PERFECT TECHNOLOGY MAKES THE DIFFERENCE

JUDO REFERENCES

judo® Water Treatment

JUDO Filtration systems

More than Up-to-date Filter technique

Filter Types

JEF-F	for decolouring
JEF-E	for deferrization
JEF-M	for demanganization
JEF-S	for deacidification
JEF-AK	for improvement od adour and taste

The modular use of different pre- and post-treatment steps renders possible the production of drinking water and process water from the most different sources, for example surface water that is charged with suspended solids, heavily polluted well water, brackish water, or seawater.

In combination with flocculation, sedimentation, filtration, and sterilization as well as the most up to date ion exchange – and membrane methods JUDO produces a made-to-measure water quality.

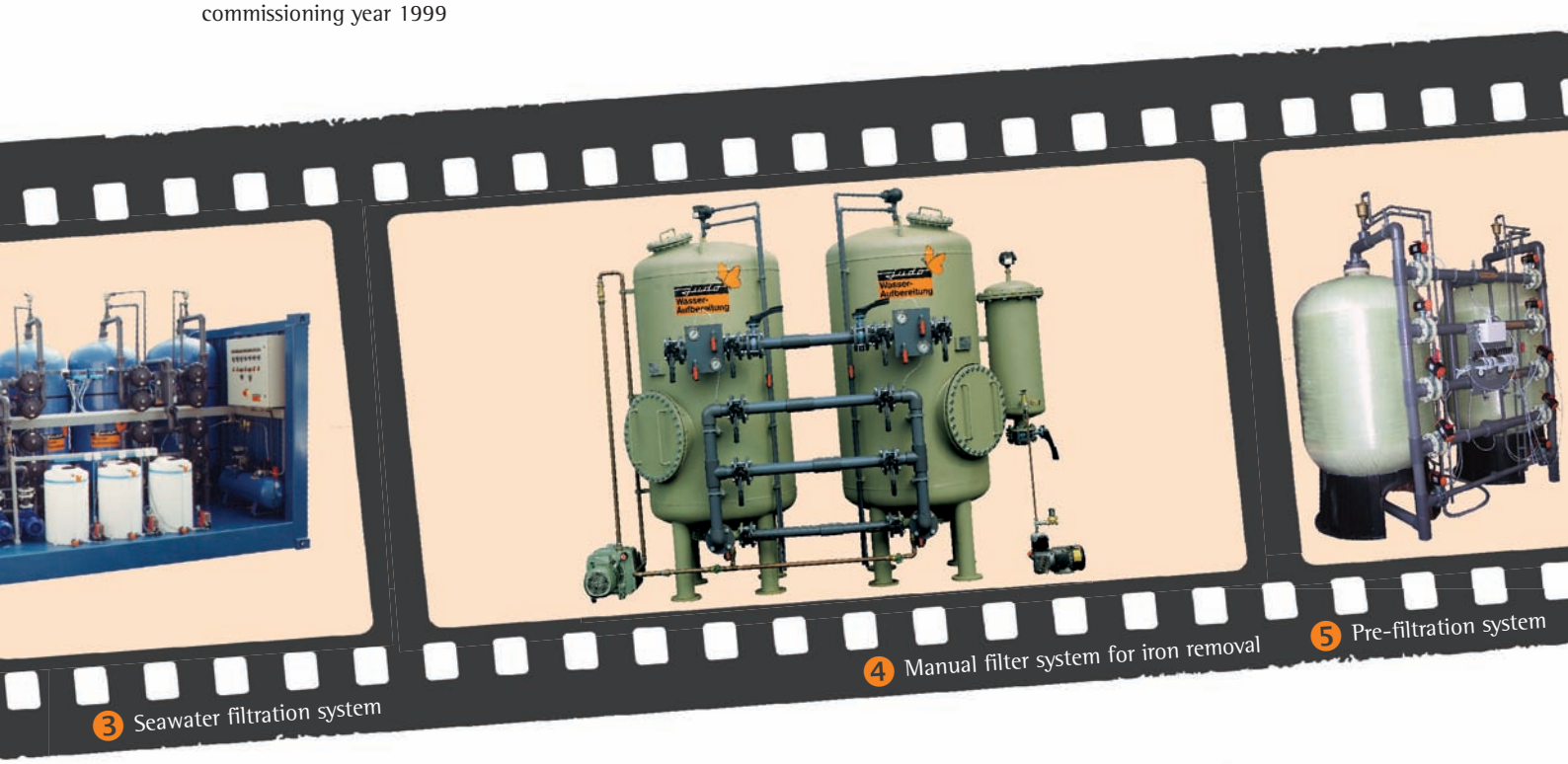
Concerning the treatment it has to be mentioned in the first place the deferrization and the demanganization of the water, followed by the de-colourizing respectively the clear filtration and deacidification. In order to optimize the water quality, among others, the adsorption method of undesireable coloring substances, as well as of substances that detract from the taste and the odor is employed via activated carbon filters.

1 Plate settler

2 Seawater filtration system

Filtration References

1. **Stud Talihoh, Krefeld (Germany)**
   Plate settler for the Pre-filtration
   commissioning year 2002
2. **Seawater Filtration System, Diwanja (Nigeria)**
   Seawater filtration system
3. **Fish Factory, Lake Victoria (Kenya)**
   Seawater filtration system
   commissioning year 1999
4. **E-Series for a water-work (Germany)**
   Manual filter system for iron removal
   commissioning year 1995
5. **Knauf, Teheran (Iran)**
   Pre-filtration system for a reverse-osmosis plant
   commissioning year 2001



Water-work, Wrzesnia (Poland)

Renewal of the existing water treatment unit

The flow rate capacity of the water treatment unit is variable between 80 and 320 m³/hour.

Procedual steps

1. Oxidation by means of oxygen transfer: for the oxidation of dissolved iron, and for the oxigenation of the water.
2. Oxidation by means of potassium permanganate dosage: for the oxidation of the dissolved manganese, and for the development of a manganese dioxide layer
3. Multi-media-filtration: for the filtration of undissolved impurities, dual-street multi-media filtration plant, each with three filter units, diameter 2.200 mm.
4. Disinfection: dosing of sodium hypochlorite solution for the prophylactic sterilization.

Pictures of the water-work

1. **Filter base**
2. **View in the water-work**
   Picture with the filter vessels and pressure pumps
3. **View in the water-work**
   Picture with the filter vessel and the filter connection
4. **Control board**
   Easy control of the unit with an clearly arranged control board

Water-work Wrzesnia

JUDO Desalination systems

Via ion-exchange

1 Partial demineralization unit

2 Multi-stage demineralizatio

Desalination References

1 Partial Demineralization

JUDO partial demineralization unit with additional softening unit as comapct 40” container mounted ready for opeartion.

2 Research center, Berlin (Germany)

Multi-stage fully automatic JUDO demineralization equipment in a research institute to supply various water qualities.

3 Henkel, Herborn (Germany)

Desalination unit
commissioning year 2005

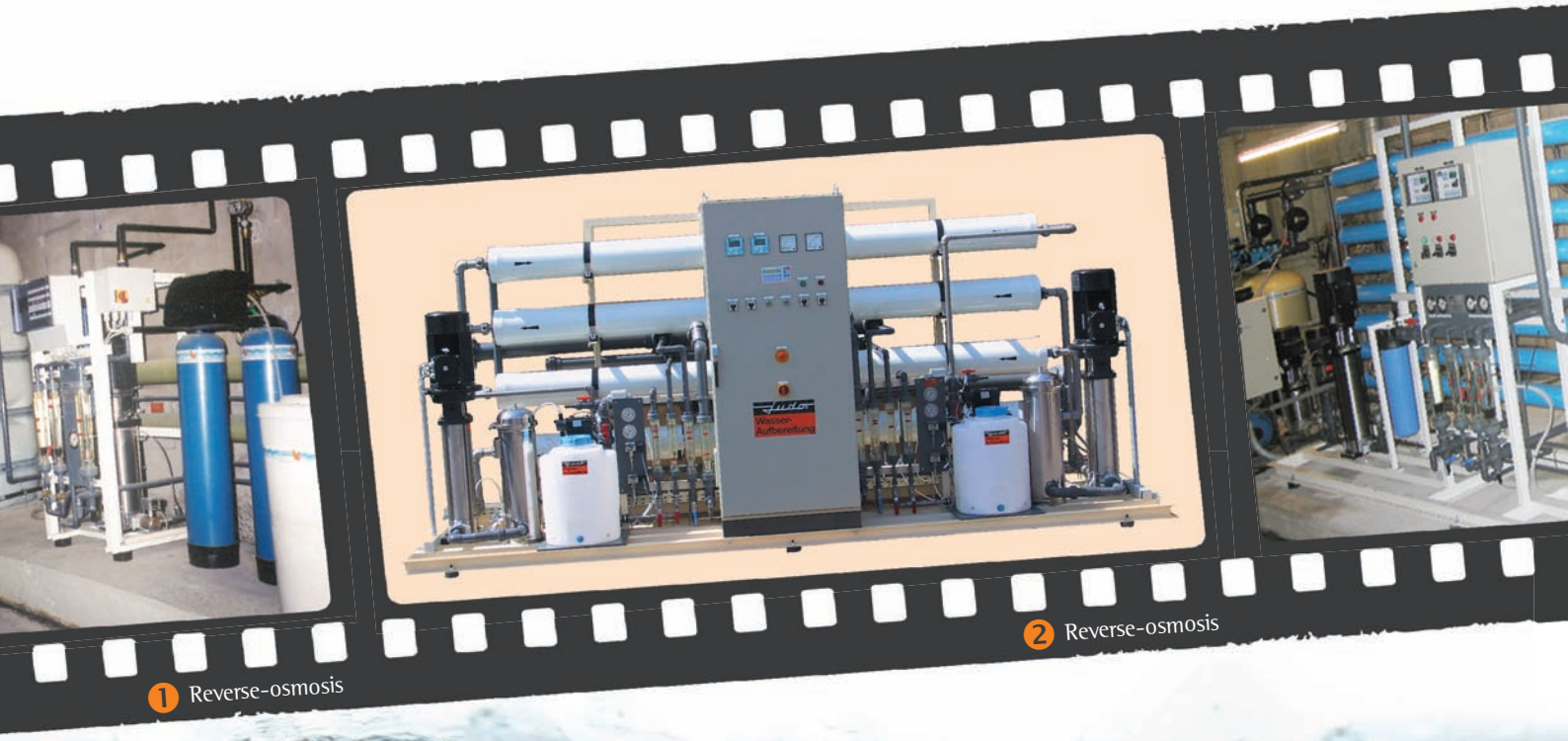
3 Desalination unit

JUDO Reverse-osmosis

Innovative and economical

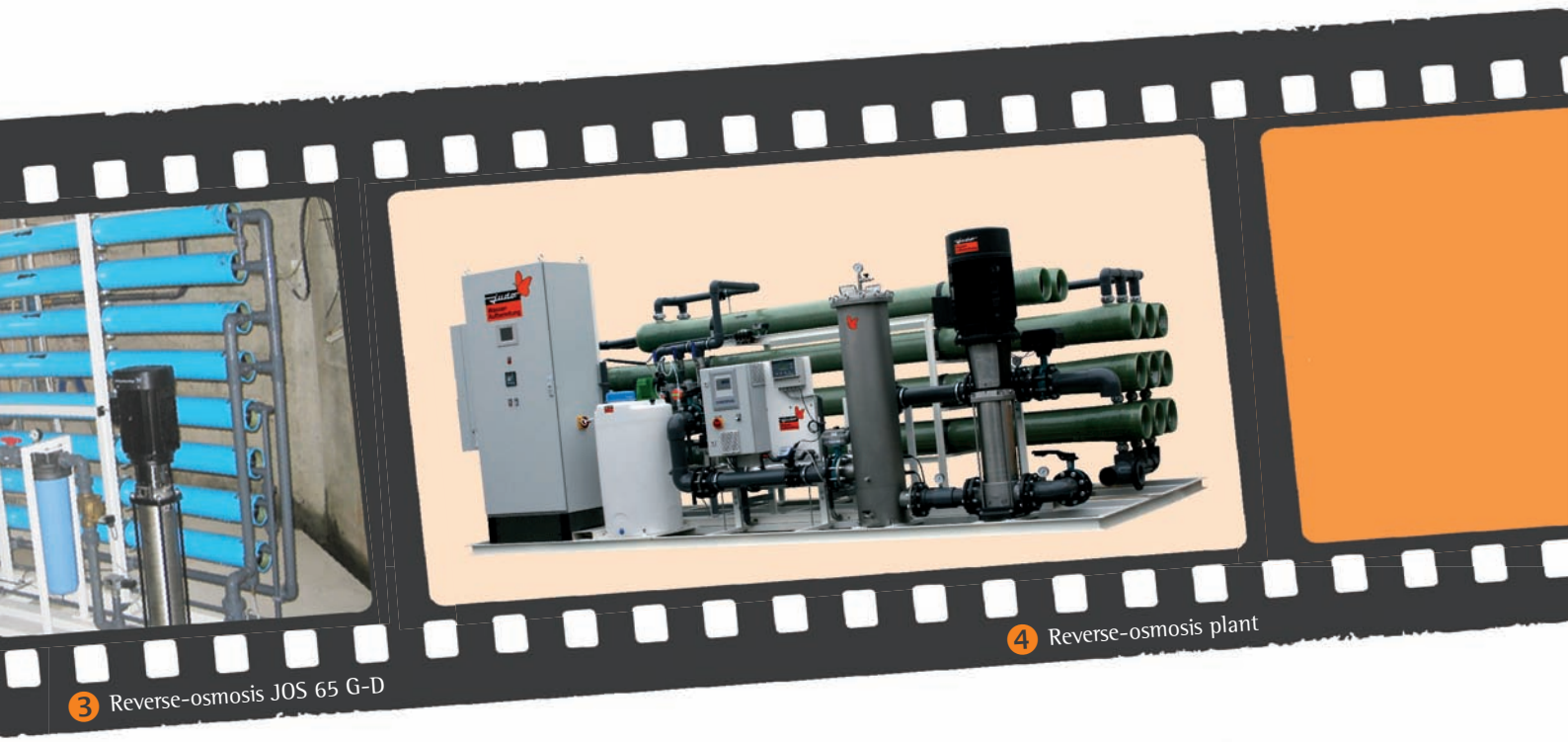
The process of reverse osmosis is a well tried, environment minded, extremely rational method of removing dissolved salts from natural water. Desalination takes place in a purely physical way which means that chemicals are only required in limited amounts for any pre- or post-treatment which may be required. Desalination is via semipermeable membranes which, by reason of their structure, retain dissolved salts and also organic substances, bacteria and viruses. The pure water thus produced is available in continuous supply and any waste water can be led to the drainage system without further treatment.

JUDO reverse osmosis systems with modern, energy-saving low-pressure membranes are compact units ready for connection, which are used for the continual, environmentally friendly production of desalinated water. A well-known principle found in nature, "natural osmosis", is reversed in this process, in order to separate out the salts and other materials dissolved in the water by means of corresponding pressure and semi-permeable membranes. The water quality that can be achieved in this way now allows conventional desalination systems using acid and caustic soda on the ion-exchanger principle to be largely dispensed with. JUDO reverse osmosis systems with stepped permeation can also achieve residual conductivities of below 10 to 5 µS/cm. JUDO reverse osmosis systems are in successful use in steam boilers, cooling and air-conditioning technology, glass-dishwashing machines, laboratories and for process water – in short, everywhere where special demands are placed on the water quality, improving the efficiency of existing systems. Computer-assisted design by our experts ensures the optimum co-ordination of pump pressure, membrane area, residual conductivity and system yield.



Reverse-osmosis References

1. **AOK Health Fund, Stuttgart (Germany)**
   Reverse-osmosis for the cooling system
   commissioning year 1999
2. **Knauf, Teheran (Iran)**
   Reverse-osmosis
   commissioning year 2001
3. **Botanical Garden, Frankfurt (Germany)**
   Reverse-osmosis JOS 65 G-D for the irrigation system
   commissioning year 2005
4. **Fiducia, Rheinstetten (Germany)**
   Two reverse-osmosis plants for the cooling-systems
   of a data processing center
   commissioning year 2007



3 Reverse-osmosis JOS 65 G-D

4 Reverse-osmosis plant

JUDO Seawater desalination

Argyropoulos, Ithaki (Greece)

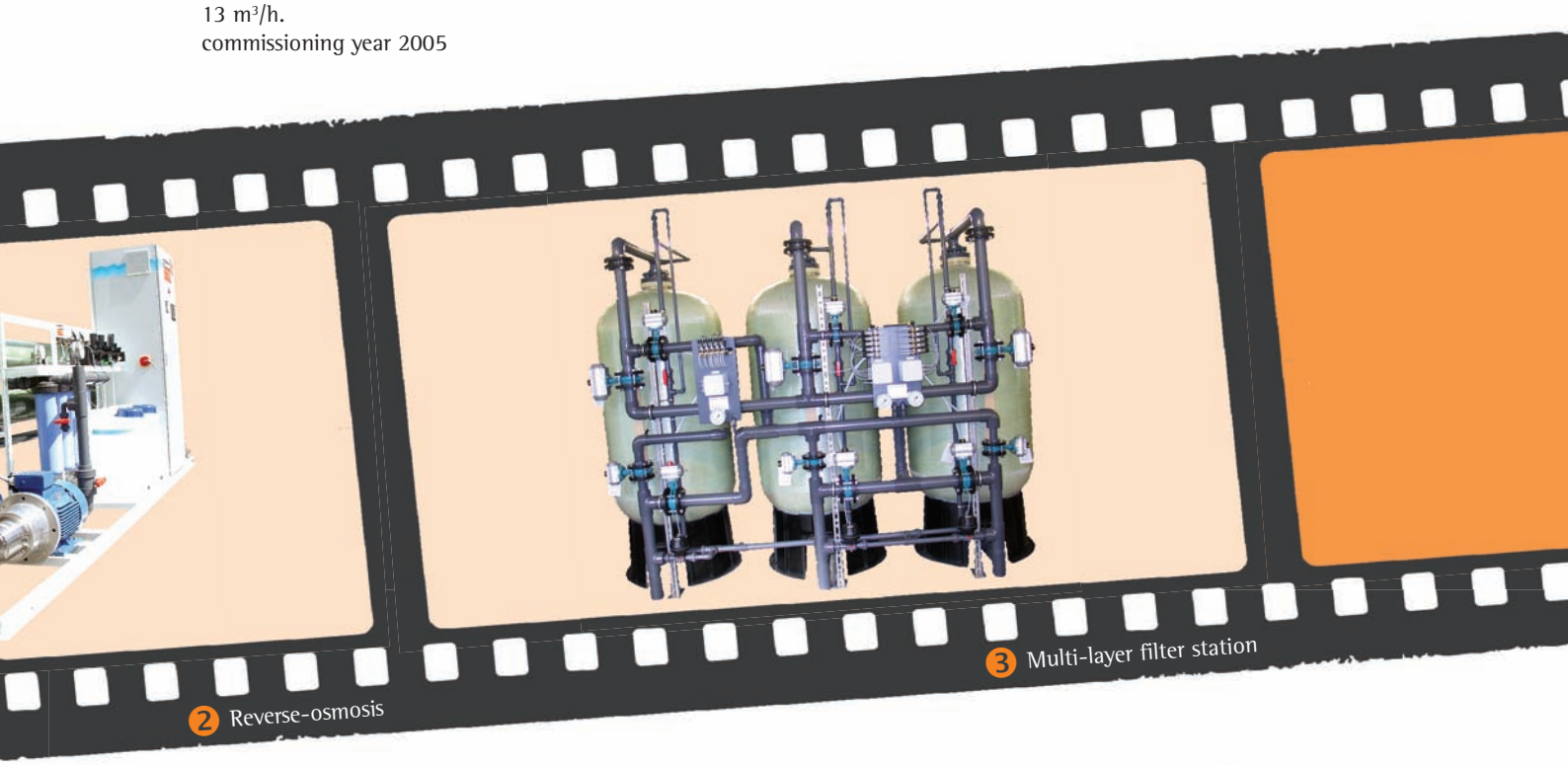
Pre-Treatment
Multilayer-Filter-Station consisiting of 2x JEF-MF 90 K-A. Automatic Multi-Media Sand Filter with each flow rate 6 - 8 m³/h and JEF-AK 90 K-A Activated-Carbon-Filter with flow rate 13 m³/h.

Reverse-osmosis
JUDO reverse osmosis unit for the desalination of pretreated clear, iron and manganese free seawater. The system produces 100 m³/day (23 hour) Permeate.

1 Country estate Agyropoulos (middle)

Pictures of the desalination plant

1. **Country Estate Argyropoulos**
2. **Reverse-Osmosis Unit**
   The system produces 100 m³/day (23 hour) Permeate.
   commissioning year 2005
3. **Multi-Layer-Filter-Station**
   Automatic Multi-Media Sand-Filter with each flow rate 6 - 8 m³/h and Activated-Carbon-Filter with flow rate 13 m³/h.
   commissioning year 2005



JUDO Seawater desalination

Stavros, Ithaki (Greece)

1 Country of Stavros unit

Pictures of the desalination plant

1. **Country of the Stavros unit**
2. **Filter system**
   The Pre-filtration system produces 22 m³/hour commissioning year 2006
3. **Post-treatment**
   Post-treatment consisting of a hardness regulation system with intermediate storage tank for drinking water and safety chlorination dosing pump unit. commissioning year 2006
4. **Control panel**
   Easy, worldwide and fast control of the desalination system.

JUDO Seawater desalination

Kioni, Ithaki (Greece)

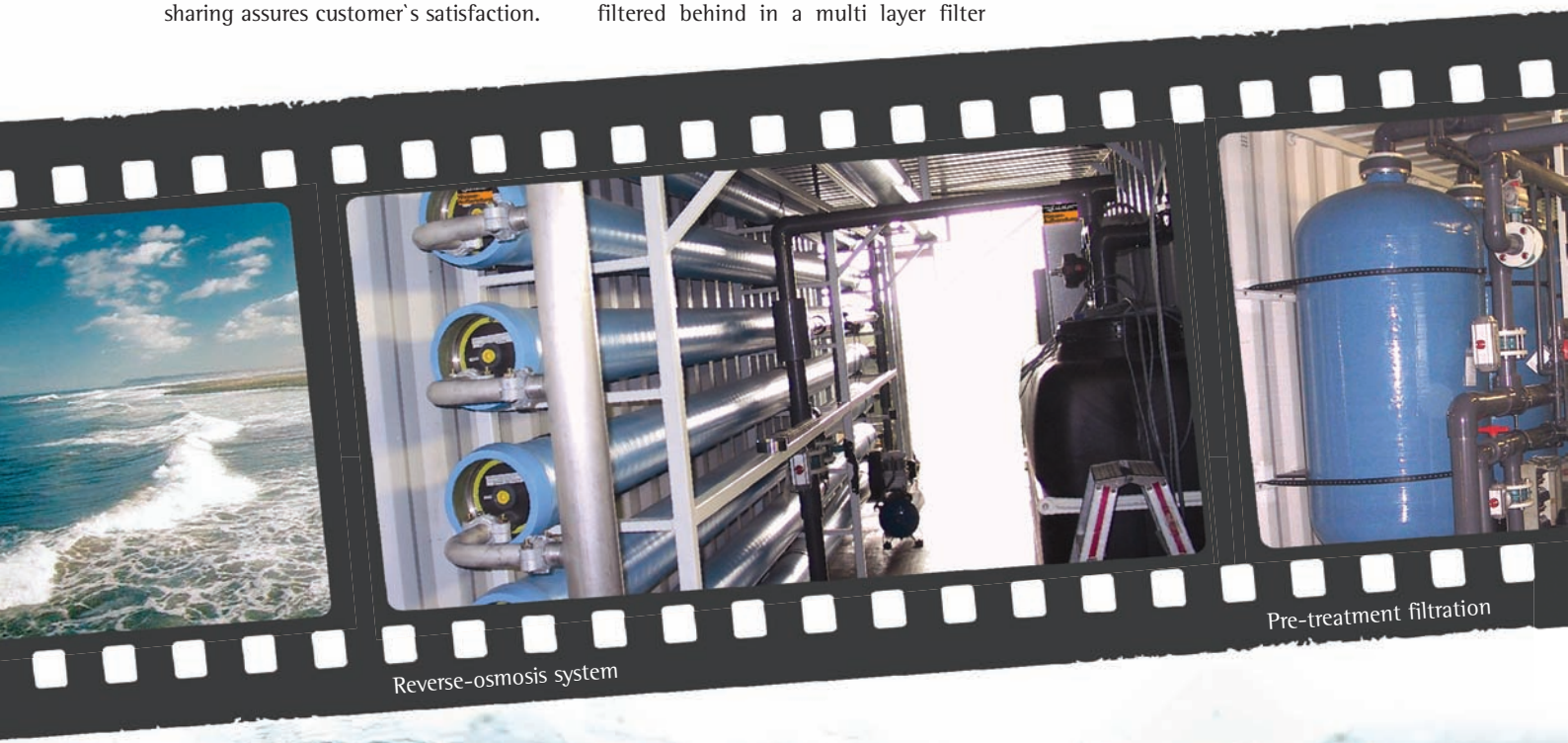
JUDO is more than just delighted to supply two modern and tailor made skid mounted sea water desalination units (capacity 120 and 500 m³ per day) to the community of Ithaca. The contract was signed in an official ceremony by the Mayor of Ithaca Mr. Karabias Tilemaxos and Mr. Hartmut Dopslaff CEO of JUDO Water Treatment, Germany. Furthermore, it has to be pointed out that JUDO`s local partners represented by Mr. Nikolaidis and Mr. Kouratos in charge of after sale services, spare parts supply, maintenance, and engineering, have done an outstanding job. This partnership that is build on trust and knowledge sharing assures customer`s satisfaction.

Desalination Process

Two sea water desalination plants, which are completely build in containers, were delivered and installed: One unit with a capacity of 500 m³/day in Vathi and a second unit which supplies 120 m³/day at the site of Kioni.

The sea water is either pumped through centrifugal pumps directly out of the sea (Kioni) or with submersible pumps out of concrete shaft, which has a hydraulic connection to the sea (Vathi).

The pre-treatment stage starts with optional dosing of disinfection and flocculation agents. Suspended solids and other undissolved impurities are filtered behind in a multi layer filter stage. An activated carbon filter station follows to prevent oxidizing agents to cause damages in the desalination stage. A further pre-treatment is dosing of sulphuric acid and antiscalant to stabilize all kinds of dissolved salts in the sea water which can cause membrane scaling. The pre-treatment is completed with cartridge filters that remove all residual particles with a size of more than 1 micron. The desalination itself takes place in a reverse osmosis unit, were the pre-treated water is pressed with nearly 70 bars through semipermeable membranes. The sea water is separated in one stream called permeate with a low salt



content. The permeate is used as a good quality drinking water, and the brine is flushed back to the sea.
The high pressure pump system - used to pressurize the water - includes an energy recovery system, which recovers the pressure energy of the brine stream, so that the power consumption is reduced up to 35%. A post-treatment follows the desalination.
To increase the hardness to a comfortable value for drinking water, it flows through a bed of calcium carbonate gravel with a higher inner surface. The hardness can be adjusted by the pH-value of the pretreatment or the calcium carbonate gravel bed.
As the last step, a safety chlorination takes place, to prevent bacterial growth in the drinking water storage tanks. The complete desalination process is designed to reach an optimum of low energy and chemicals consumption as well as a good drinking water quality.
All process stages are automatically controlled by a state of the art PLC-System. Important information as sea water and drinking water quality or flow rates are visualized on a PC at the site of Vathi.

Seawater desalination in Kioni

JUDO Seawater desalination

Vathi, Ithaki (Greece)

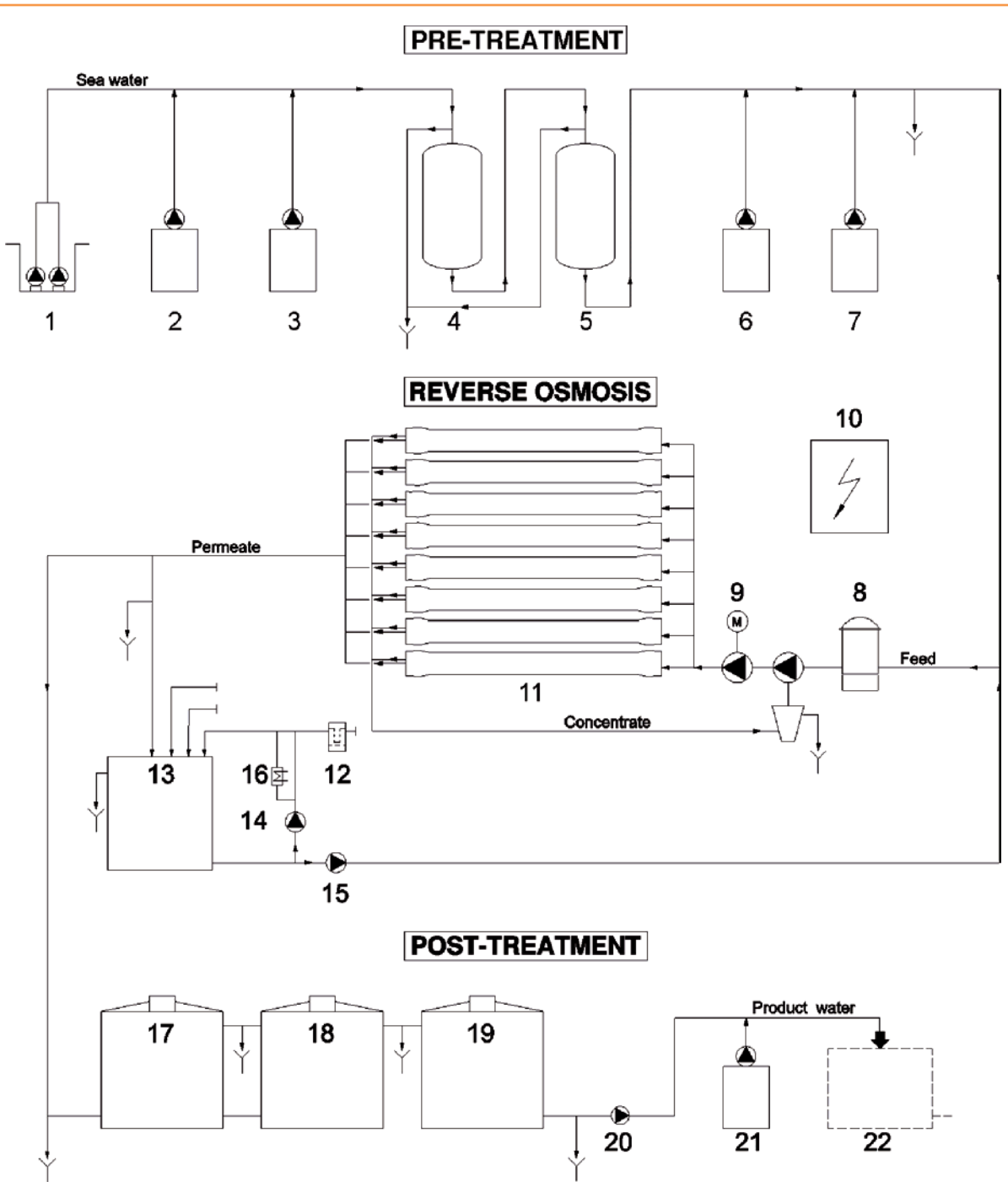
Pre-treatment filtration system

Reverse-osmosis system

Seawater desalination in Vathi

JUDO Seawater desalination

Flow sheet from Vathi and Kioni, Ithaki (Greece)



Legend:

1. sea water pump station
2. disinfection dosing unit
3. flocculation dosing unit
4. multi layer filter station
5. activated carbon filter station
6. pH-correction dosing unit
7. anti-scalant dosing unit
8. cartridge filter 1 microner pump station
9+10. high pressure pump with energy recovery system
11. reverse osmosis membrane stack
12. cartridge filter (chemical membrane cleaning system)
13. permeate flushing and membrane cleaning tank
14. chemical cleaning pump
15. permeat flushing pump
16. heater (chemical membrane cleaning system)
17+18. hardness regulation system
19. intermediate storage tank for drinking water
20. pressure booster pump for drinking water supply
21. safety chlorination dosing pump unit
22. (public) drinking water tank

Coal Mine, Kattowice (Poland)

Customized solution by JUDO

The plant is a customized solution, developed for a coal mine in Kattowice (Poland). Conception, planning, installation, and service - all from a single source - JUDO.
In this specific application more than 3.000 m³ per day (800.000 gpd) of strongly polluted mine water are pumped from a maximum depth of 1.100 feet and then it is processed in a multistage water treatment plant.
The treatment process starts with aeration, flocculation, and sedimentation followed by filtration, adsorption, and desalination of the polluted water. JUDO combines traditional processes and state of the art water treatment technology to manufacture customized solutions that most often exceeds the expectations of our customers. The described plant in Kattowice produces 1.500 m³ (400.000 gpd) potable water and 1.500 m³ (400.000 gpd) demineralized process water per day.
Particular attention is paid to environmental and ecological concerns to ensure minimal usage of chemicals and maximum water recovery.
The total water capacity produced by this plant would be enough to satisfy the drinking water need of a European city with a population of approximately 30.000 people.

Pictures of the plant

1 **Oxidation and flocculation**

Oxidation and flocculation by aeration followed by dosing of caustic soda (NaOH) and flocculation agents.

2 **Flocculation and sedimentation**

Flocculation within the reaction tank followed by sedimentation in a lamella separator.
Flow rate 200 m³/h (880 gpm)

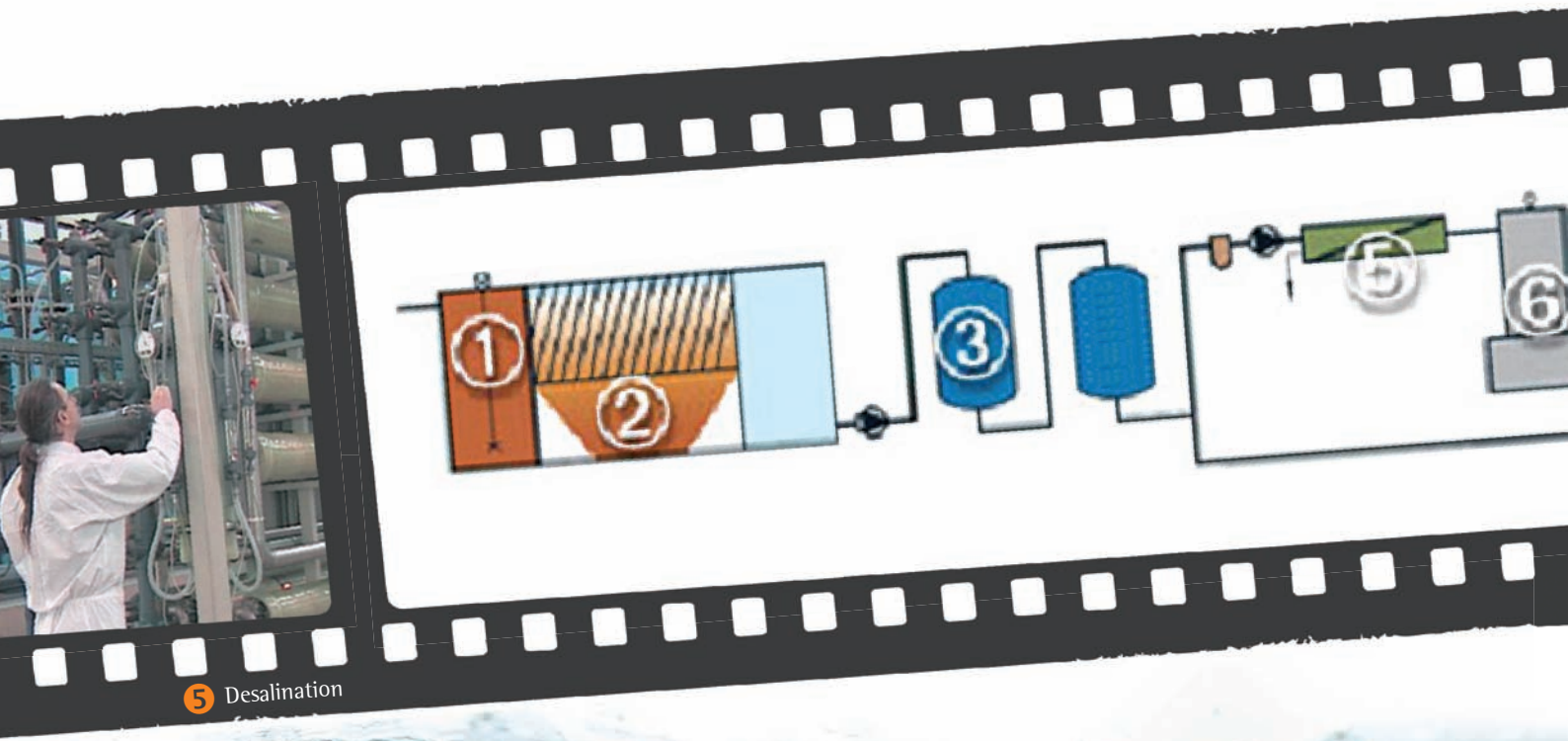
3 **Filtration and adsorption system**

Filtration and adsorption through multi-layer filters followed by an activated-carbon filter stage.
Flow rate 200 m³/h (880 gpm)

Customized plant in overview

Coal Mine, Kattowice (Poland)

Customized solution by JUDO



5 Desalination

Pictures of the plant

5 Desalination

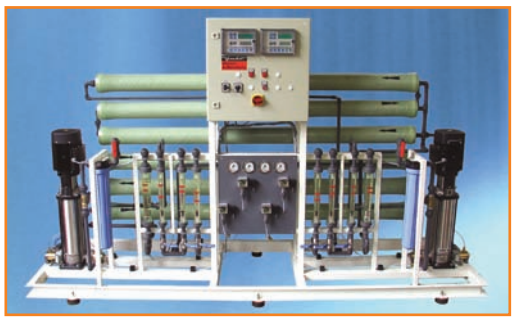
Desalination by reverse-osmosis followed by stripping of surplus carbonic acid.
Permeat flow 110 m³/h (485 gpm)

6 Softening

Softening by ion exchange.
Flow rate 90 m³/h (396 gpm)

7 Hardness regulation

WATER CULTURE AT ITS BEST



Reverse-osmosis

Seawater desalination
500 m³/day

Purification of surface water

Water works 5.000 m³/day

Decarbonization and softening by ion-exchange

Reverse-osmosis
3.000 m³/day

Quality
made
in Germany

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Water
Treatment

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JUDO quality management
We are certified according ISO 9001:2000

We reserve the right to make technical changes

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