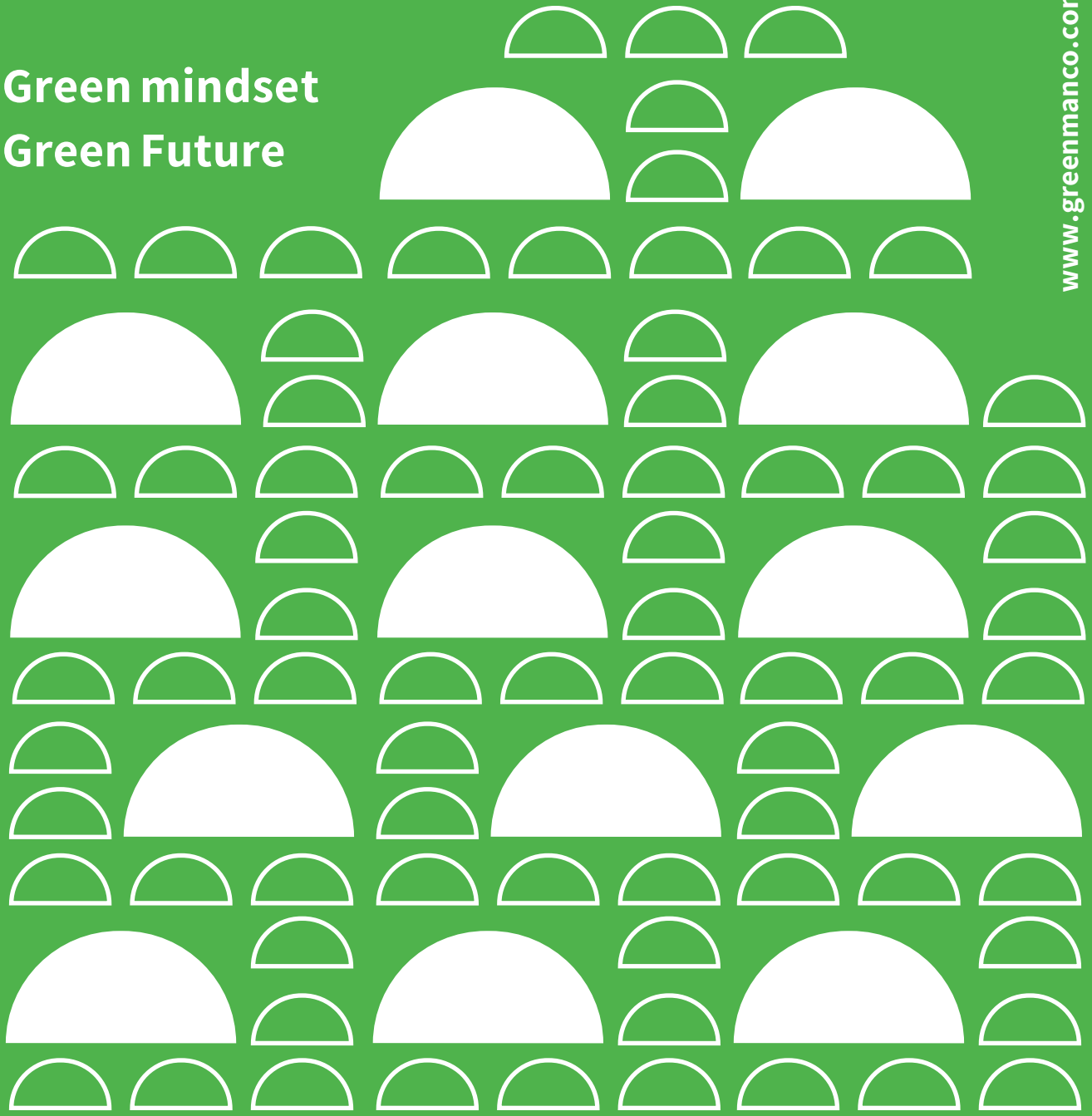


**Green mindset
Green Future**



www.greenmanco.com



GREENMAN

Green mindset, green future

PLANTA



**Carbon dioxide dosing and
condition monitoring system**
powered by **PACKMAN** industrial group



ABOUT GREENMAN

www.greenmanco.com



About Greenman

Packman Company started its activity by five graduates of Technical Faculty of Tehran University with the aim of improving the level of technical knowledge of the country in 1975. With a strong background in equipment production and service provision, Packman Company has been engaged in the field of technical knowledge in various industries such as power plant, petrochemical and oil, hospital, construction, agriculture, etc. Relying on the capabilities of its expert forces, this company has always been a leader among the industries of the country.

There is a special opportunity for the development of the agricultural industry in Iran due to the country's climatic and geographical situation and the need for non-oil exports.

Considering the traditional growth of the agricultural industry, which causes the country's water storages and energy resources to be wasted, this group has entered into the design of agricultural industrial systems, and in this regard, GREENMAN has been established as a new department. GREENMAN is proud to be present in all fields of engineering design and equipment manufacturing by relying on its capabilities in engineering, research and development, product production and process optimization.

Our field of activity include the following:

- Heating, cooling, ventilation and humidity facilities
- Water treatment and irrigation facilities
- Carbon dioxide enrichment system
- Energy systems and optimal design
- Climate control system, electrical engineering and artificial lighting
- Cold storage and product storage



Scan to Visit the GREENMAN Website



About Greenman

GREENMAN specializes in agriculture and industrial greenhouses. Considering the importance and delicacy of greenhouse issues, this group is proud to cooperate with a group of expert and experienced engineers in the fields of engineering and agriculture. Some of the engineering services provided by GREENMAN are as follows:

- Design and modeling of cooling, heating and air conditioning systems with specialized greenhouse standards using ANSYS FLUENT, TRNSYS and ENERGYPLUS software and...
- Designing all parts of CO₂ dosing system according to the conditions of greenhouse cultivation and structure
- New greenhouses design with special and energy-optimized systems using ANSYS FLUENT, TRNSYS software and the home made code developed exclusively in GREENMAN
- RO water treatment system design and fertilizer and chemical dosing package
- 3D modeling and presentation of piping maps for greenhouse facilities





PLANTA



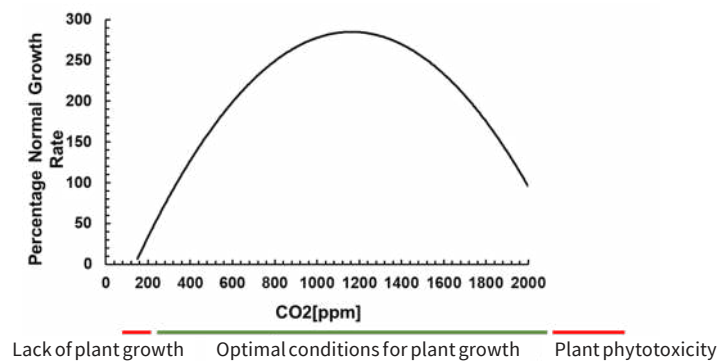
PLANTA

Carbon dioxide dosing and condition monitoring system

After about 40 years of experience in the field of heating industry, especially steam and hot water boilers, Packman Company started its activity in the field of manufacturing burners with the Raadman brand since 2011. Achieving optimal and low-polluting combustion on the one hand and the country's importance in the development of greenhouses and the need to consume carbon dioxide on the other hand, prompted this group to design and produce carbon dioxide enrichment packages by using local experts and creating the necessary technical knowledge.

This technology with the brand name PLANTA can be offered to respected customers in 10 capacity models from CFM 300 to CFM 4500. One of the most important features of the device is to increase photosynthesis and thus increase the growth of plants, as well as reduce the emission of carbon dioxide pollutant to the environment by optimally using it to provide the energy source needed for plant growth.

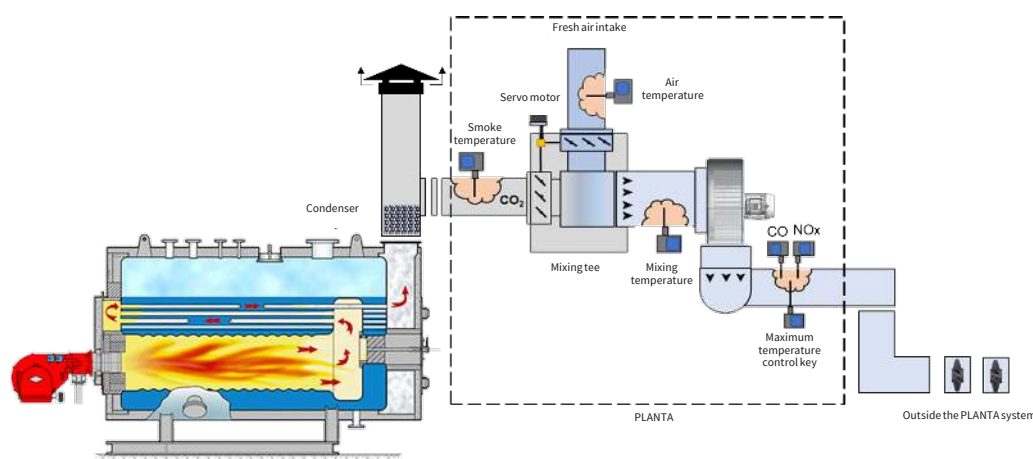
During photosynthesis, plants convert water and carbon dioxide in the environment into glucose and oxygen with the help of sunlight. Then the produced glucose is used as a source of energy for growth. The amount of carbon dioxide in the environment is around 400 ppm. Any crop growing in a fully enclosed greenhouse with little or no ventilation can reduce CO₂ levels to 200 ppm during the day. This will have a significant negative impact on products. Increasing CO₂ concentration to the optimal value leads to an increase in the growth rate of plants, as shown in the diagram. This amount will change according to the type of plants in the greenhouse.





Also it should be mentioned that CO₂ excessive concentration causes poisoning of plants. In order to achieve a carbon dioxide concentration of 1000 ppm in the greenhouse, it is necessary to inject 0.003 m³/h per square meter, according to ANSI-ASABE EP- 406.4 standard. Also, the injection rate will be 0.0045 m³/h for each square meter, in order to achieve a concentration of 1500 ppm. Hot water or steam boilers are one of the sources of carbon dioxide supply. In these boilers, fuel (for example, natural gas) is combined with air and carbon dioxide is produced after combustion. This rich source of carbon dioxide can be used to supply plant food if this combustion is perfect and free of carbon monoxide and NO_x oxide emissions and has a suitable temperature. PLANTA receives the rich source of carbon dioxide contained in the combustion products of the boiler and condenser, and sends it to the greenhouse after mixing with air and diluting the mixture

Note: Carbon dioxide dosing systems have only the task of providing the diluted mass with the appropriate temperature and pollution in their output, considering the differences in the dimensions of the greenhouses and the uncertainty of the injection routes from the boiler room to the greenhouse.

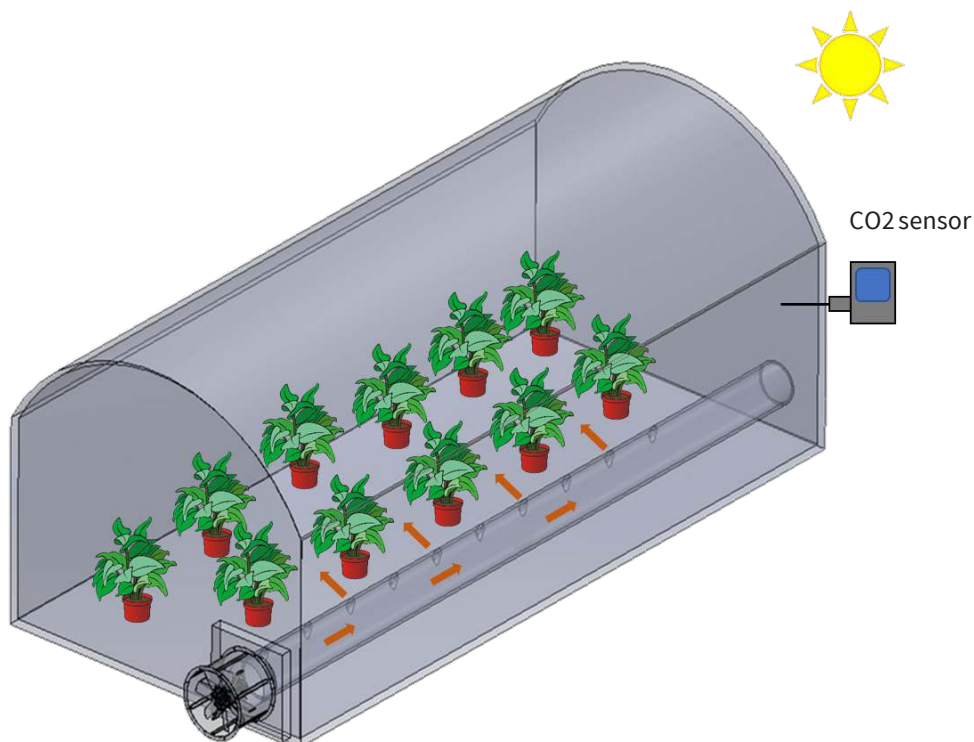


Device features

- Receiving the carbon dioxide injection command from the central climate control system as a 24V-DC digital signal
- CO/NO detector to protect plant health
- Safe flue gas temperature control to be sent to the greenhouse through the combination of the fresh air with the ambient air



- Thermostat to control the maximum output temperature
- 316 stainless steel fan and body, to resist corrosion caused by condensation of combustion products
- The mixing box is made of stainless steel 316 and has two flue gas and air inlets, equipped with two dampers to adjust the inlet flow rate
- Electrical Control panel to control and adjust all the parameters of the CO₂ to the greenhouse
- Touch screen to view and adjust system control parameters
- The ability to connect to the Packman condenser



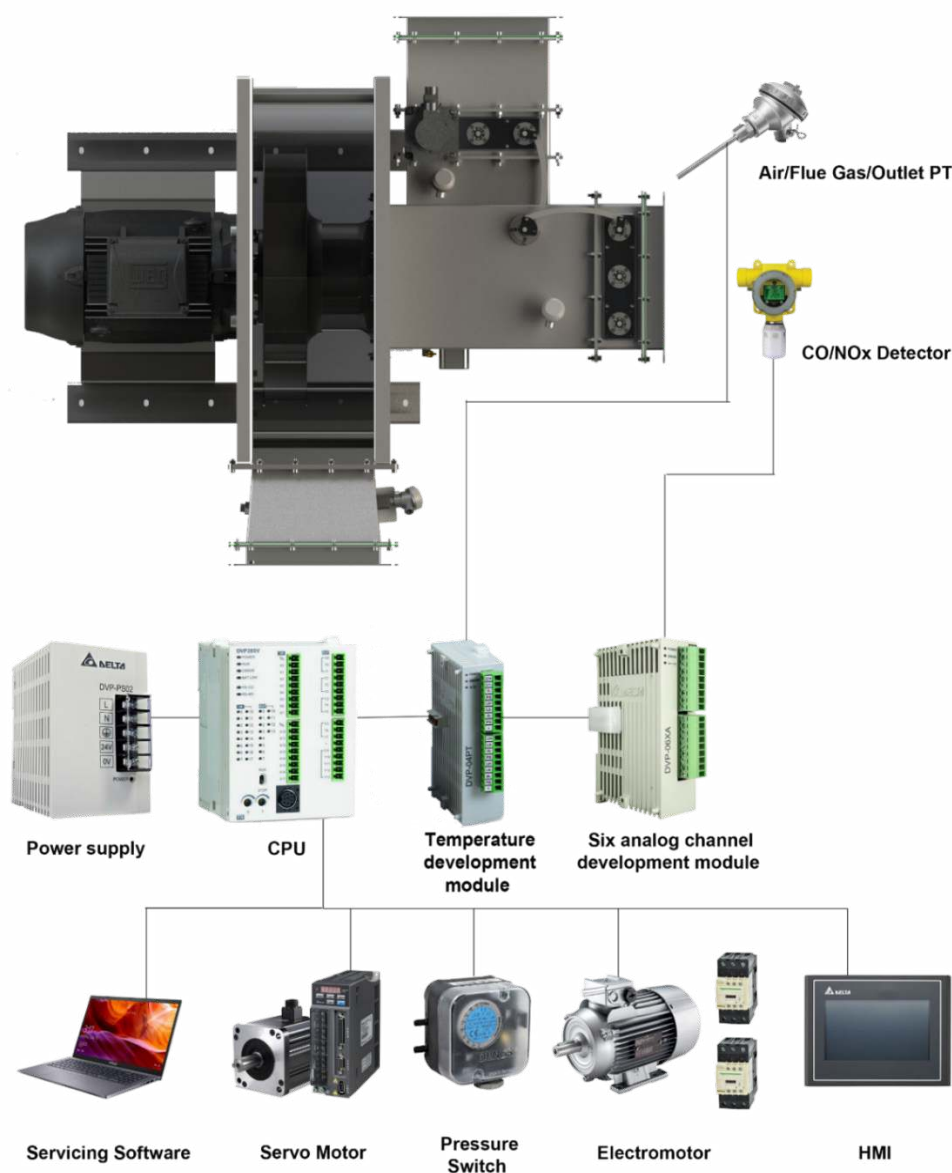
Control system performance

PLANTA control panel is designed to continuously monitor the gas temperature and the concentration of exiting pollutants. Outlet gas temperature is regulated by controlling the air and smoke flow rate passing through the dampers located in their entrance path. The smoke damper control is done through the servo motor connected to it, which is under the command of the control panel. The air damper is controlled through a mechanical mechanism connected to the smoke damper. Therefore, both dampers are controlled by a servo motor.



The mass is directed to the outlet through the blower, and in this section, the amount of polluting compounds from the system is continuously measured. The system will be shut down if the concentration of pollutants exceeds the permissible limit and necessary warnings are transmitted through control panels.

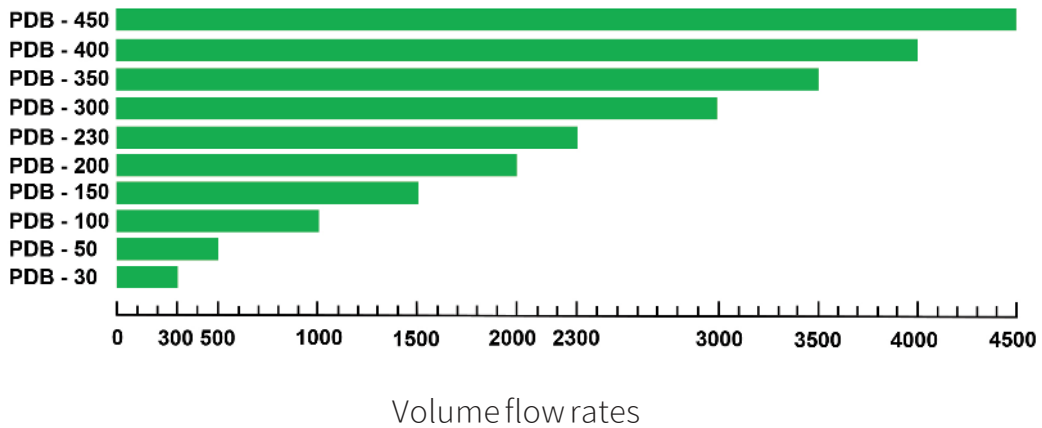
The PLANTA panel is defined in two access levels. The primary access level is specific to the user. At this level, the output temperature of the system can be adjusted and it shows the maximum allowed amount and the actual amount of carbon monoxide and NOx pollutants, the temperature of the fresh air entering the PLANTA system, as well as the temperature of the boiler smoke. Second access level is for advanced settings and special experts.





Manufacturing capacity

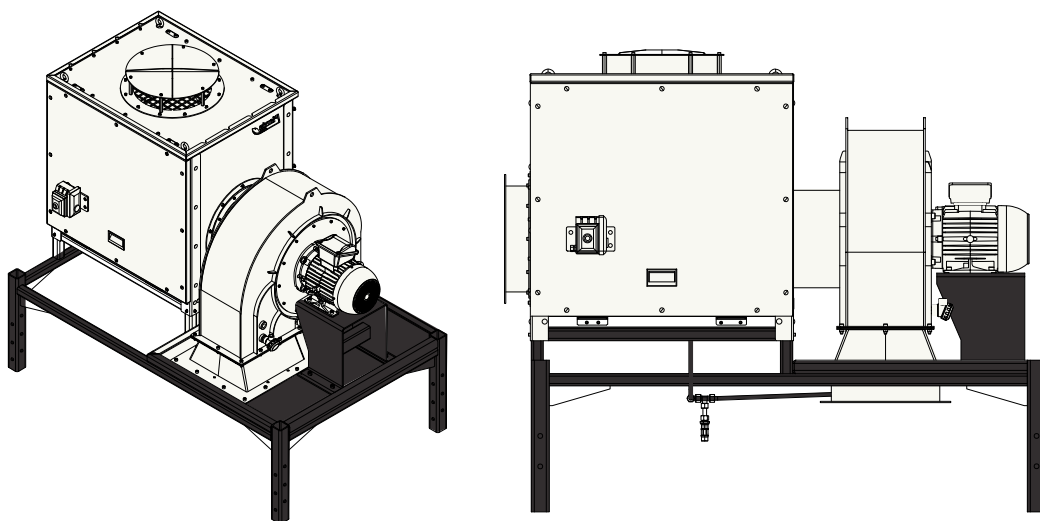
The capacity ranges of the PLANTA system are given in the following diagram. Capacities off the chart are custom made.



Conclusion

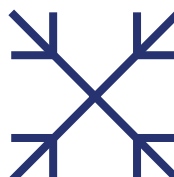
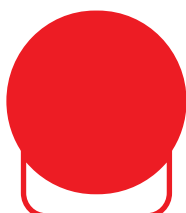
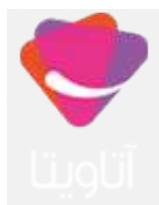
PLANTA has a dual function in improving the conditions of greenhouse plants. In such a way that it will not only increase the concentration of carbon dioxide in the environment of the greenhouse, but it can also be used to provide heat to the greenhouse in the cold seasons of the year.

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Some Of Our CUSTOMERS





PACKMAN GROUP

History

The Packman Company was founded in February 1975, and was soon afterwards registered in companies Registration Office. In early years the Packman construction and service branch focused on building installations. Different mega power plants were built by cooperating with Brown Boveri and Asseck companies in 1976.

The company started its official activities in construction of High-Pressure Vessels such as Hot-Water Boilers, Steam Boilers, Storage Tanks, Softeners and Heat Exchangers from 1984.

Packman Company is one of the first companies which supplied the high quality and standard hot water boilers to the customers.

Packman has exported its products to countries such as Uzbekistan, United Arab Emirates and other countries in the Middle East. It is one of the largest producers of hot-water and steam boilers in the Middle East.

Now we are proud to announce that the Packman industrial group has five major sub-brands that have product titles in all field of HVAC equipment and engineering services, and we do not know this success except with the help and support of our customers.

1. Construction Services Industry Association
2. Industry Association
3. Construction Companies' Syndicate
4. Technical Department Association
5. Mechanical Engineering Association
6. Engineering Standard Association

Departements:

Sales Deps:

- ∩ Power Plant & Petrochemical
- ∩ Industrial
- ∩ Hospitally Service
- ∩ Commercial & Residential
- ∩ Sport Complex & Pool

Technical Deps:

- ≡ Manufacturing R&D
- ≡ Innovation Center
- ≡ EPC Execute Unit
- ≡ Product Develop Unit
- ≡ Sales Engineering Dep.

Others:

- ≈ After Sales Service
- ≈ Project Control
- ≈ Financial Office
- ≈ Commercial Office
- ≈ Marketing Department



PACKMAN GROUP Brands



PACKMAN
Industrial Group

Designer & manufacturer of Condensing, Hot Water, Steam, Hot Oil & Waste Heat Boilers, Heat Exchangers, Autoclave Pressure & Storage Vessels & etc



GREENMAN
Green mindset, green future

Engineering & Designing Commercial Greenhouse Plant, CO2 Dosing System, Flue gas Condenser & Special HVAC Systems, Sustainable Agriculture & etc



ROMAN
Water solution

Designer & manufacturer Reverse Osmosis Plant & Package, Water Treatment, Softener & Filters and Chemical Dosing Systems & etc



RAADMAN
a look to the future

Designer & manufacturer of Industrial Mono & Dual Block Gas, LPG, Light & Heavy Oil Burners, Premixed & Postmixed Burners, Watertube burners, Process burners, Special application burners & Combustion Solutions & etc



CHILLMAN
Coolest hvac around

Designer & manufacturer of Air & Water Cooled Chillers, Air Handling Units, Fancoil, HVAC Equipment, Cold Storage Room & etc



1. Isfahan Factory



2. Vilashahr Factory



3. Parand Factory



4. Parand (2) Factory



5. Bonyad Factory



SOME OF Certificates are



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ROMAN
Water solution



RAADMAN
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+9821-42362

www.greenmanco.com

No 14, 10th Alley, Beyhaghi St, Argentina Sq, Tehran, Iran