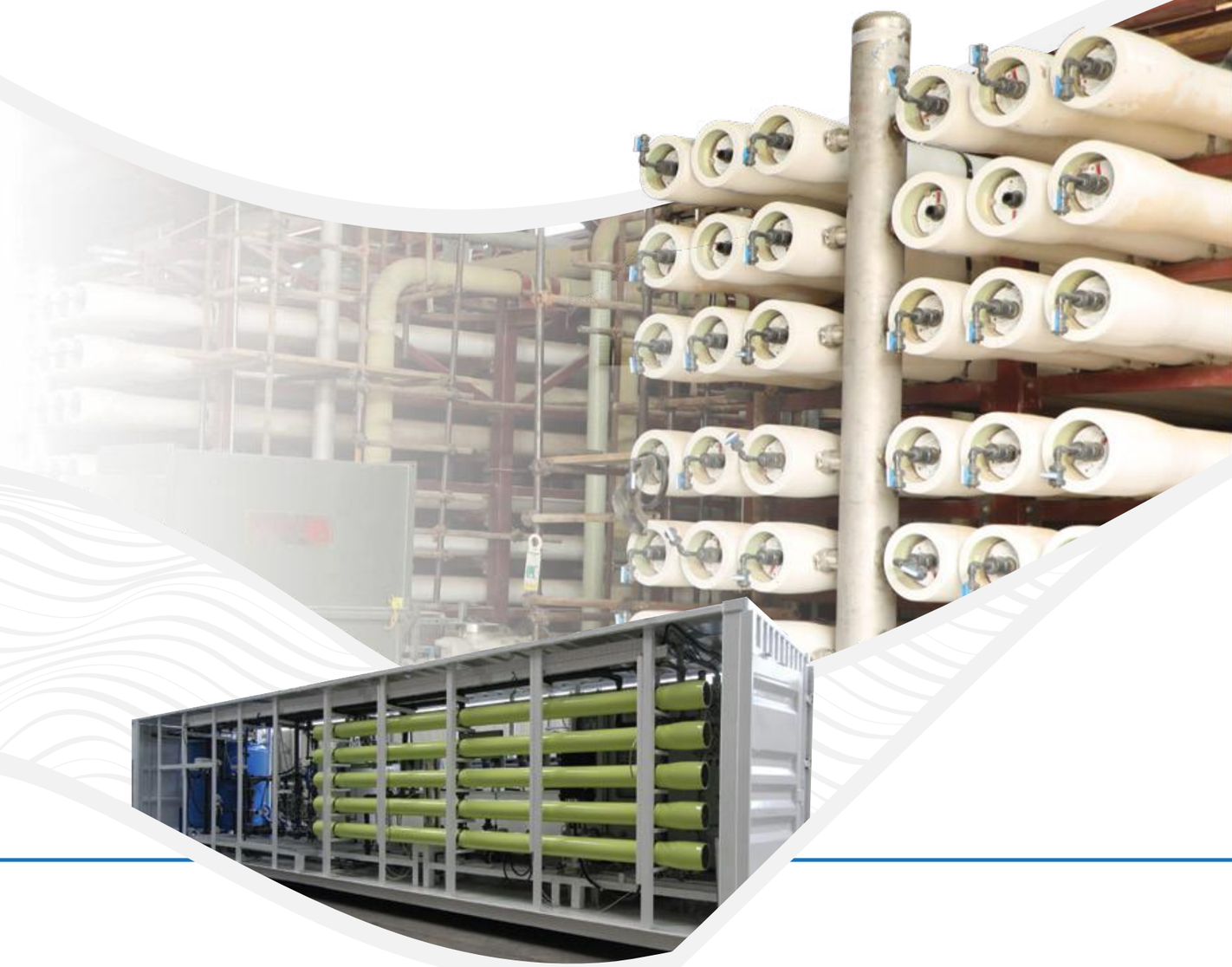
MAPNA GROUP
MAPNA Boiler & Equipment
Engineering & Manufacturing Co.



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MAPNA Boiler and Equipment Manufacturing and Engineering Company (MAPNA Boiler in brief), having a brilliant history of more than two decades in supplying industrial products and participating in the execution of the country's big projects, is an industrial knowledge-based company. The company 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, and commissioning, finance, after sales service, technical consultation, and project management of different types of boilers, being utilized in power plants, oil, gas, and mining industries, fixed equipment for oil, gas, and petrochemical plants, and water treatment and water desalination units as well in domestic and foreign markets.

This company has entered water and wastewater markets since 2014 en route to satisfying the country's essential needs in water treatment and desalination and with the purpose of using new technologies, improving performance, and keeping sustainable development. In this direction, various partnering agreements have been made with first grade world companies and expert people, required for the design and manufacturing of water desalination and water and wastewater treatment equipment, have been employed and trained. With the available support of more than 1100 expert employees, a complete and efficient supply chain, modern manufacturing facilities and machines, and noticeable experience in performing big projects, MAPNA Boiler Company is able to play an effective part in meeting respectful clients' needs for the execution of water and wastewater projects as an EPC and EPCF contractor.

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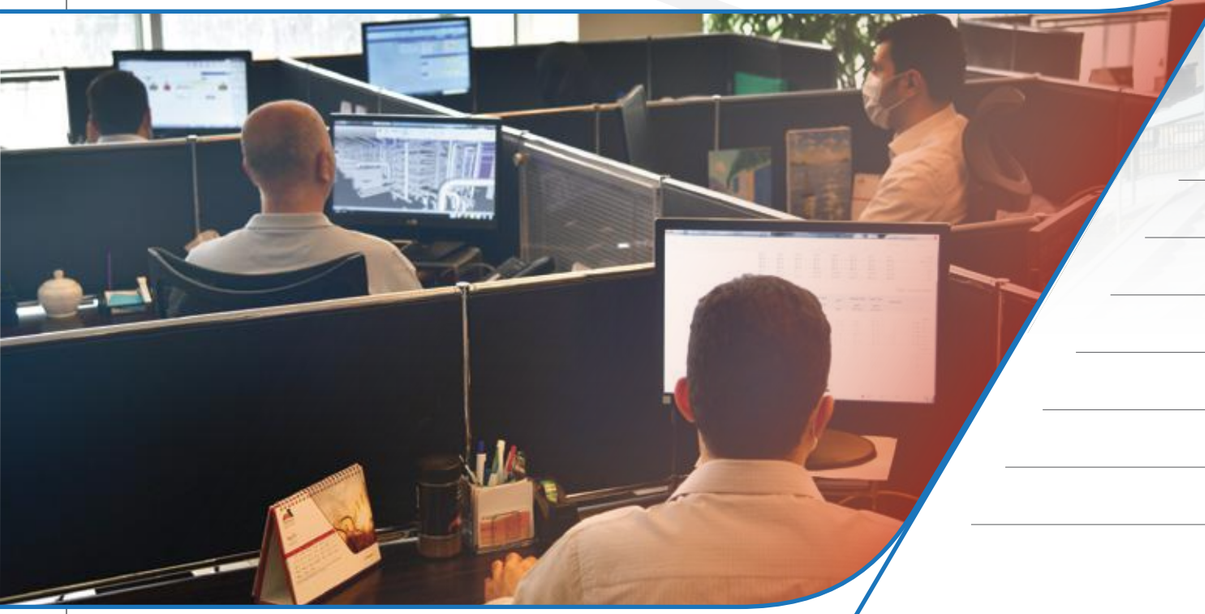
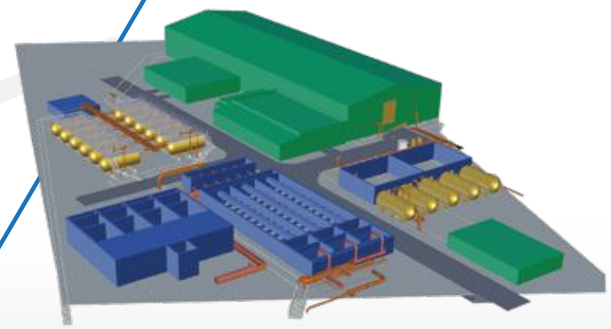
MAPNA Boiler's Solutions in Water and Wastewater Area



- BWRO and SWRO Water Desalination Systems
- Water Treatment and Demineralized Water Production Systems for Different Industries
- Medical and Industrial Wastewater Treatment and Water Recycling Systems
- Transportable (Mobile) Containerized Water Desalination Equipment
- Condensate Water De-Oiling Packages
- Eco-Friendly Zero Liquid Discharge (ZLD) Water Treatment Systems
- Blowdown Recovery for Power, Oil, Gas, and Petrochemical Plants Boilers
- Water and Steam Cycle Chemistry and Corrosion Engineering

BWRO and SWRO Water Desalination Systems

MAPNA Boiler Company has the ability of engaging as an EPC or EPCF contractor in all seawater or brackish water desalination projects with reverse osmosis technology (SWRO and BWRO) without any limitation on capacity. One of the company's distinctive projects is Lian water desalination project lying in Bushehr region with the capacity of 35,000 cubic meters per day, about to be operated. This project, considered the largest Iranian National Water and Wastewater Engineering Company ABFA's water desalination plant to produce drinking water, has been desirably accomplished, despite the technical complications of water intake and preliminary treatment due to the region's related specificities and water quality conditions. Apart from Reverse Osmosis (RO) filters, a collection of other equipment such as Dissolved Air Flotation (DAF) system, multimedia filter, and dosing systems has been used in the project.



Project Specifications

- Project Location: Bushehr- Lian Industrial Complex
- Project Capacity: 35,000 cubic meters per day
- Raw Water Type: Seawater
- Water Intake System: Subsurface Open Intake
- Technology: SWRO
- Pretreatment System: Conventional
- Produced Water Specifications: Drinking Water according to ISO 20704
- Allocated Land: 2.5 hectares

Water Treatment and Demineralized Water Production Systems for Different Industries

Given its expertise in water specifications required for power, oil, gas, and petrochemical plants, MAPNA Boiler Company designs and supplies water treatment and demineralized (demin) water production packages in an optimized way and using Reverse Osmosis (RO) and Electro De-Ionization (EDI) for power plant industries and other industries.

Numerous projects are being executed a few of which can be mentioned as follows:

Water treatment units of West Karun, Ferdowsi, Rudshur, Khorramabad, Rumaila (Iraq), Sabzevar, Aryan, Torbat-e Heydarieh, Latakia (Syria), and Mokran power plants.

Medical and Industrial Wastewater Treatment and Water Recycling Systems

Serious shortage of water resources inside the country has triggered a special attention to wastewater treatment to produce water for industries and agriculture. Wastewater treatment is a present discussion in many petrochemical and refinery complexes, steel, copper, and aluminum mills and even in power plants and small-scale industries and wastewater has taken a high value.

Taking the aim of penetrating wastewater treatment and water recycling areas, MAPNA Boiler Company has accomplished a pilot project at its own factory to transform medical and industrial wastewater to a wide range of required treated water outputs including process, cooling, and demin water for its own internal consumptions using biological treatment, mechanical filtration, and Reverse Osmosis (RO) systems. As the result, MAPNA Boiler Company has become independent of demin water constant purchase besides its commitment to its social responsibility with respect to environment and society.

This successful experience is applicable to many industries and the company has the readiness in a complete way to participate in such projects.

Project Specifications

- Project Location: Alborz Province, (MAPNA Boiler and Equipment Manufacturing and Engineering Company's Factory)
- Project Capacity: 60 cubic meters per day
- Raw Water Type: Medical and Industrial Wastewater
- Medical Wastewater Treatment System Technology: Activated Sludge
- Advanced Wastewater Treatment System Technology: DMF+CF+ACF+UF+RO+EDI
- Produced Water Specifications: Demin Water with Electrical Conductivity less than 0.1 µS/cm
- Allocated Land (Advanced Treatment System): 100 square meters

Transportable (Mobile) Containerized Water Desalination Equipment

This MAPNA Boiler Company's new product provides drinking water in a quick way for the required consumptions in distant, off-the-grid, and also natural disaster-affected areas. Compact and optimum design for BWRO water desalination system in a limited space, keeping accessibility to components, and acceptable maintainability are of the most important features of the product. Due to the type and specific nature of this product, a handful of them gets available in Make to Stock (MTS) to rapidly answer respectful costumers' needs.

Project Specifications

- Reverse Osmosis Technology
- Optimum and Compact Design in 40-foot Transportable (Mobile) Container
- Quick Delivery, Transport, and Installation
- Capacity of 300 to 1000 cubic meter per day Sweet Water (Modular type)
- Application in remote rural regions, natural crisis-stricken areas, and industrial and agricultural centers

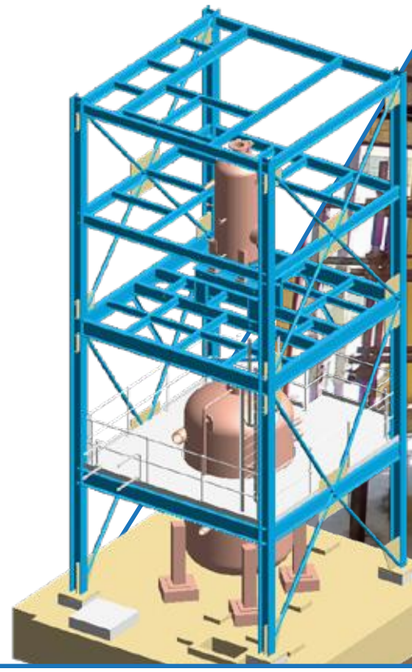
Condensate Water De-Oiling Packages

De-Oiling package is used in water treatment systems in order to separate and eliminate oil and suspended solids which results in recovering the recycled condensate water of refinery and petrochemical process units. The contamination source is hydrocarbons leaking from process units which should be taken out of water before its introduction into boiler units. The main equipment of the package includes Coalescer Filter and Activated Carbon Filter Vessels. The package is also equipped with Load and Unload Adopted Facility for Resins and Activated Carbon in addition to a Dual-Purpose Backwash Pump.

De-Oiling assembly was for the first time executed in Iran by MAPNA Boiler and Equipment Manufacturing and Engineering Company through an EPC project in South Pars-Gas phases 15 and 16.

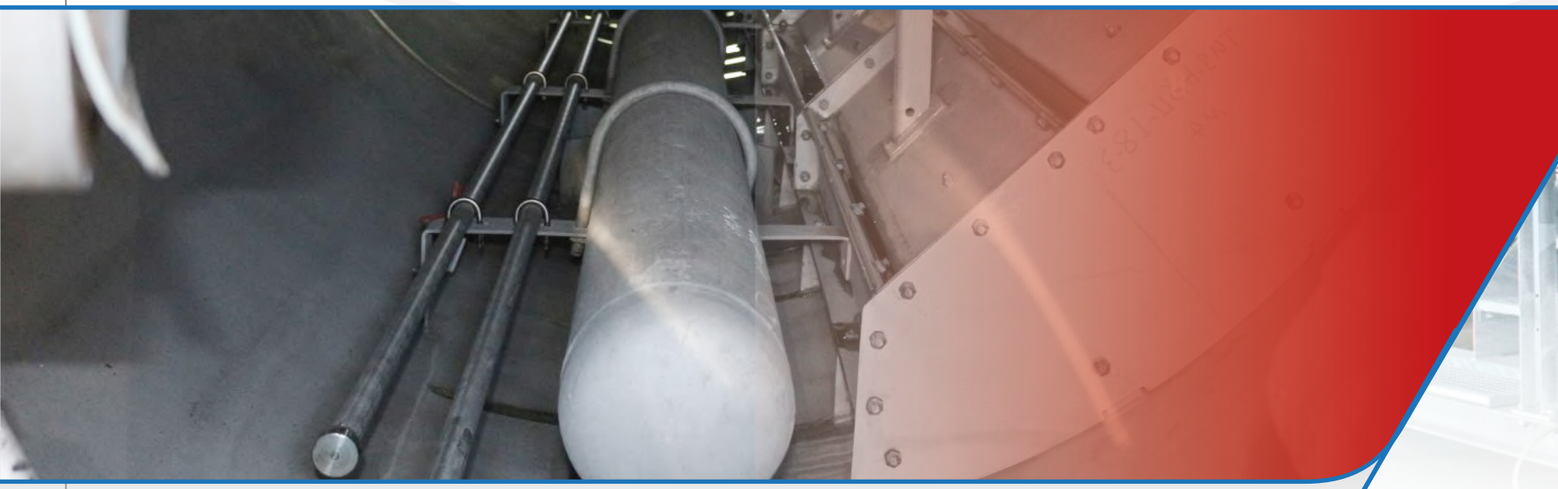
Blowdown Recovery for Power, Oil, Gas, and Petrochemical Plants Boilers

Boiler blowdown is the water steadily drained out from the boiler drum during its operation time to maintain boiler water impurities at an allowable level. This technique brings about a considerable waste of water in combined cycle power plants and other industries using boilers. One of MAPNA Boiler's solutions is constant recovery of the blowdown water and boiler efficiency improvement by returning the vapor flashed from blowdown tank to deaerator as well. The blowdown water is carried to water treatment plant after its preheating the condensate water, which enters the boiler, for the blowdown reuse in water and steam cycle.



Water and Steam Cycle Chemistry

Relying upon more than two decades of experience in the design and execution of power plants steam cycle, MAPNA Boiler Company is capable of presenting comprehensive services in water chemistry and corrosion areas as follows:



- Study, analysis, diagnosis, and improvement of power plant water and steam cycle
- Analysis and diagnosis of typical failures in heat recovery steam generators, investigation of failures and corrosion history in boilers looking into data analysis of chemical regimes, boiler operation conditions, and periodic inspections based on Root Cause Analysis (RCA)
- Analysis and diagnosis of precipitations in boiler water/steam and gas sides and metallurgical examinations of testpieces in MAPNA Boiler's laboratory
- Investigation of chemical injection/dosing and sampling systems performance and calibration
- Performance investigation of chemical injection/dosing and sampling systems to make certain of their performance accuracy
- Performing of Non-Destructive Tests (NDTs) such as thickness measurement of areas subject to failure and data analysis to emerge assured of desired conditions
- Presenting of proper quality control instructions for water and steam cycle during system operation
- Presenting of maintenance instructions for replacing failed components
- Presenting of tubes inside and outside chemical cleaning instructions
- Evaluation and investigation of precipitation inside tubes and presenting of their chemical cleaning procedure
- Presenting of HRSGs preservation methods within out-of-service and equipment supply times according to ambient conditions
- Boiler operation and site conditions
- Performance data analysis after proper chemical regime application to be certain about the effectiveness of presented instructions
- Maintenance, renovation, and procurement of spare parts for existing systems
- Failure diagnosis and feasibility analysis for upgrading power plants water treatment systems including WTPs and CPPs
- Presenting and conducting of optimum collection plan of drains such as blowdown toward preventing the waste of water and energy
- Planning and performing of various required periodic inspections
- Establishment of workshops and training programs for operators

Qeshm Power and Water Cogeneration project