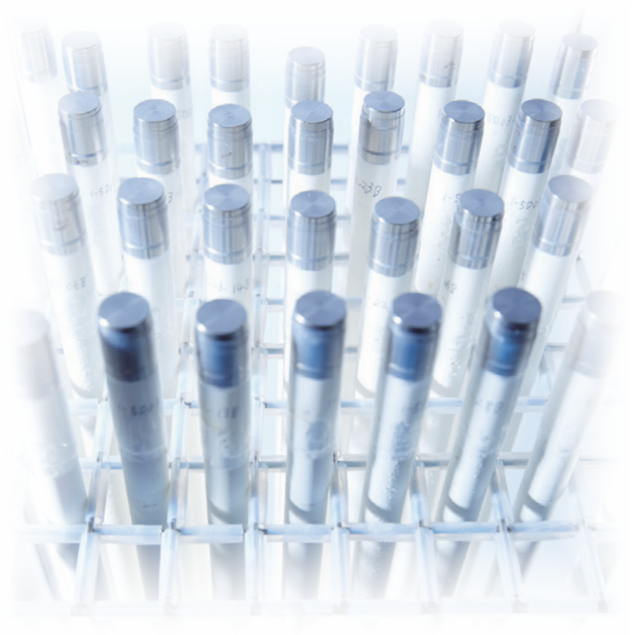
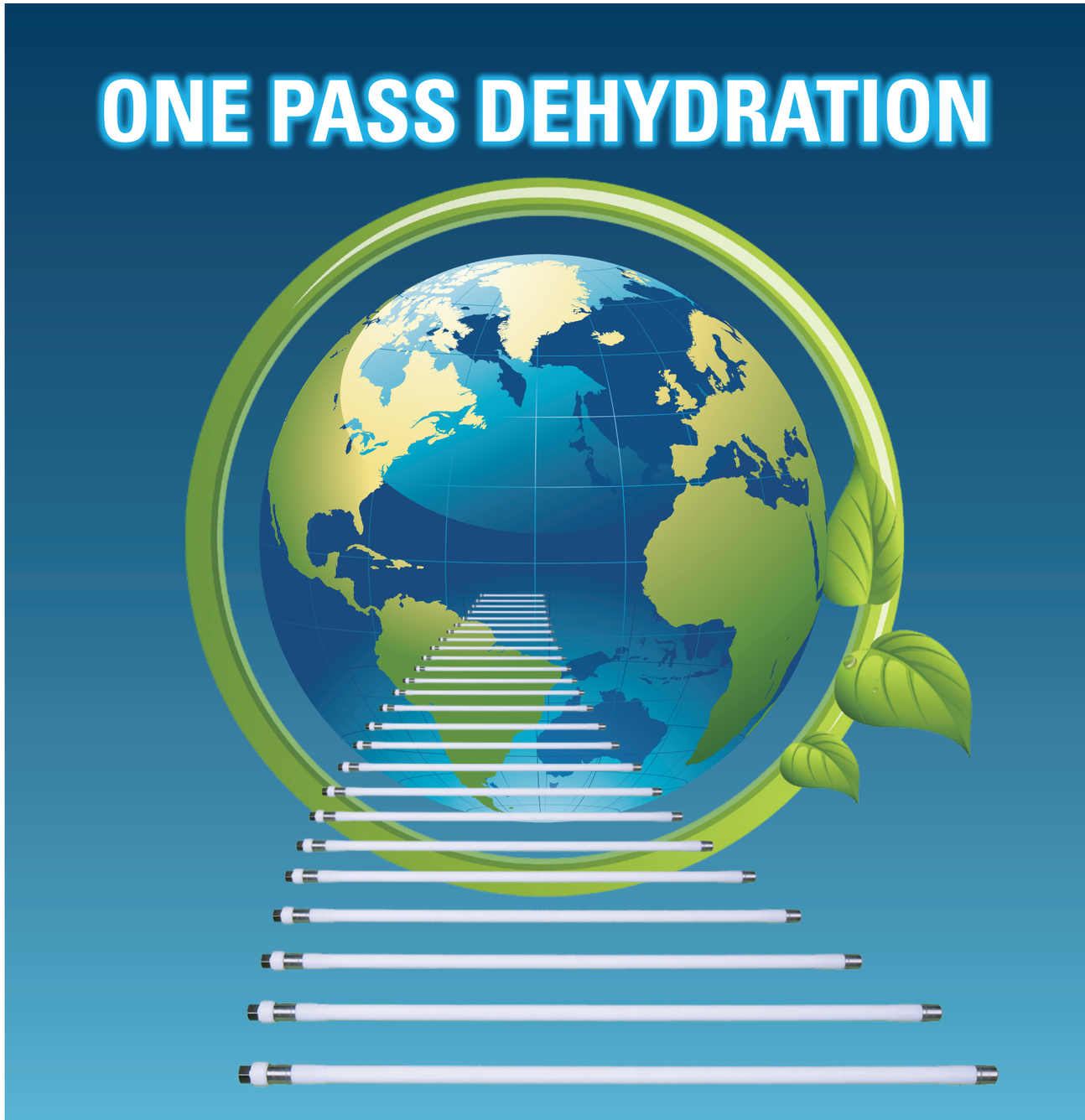
MITSUBISHI CHEMICAL

ZEBREX™





■Manufacturer

Mitsubishi Chemical Corporation

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■Distributor

Issued in July, 2020/ZXb03-02

Optimize dehydration with ZEBREX

ZEBREX™

ICM A Strategic collaboration with ICM in USA, Canada, Brazil, and Argentina

ZEBREX contributes to the optimization (efficiency improvement) of your plant. Not only is ZEBREX an energy-saving dehydration process by itself, it also makes it possible for us to offer optimization proposal for process as an integrated system with Distillation to maximize its efficiency. As a dehydration process, ZEBREX can be applied to bioethanol plants that use all sorts of raw materials.

Meeting the needs of society

●Capacity expansion

- Policy to increase the ratio of bioethanol in fuel e.g. E10 → E15.

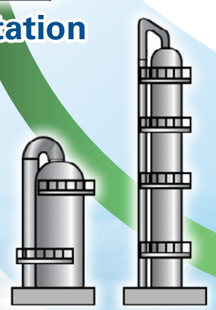
●Energy saving

- Enhanced energy saving regulations.
- Policy to grant a premium to bioethanol produced with lower energy.

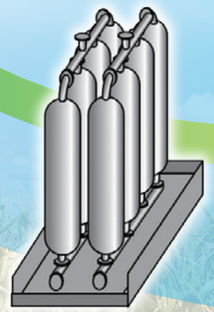
Zeolite membrane dehydration technology

ZEBREX™

Fermentation



Distillation



PSA

OPTIMIZATION of Distillation

REGEN Recovery

ZEBREX™

ONE PASS

DEHYDRATION with no Regen

SUCCESS

KEY BENEFITS

- Increases dehydration capacity.
- Increases capacity in distillation and evaporation.
- Debottlenecks the mole sieves.
- Reduces energy use and lowers carbon intensity.
- Dries ethanol to EU or other low-water specs.

One pass

Solution

Technology

Customized solutions to your own process

ZEBREX can be customized according to the situation, purpose and budget of your plant. Even just “Add-on” to your existing plant can achieve both energy saving and increasing capacity. With “Exclusive” or “Replace”, amount of energy saving gets more, and it is also expected to reduce the maintenance cost of mole sieves/PSA. Furthermore, in the case of “Green Field”, a new plant construction, the energy saving can be maximized by optimizing the process design of ZEBREX and Distillation as an integrated dehydration system ZEBREX has a track record of more than 70 installations around the world.

ZEBREX™

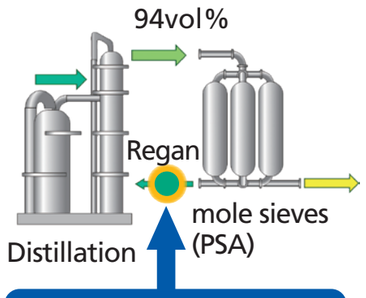
A Strategic collaboration with ICM in USA, Canada, Brazil, and Argentina

Capacity ※1: Depends on Regen concentration and flow rate from existing mole sieves.
Steam ※2: Compared to the mole sieves with no heat integration.
※3: Depends on Regen concentration from existing mole sieves.

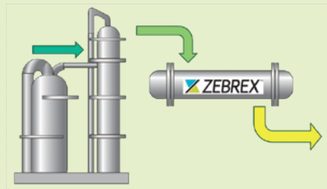
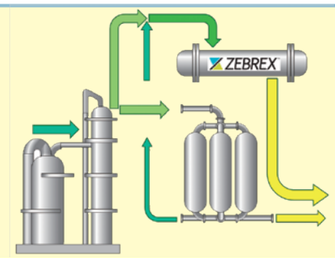
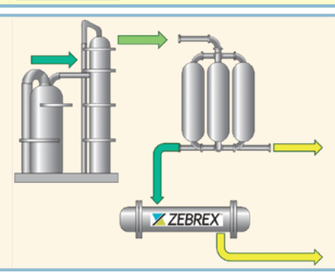
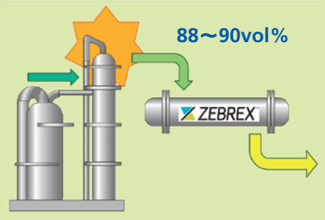
One pass

Solution

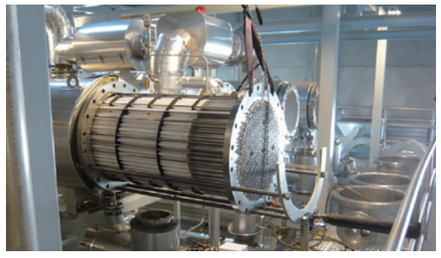
(Existing)

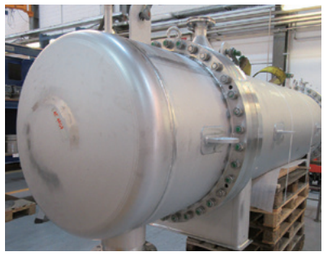


Regan: Bottleneck in capacity expansion, Wasting energy.

	Capacity※1	Steam※2※3
Replace ・Complete replacement of PSA by ZEBREX ・Large Energy saving ・Expanding distillation capacity ・Flexible Production rate ・Easy Operation ・Stable operation of Distillation		-33%
Exclusive ・Hybrid of PSA and ZEBREX ・More Energy saving ・Expanding distillation capacity ・Flexible Production rate ・Stable operation of Distillation ・Reducing PSA maintenance		+25% No need for extra stripping column -16%
Add-on ・Dehydrating PSA Regen by ZEBREX ・Energy saving ・Expanding distillation capacity ・Lower CAPEX ・Stable operation of Distillation		-11%
Green Field Optimization of the distillation column and ZEBREX to achieve maximum efficiency. (Distillation column size will be smaller than usual, because ZEBREX can accept lower ethanol concentration for the feed from Distillation, and dehydrate it efficiently.)		Arbitrary	-40%

Year	Country/Area	Capacity
2020 (in progress)	USA	64MMGPY (22t/h)
2016	Japan	1.5MMGPY (0.5t/h)
2015	Sweden	33MMGPY (1t/h)
2008	Finland	15MMGPY (5t/h)
2008	Ukraine	18MMGPY (6t/h)
2007	Finland	15MMGPY (5t/h)
2005	Japan	1.5MMGPY (0.5t/h)
2004	Lithuania	3MMGPY (1t/h)
2003	Lithuania	3MMGPY (1t/h)





It all starts with zeolite membrane

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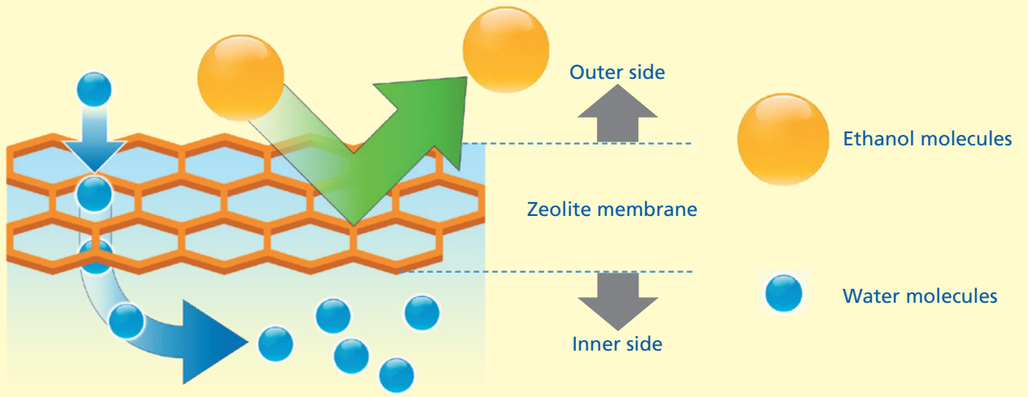
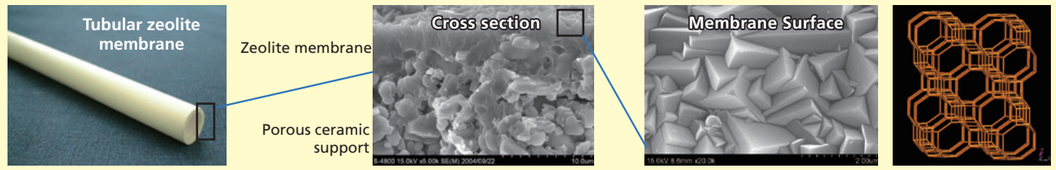
The core material / technology of ZEBREX is zeolite membrane. Water and ethanol are separated by zeolite membrane that has homogeneous pores. This dehydrating process is efficient because it is continuous and start-up / shut-down is also quick. The plot plan of the ZEBREX dehydration UNIT can be arranged according to your circumstances.

Water/Ethanol separation mechanism

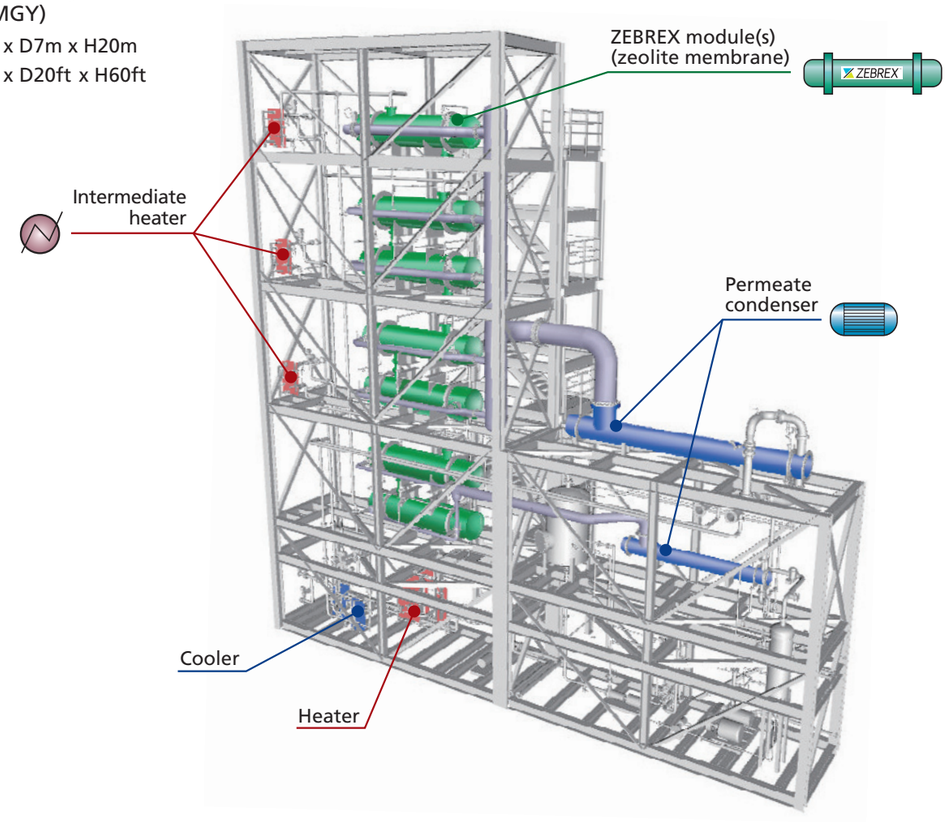


Water is separated into the tube by passing through the zeolite membrane

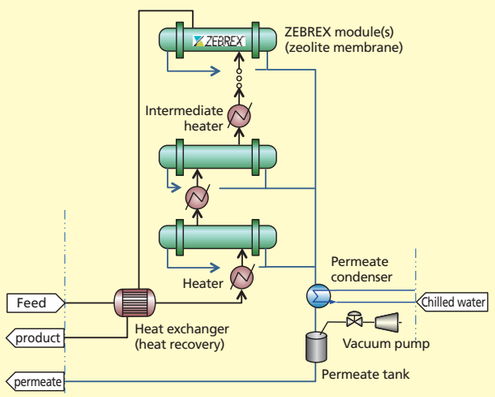
Zeolites are an alumino-silicate materials that have unique micro-porous structures. A Zeolite membrane is hydrothermally synthesized on porous ceramic support.



ZEBREX dehydration UNIT
(60MMGY)
W15m x D7m x H20m
W45ft x D20ft x H60ft



PV : pervaporation



VP : vapor permeation