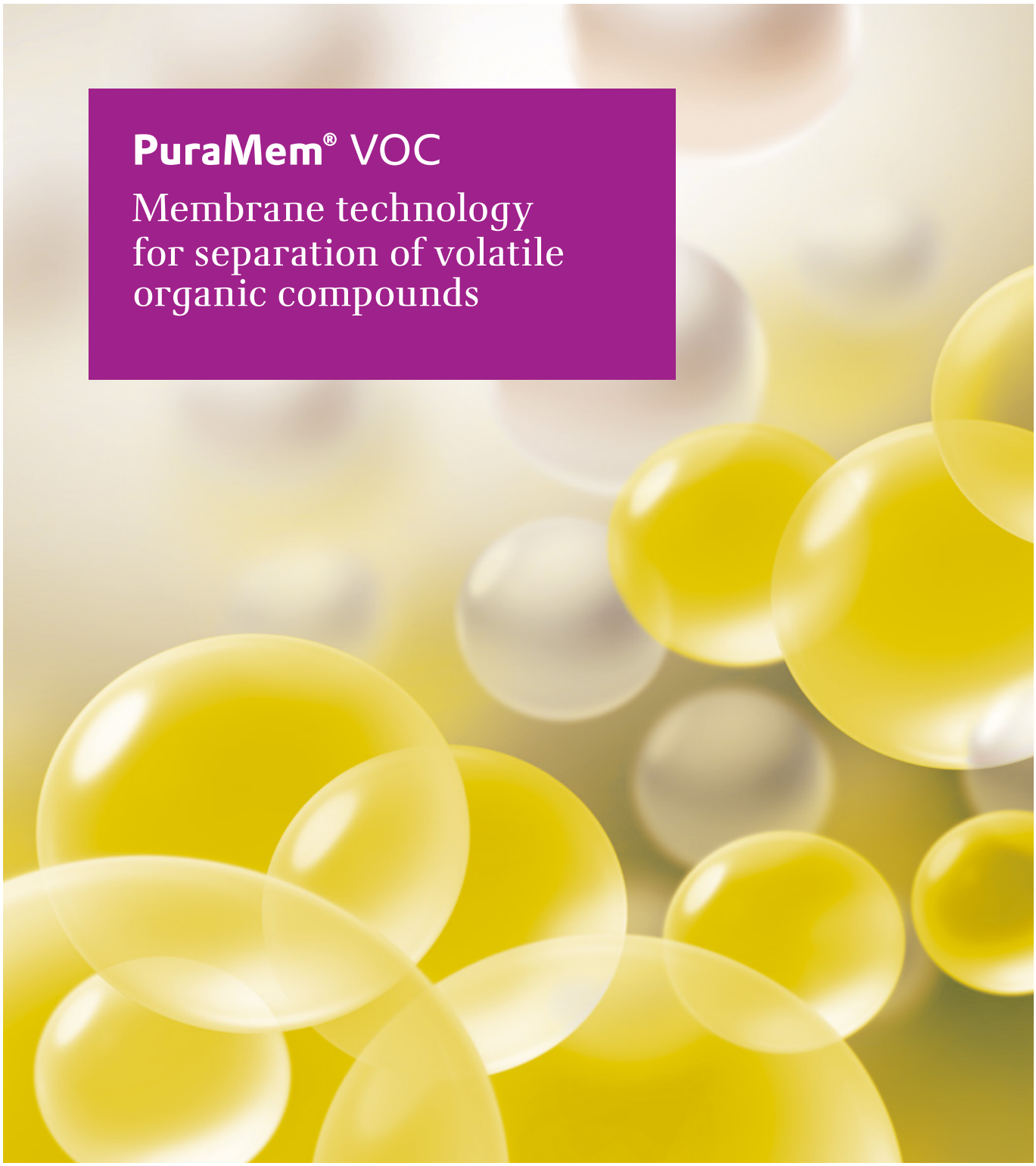

PuraMem® VOC

Membrane technology for separation of volatile organic compounds

EVONIK
Leading Beyond Chemistry

EVONIK IS ONE OF THE WORLD LEADERS IN SPECIALTY CHEMICALS. THE COMPANY IS ACTIVE IN MORE THAN 100 COUNTRIES AROUND THE WORLD. EVONIK GOES FAR BEYOND CHEMISTRY TO CREATE INNOVATIVE, PROFITABLE AND SUSTAINABLE SOLUTIONS FOR CUSTOMERS.

MORE THAN 32,000 EMPLOYEES WORK TOGETHER FOR A COMMON PURPOSE: WE WANT TO IMPROVE LIFE, DAY BY DAY.

With our polymer-based membranes for efficient gas separation and organophilic nanofiltration, SEPURAN® and PuraMem®, we offer high performance solutions for your business.

The brand PuraMem® stands for spiral wound membrane modules with excellent robustness that enable highest purity.

Evonik. Leading beyond Chemistry.

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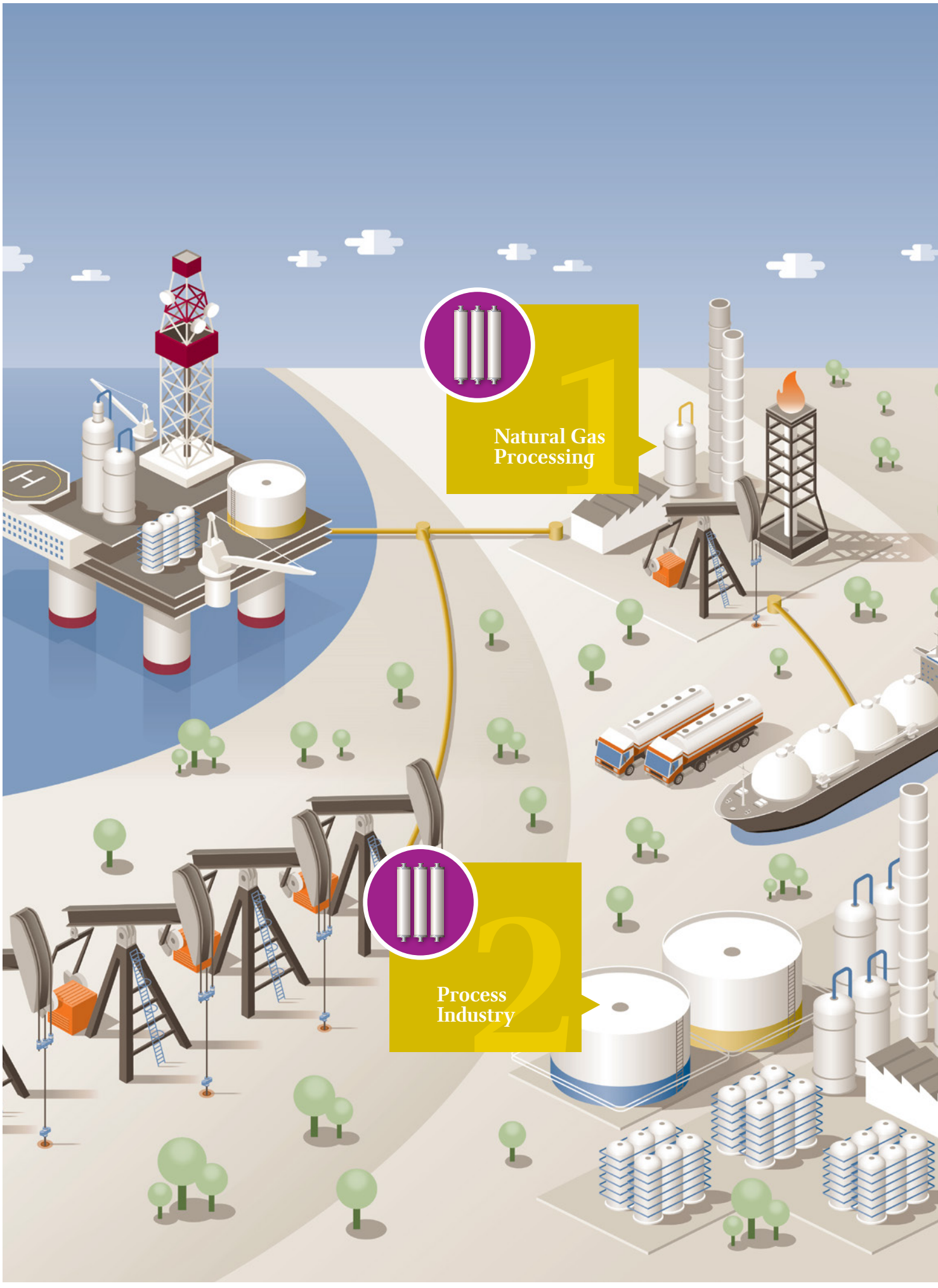
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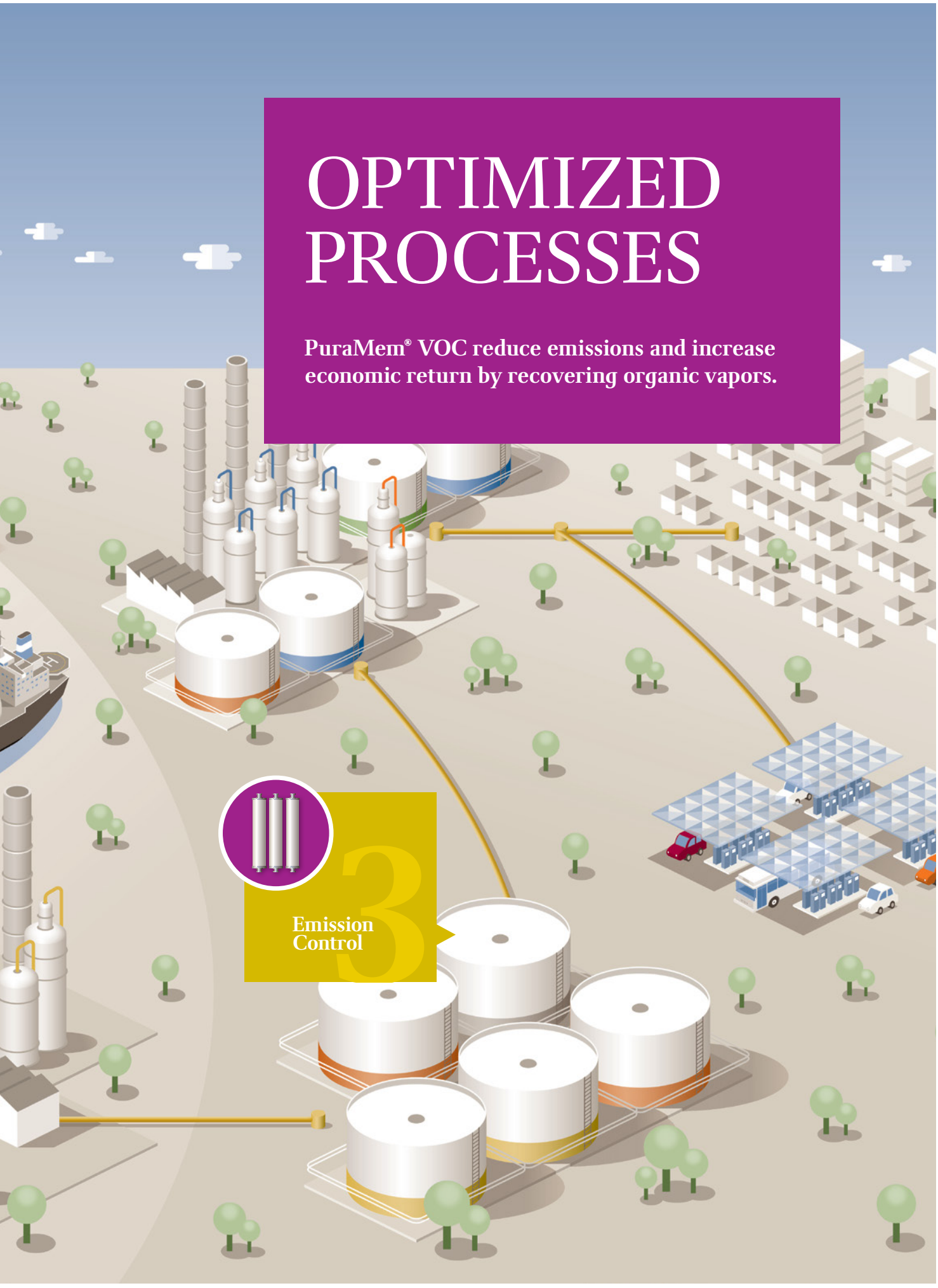
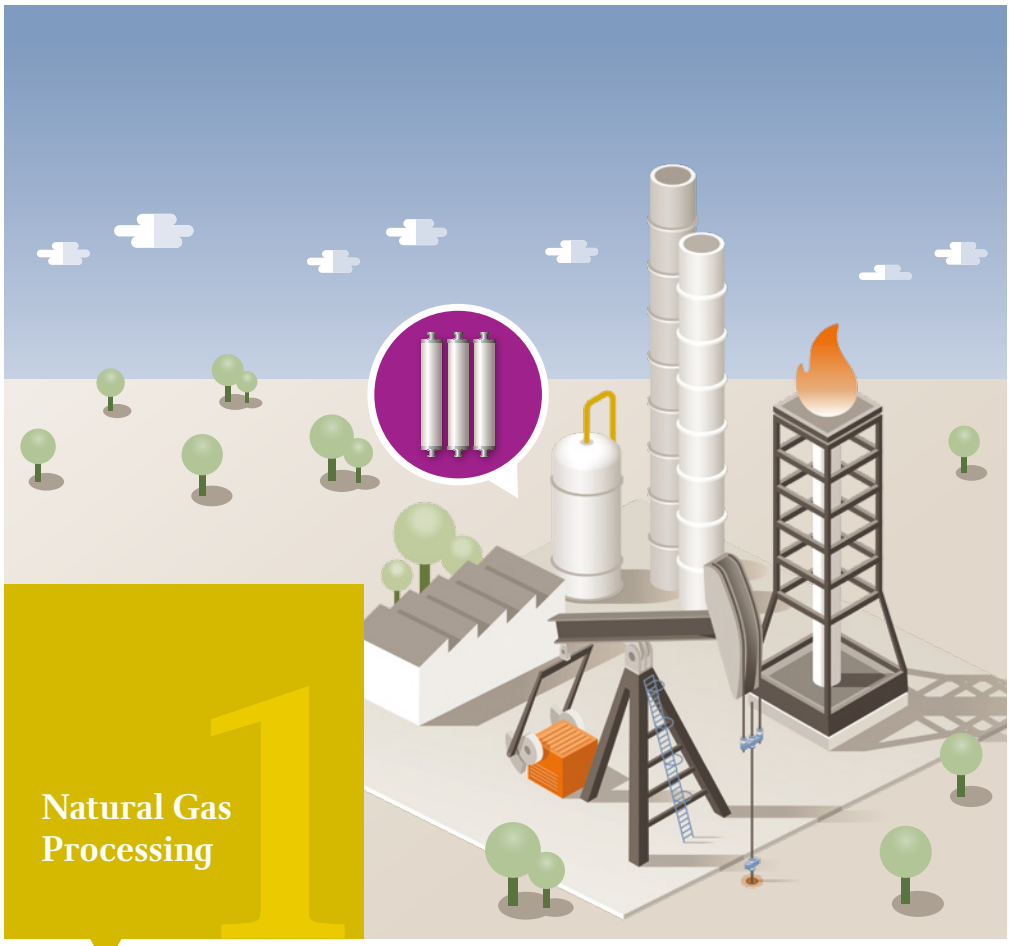
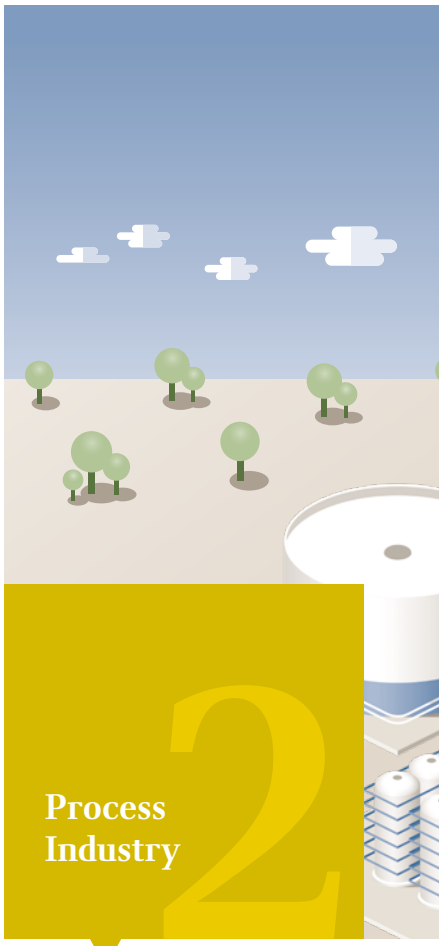


OPTIMIZED PROCESSES

PuraMem® VOC reduce emissions and increase economic return by recovering organic vapors.



1 Natural Gas Processing



2 Process Industry

Separation of natural gas liquids from methane

PuraMem® VOC offers a safe and efficient process for natural gas processing with the lowest operating cost of any technology available. The membrane separates Natural Gas Liquids (NGL), water or hydrogen sulfur from Methane, while keeping the Methane at pressure.

Typical applications are:

- NGL separation before gas sweetening
- Fuel gas conditioning to reach optimum Wobbe index
- Reducing flare gas and increasing methane yield

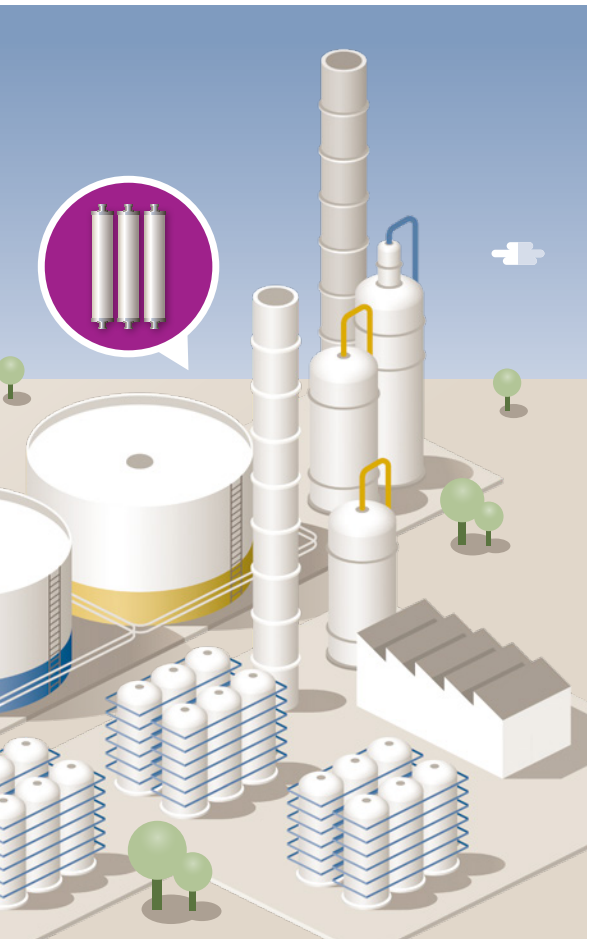
By combining our SEPURAN® NG membrane with a PuraMem® VOC stage, the overall number of membrane cartridges can significantly be reduced.

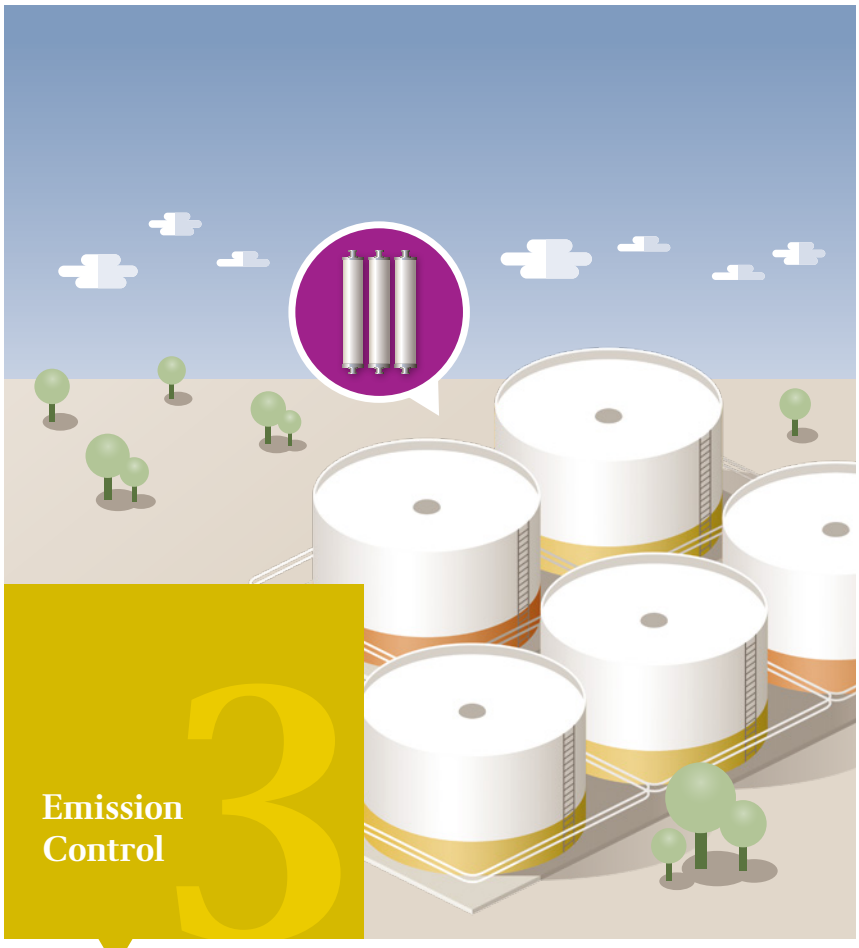
You can also combine PuraMem® VOC with other technologies. The membrane can for example:

- Reduce temperature for a cryogenic distillation
- Optimize PSA separation by reducing operating and investment cost

Yield increase by raw material conditioning and recovery

For chemical processes, the use of PuraMem® VOC is especially rewarding. You can use it to condition raw material streams for a more efficient process or to recover remaining organic raw materials in your off-gas stream to improve yield and offer high payback.





Emission Control 3

Main applications are in polymer production such as:

- Polyethylene (PE)
- Polypropylene (PP)
- Polyvinylcloride (PVC)
- Polymethylmetacrylate (PMMA)

But PuraMem® VOC can improve processes in many other applications.

Emission control and recovery of vapors in tank farm operation

PuraMem® VOC can help you to reach ambitious VOC emission targets by fully recovering the VOCs which can be fed back to the tanks. This gives membrane technology a significant advantage over the widely used VOC destruction technologies like thermal or catalytic oxidation.

Normally a membrane module and a vacuum pump on the permeate side are sufficient to clean the exhaust stream from your storage tanks of most organic liquids.

Typical examples include:

- Gasoline, Diesel, Jet Fuel
- ETBE, MTBE and other types of additives
- Ethanol, Methanol
- Other types of hydrocarbons

But also the combination of a membrane with other technologies offers significant advantages reducing the overall cost of ownership.

WE BOOST THE CHEMISTRY...

... of our high performance polymers to create especially selective and robust membranes, that can withstand extreme pressure and temperatures. The spiral wound module setup stands for a robust, durable and high performing membrane system.

Did you know?

PuraMem® VOC allows bigger VOC molecules to pass through the membrane while holding small molecules back

This specific effect is perfect for the separation of a small amount VOC from a process stream as the main stream experiences only a small pressure drop.

Consistently high performance

PURAMEM® VOC is an especially robust, spiral-round module membrane, which is based on Evonik high-performance polymers, optimized for the specific applications. It features a stable performance over long time periods and challenging operating conditions.

Flexible diameter

Our membranes have been designed for conventional, membrane-based natural gas processing plants. As plug-in replacement for all standard membranes (7.95 to 8.3'') no further adaptations are required to the existing equipment.

HOW DOES IT WORK?

Our product

PuraMem® VOC	8" Cartridge
Module materials	Stainless Steel (1.4404/316L & 1.4571) and FKM (Viton) sealing
Trans membrane pressure	25 bara / 360 psia
	80 bara / 1160 psia
Temperature	0 - 50 °C / 32 - 122 °F

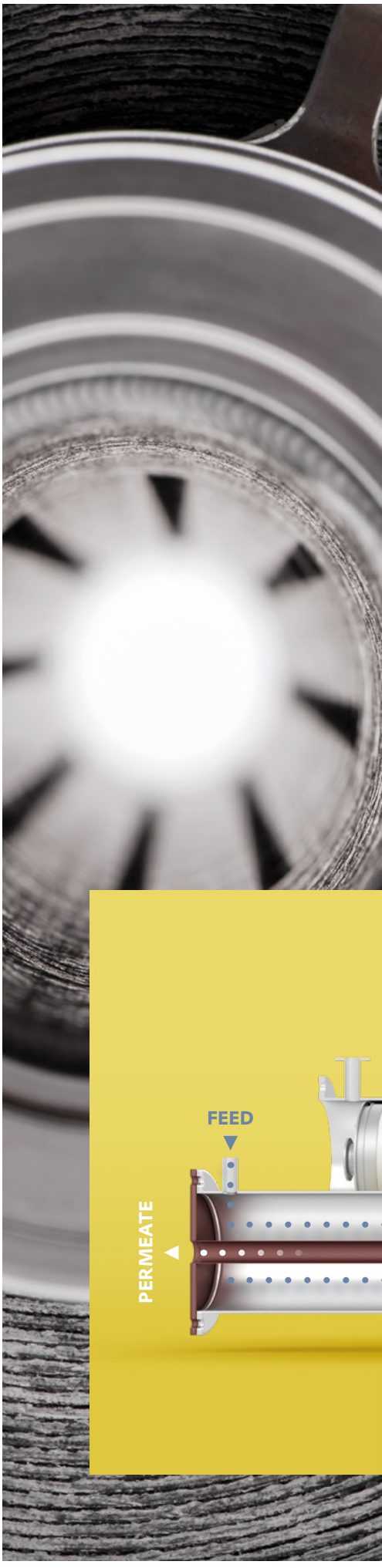
Your benefits

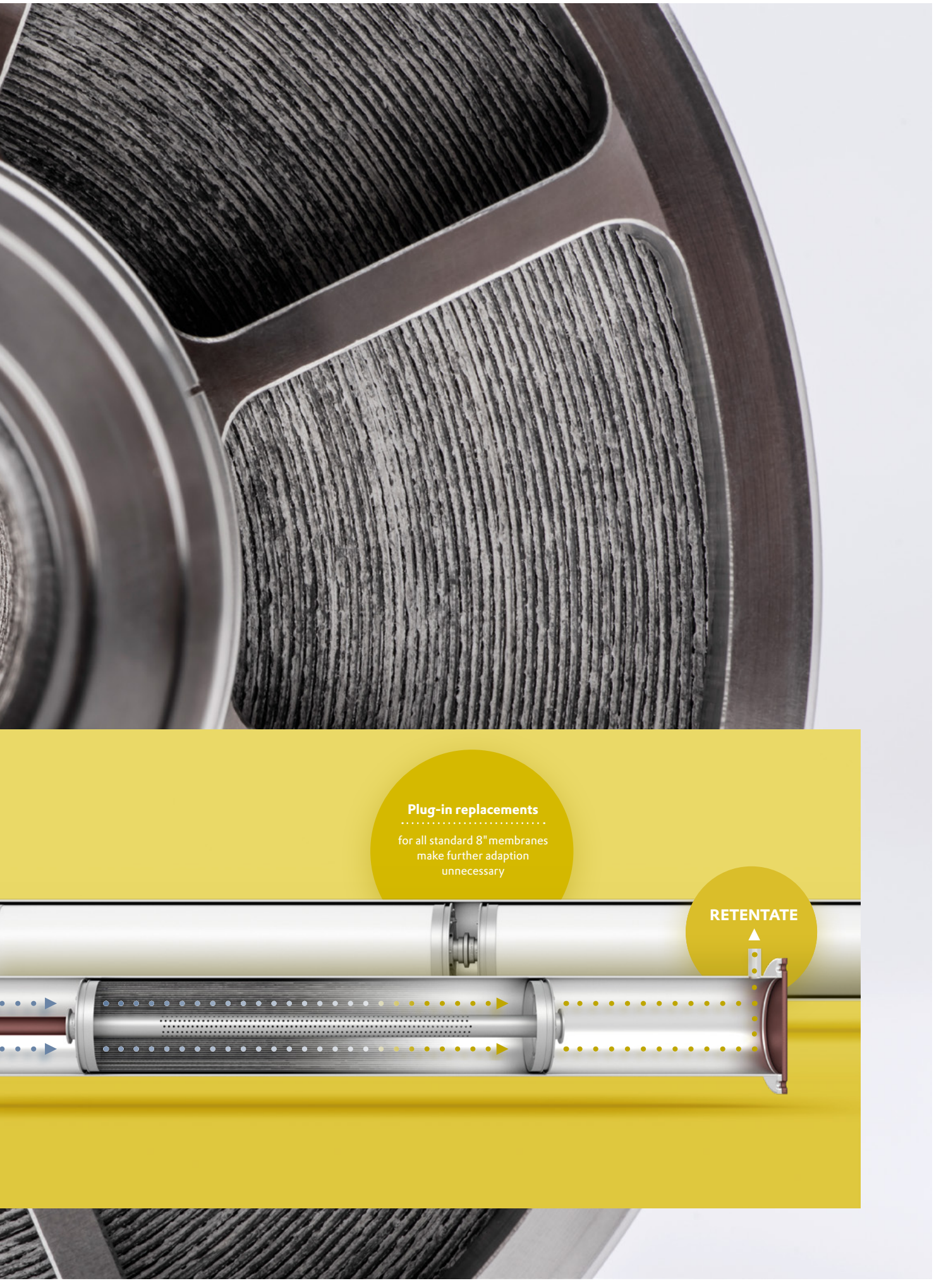
- Reduced operating costs
- Reduced processing time
- Environmentally friendly processing
- Safe process and simple start-up
- Increased product value
- Lower energy consumption
- No auxiliary materials such as water or sorbents required
- No emissions into the environment
- Separation at ambient temperature is possible
- Low space requirements
- Continuous separation process
- Simple, modular setup
- Flexible and easily expanded
- Very high selectivity
- High yields and purity

Functionality

VOC involves a membrane and a gas stream that contains at least two components ("feed"). The feed is pushed through the membrane with an applied pressure of up to 25 bar. Due to the specific properties of the membrane, the VOC component passes through the membrane and becomes the "permeate" whereas the concentrate is retained by the membrane ("the retentate").

For initial membrane screening and proof-of-concept testing, the PuraMem®VOC membranes are available in flat sheet format.





Plug-in replacements

for all standard 8" membranes
make further adaption
unnecessary

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Evonik Operations GmbH
Paul-Baumann-Straße 1
45772 Marl
Germany

PHONE +49 2365 49-9227
voc@evonik.com

Evonik Corporation
High Performance Polymers
Parsippany, NJ 07054
United States

PHONE +1 973 929-8000

Evonik Specialty Chemicals (Shanghai) Co., Ltd.
55 Chundong Road
Xinzhuang Industry Park
Shanghai 201108

www.membrane-separation.com
www.evonik.com/puramem-voc

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