

Kelvion





HEAT EXCHANGERS FOR ENERGY EFFICIENCY IN INDUSTRY

SOFIA, 24.10.2017



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2. Our Key Markets
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4. Save Energy with Economizer
5. Save Energy with REKULUVO/REKUGAWO
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- 1.

WHO WE ARE

WHO WE ARE

Kelvion is a globally active manufacturer of industrial heat exchangers for a highly diversified range of market segments. Since **1920**, the company manufactures and markets its products throughout many and various market segments – since November of 2015, under the new Kelvion brand. With plate heat exchangers, shell and tube heat exchangers, finned-tube heat exchangers, modular cooling towers, and refrigeration heat exchangers, the company supports customers in highly diverse global segments

We're Kelvion – ready to take on the challenges of heat exchange.

OUR HISTORY

1920

1920: Foundation of GEA in Bochum by Otto Happel sen. (Born 1882).

GEA, abbreviated from the original German name of the company "Gesellschaft für Entstaubungs-Anlagen mbH", was the work of a man who was an entrepreneur with heart and soul, a man gifted with an exceptional technical insight and filled with the desire for pioneering technical innovations.

1989

1989: Going public.

GEA presented itself to the public as a "global and broadly diversified supplier of machines, systems and components in the field of energy, environmental and process engineering".

1999

1999: MG / GEA - the takeover. In April 1999, GEA was acquired by mg technologies AG (the successor of Metallgesellschaft).

2010: Reorganization of the group.

Reorganization of GEA's 9 Divisions into technologically distinct Segments. The largest segment is the Heat Exchangers Segment (HX).

2010



OUR HISTORY

2014

2014: In October, GEA Group concludes the agreement on the sale of the Heat Exchangers Segment to Triton.



2015: With the new name, the former GEA Heat Exchangers has been formally split from the GEA Group and is writing its own history as Kelvion.

The name Kelvion pays homage to Lord Kelvin (1824 - 1907). Lord Kelvin formulated the laws of thermodynamics and absolute units of temperature are stated in kelvin, in his honor.

2016: Being the global experts in heat exchange, Kelvion is ready to guarantee the best solutions for any challenge in the different industrial markets.

Kelvion



KELVION AT A GLANCE

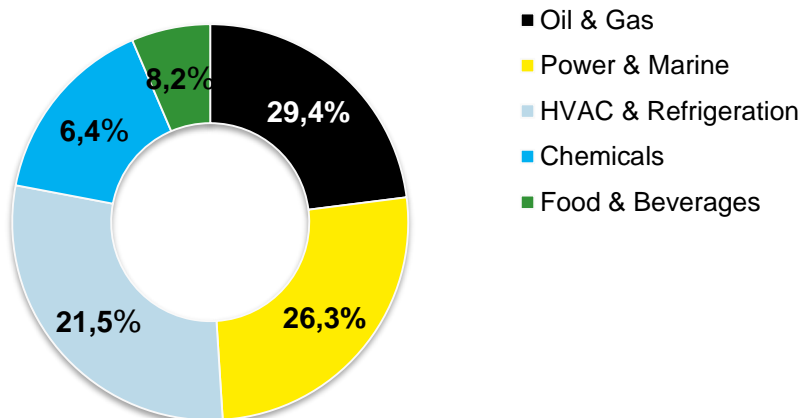
Key facts FY16

- Headquarters: Bochum, Germany
- Total sales: ~ 830 million Euro
- Sales and manufacturing presence in 26 countries on all continents
- The widest range of heat exchangers: air cooler, gasketed / welded / brazed plate heat exchangers, cooling towers, shell & tube, etc.

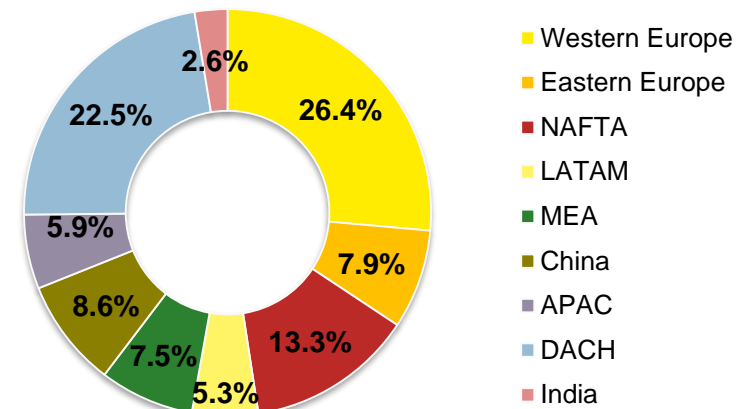
Global production footprint



Sales by industry FY16 (%)



Sales by region FY16 (%)





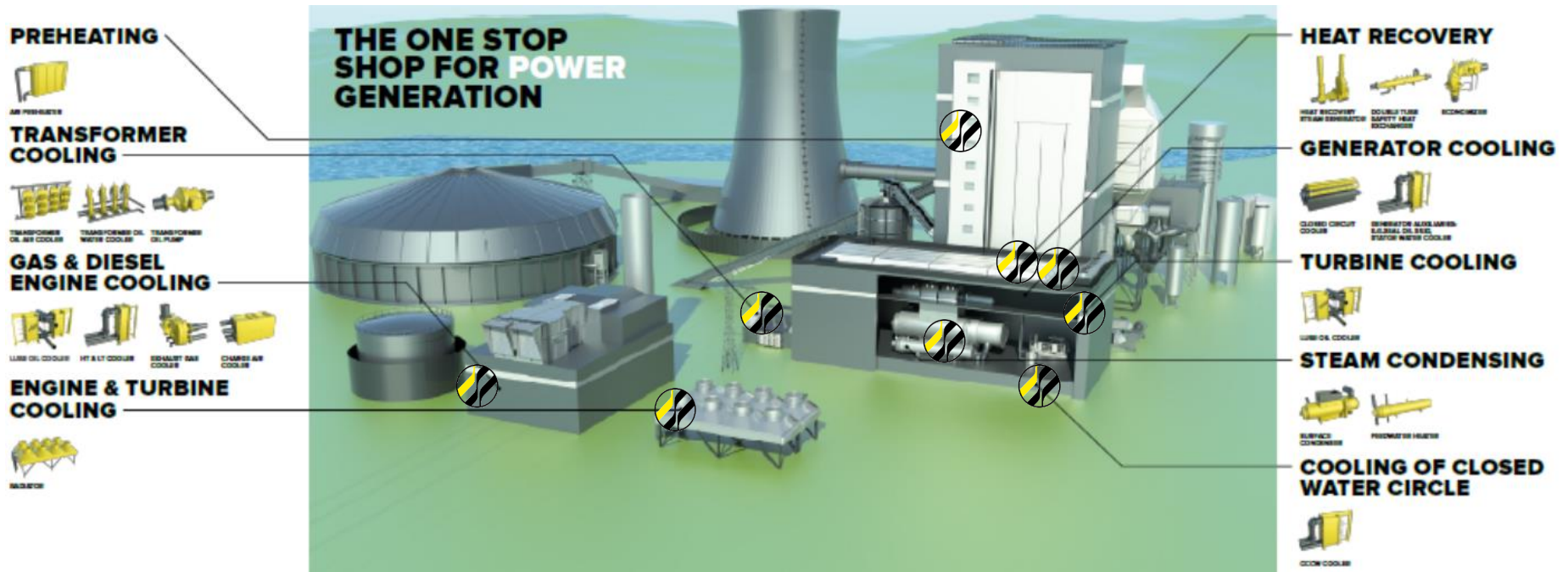
2.

OUR KEY MARKETS

OUR KEY MARKETS



AND THIS IS US POWER





3.

OUR PRODUCTS

OUR HEAT EXCHANGERS – KELVION 2017

Plate Heat Exchangers (PHE)

GPHE (Gasketed PHE)

LWC (Semi-welded PHE)

WPHE (Welded PHE)

BPHE (Brazed PHE)

SHE (Spiral HE)

- > K°Bloc
- > K°Flex
- > Rekuluvo/ Rekugavo

Tube Bundle Heat Exchangers (THE)

Plain Tube HE

- > Shell & Tube Heat Exchangers
- > Double Tube Safety Heat Exchangers (DTSHX)

Extended Surface Heat Exchangers

Finned Tube HE




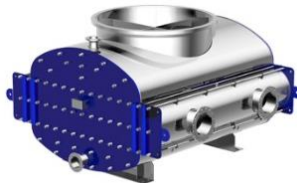

- > Air Cooled Condenser (ACC)
- > Air Fin Cooler (AFC-Alu / AFC-HDG)
- > Air Dryer
- > Economizer
- > Air Preheater
- > Desublimator
- > Charge Air Cooler (CAC)
- > Closed Circuit Cooler (CCC)

Direct Contact Heat Exchangers




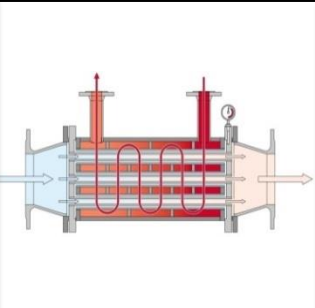
Cooling Towers (CT)

- > Wet Cooling Tower (Open System)

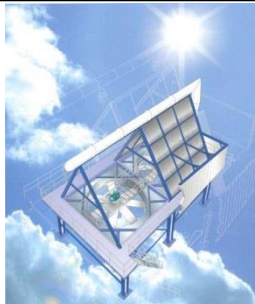




KELVION PRODUCTS

	GPHE Gasketed PHE	LWC Semi-welded PHE	WPHE K°Bloc	WPHE K°Flex	WPHE Rekuluvo / Rekugavo
Product lines					
Key features	<ul style="list-style-type: none"> • Lower pressure and temperature range • Ease of maintenance / replacement / service • Wide range of applications 	<ul style="list-style-type: none"> • Suitable for critical media • Fully accessible on one side for cleaning • Laser welded on critical media 	<ul style="list-style-type: none"> • K°Bloc is available in various corrugation designs and sizes for a wide range of applications. • This plate heat exchanger is generally used in the oil and gas industry, in petrochemical and chemical applications, in the automobile and pharmaceuticals industry, as well as in paper manufacturing. 	<ul style="list-style-type: none"> • K°Flex is based on a modular concept • Assymetric plate pattern with channels shaped like tubes and waves • Maximum Sizes: 2.500m² (standard), 12.500m² (tailormade) • Pressure range from vacuum up to 100 barg • Excellent for 2-phase applications (condensation and evaporation) 	<p><u>Applications:</u></p> <ul style="list-style-type: none"> • GAS- GAS • Atmospheric pressure • Combustion air preheating • Flue gas reheating • Heat recovery • Power stations <p><u>Advantages:</u></p> <ul style="list-style-type: none"> • Very high efficiency • Compact design • low fouling • easy to clean • vertical flow • Modular design for big units • leak free





KELVION PRODUCTS

	BPHE Brazen PHE	SHE Spiral HE	Shell & Tube Plain Tube HE	DTSHX Double Tube Safety HE
Product lines				
Key features	<ul style="list-style-type: none"> • Medium pressure and temperature range • Compact design, low weight • Typical applications -HVAC (heating & Cooling) -refrigeration systems 	<ul style="list-style-type: none"> • Long coils form the Spiral body of Spiral Heat Exchangers • Operation in perfect counterflow, crossflow or cross and counterflow. • Self-cleaning effect in single channel design • Dirty fluids can be handled in channel gaps between 5mm and 30mm • Ideal for overhead condenser applications 	<ul style="list-style-type: none"> • Long time experience in the design and fabrication of Shell&Tube Heat Exchangers in Kelvion workshops worldwide • Design according to TEMA, HEI and international design codes (ASME, AD, EN13445) • Pressure up to 500barg and 800°C • Large range of materials (e.g. carbon steel, duplex, stainless steel, high alloys, titanium) 	<ul style="list-style-type: none"> • Kelvion Double Tube Heat Exchanger Safety Solutions take care of critical liquids which need to be separated from the cooling/heating media.

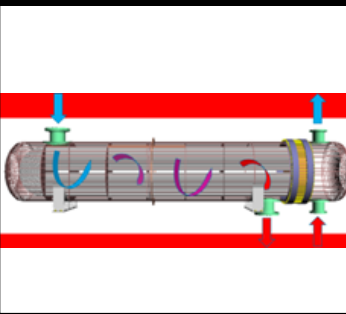




KELVION PRODUCTS

	ACC Air Cooled Condenser	AFC Air Fin Cooler - Alu	AFC Air Fin Cooler - HdG	Air Dryer	Economizer Exhaust gas cooler
Product lines					
Key features	<ul style="list-style-type: none"> • Preferred option for air cooled vacuum Condensers in API design code ambience • Especially for petrochemical, Oil & Gas applications 	<ul style="list-style-type: none"> • Air Cooler with aluminum fins, mainly for the Oil & Gas industry • High pressure up to 800 bar Temperature range of -120°C to 600°C • Fully made to order • High speed to low-noise fans 	<ul style="list-style-type: none"> • Hot dip Galvanized (HdG) Air Fin Coolers • Industrial applications in challenging environments (e.g., mining, sand and dust, fertilizers, chemicals) • Fully made to order • Low-noise fans 	<ul style="list-style-type: none"> • Kelvion air dryers are used for drying or cooling processes in a large variety of applications in Chemical, Light- & Heavy Industry and Mining • Process technology : drying wood, chemicals, fibers, minerals, crops etc. 	<ul style="list-style-type: none"> • Kelvion economizers are used for heating and cooling processes in a large variety of applications in Chemical, Light- & Heavy Industry and Mining

KELVION PRODUCTS

	Air Preheater	Desublimator	CAC Charge Air cooler	CCC Closed Circuit Cooler
Product lines				
Key features	<ul style="list-style-type: none"> • Tube bundles to pre-heat air within an industrial combustion process • Used for high-temperature applications 	<ul style="list-style-type: none"> • Transforming gas directly into solid state • Special application for chemical plants in phthalic anhydride production 	<ul style="list-style-type: none"> • Coolers for diesel / gas engines (>200 KW) • Enhancement of engine performance reliability, and fuel consumption 	<ul style="list-style-type: none"> • Coolers for generation and electrical engines • Designed to match individual applications

KELVION PRODUCTS

		Alternative Power Solutions	Radiators	Commercial Air Coolers	Customized Air Coolers	Condensers / CDC
Product lines	Key features					
		<ul style="list-style-type: none"> • Special Shell & Tube heat exchangers for nuclear power, process and propulsion systems 	<ul style="list-style-type: none"> • Dry Cooler for power generation and industrial processes • Customized or modular depending on application and customer specification 	<ul style="list-style-type: none"> • Air Coolers for commercial refrigeration application with pre-defined options/ variations • Cooling capacity <~ 50 kW 	<ul style="list-style-type: none"> • Customized Air Cooler for industrial refrigeration • Cooling capacity >~ 25 kW 	<ul style="list-style-type: none"> • Customized or modular Air Cooled Condenser and Commercial Dry Cooler mainly for commercial refrigeration and Air conditioning applications

KELVION PRODUCTS

Machine Cooling

Transformer Oil Air Coolers

CT Evaporative Water Coolers

CT Field Erected Cooling Towers

CT Waste Water Coolers

Product lines



Key features

- Coolers for diesel / gas engines (>200 KW)
- Enhancement of engine performance
- Provides special Hot dip galvanization for Compact Systems

- Ensures dissipation of heat in oil cooled transformers
- Primary application within Power generation and transmission
- Provides special Hot dip Galvanization competence for Shell & Tube

- Pre-assembled water coolers from 1 to 21 m²
- Cooling capacity up to 300 m³/h.cell – 3500 kW
- Modular line
- low noise applications

- Large cooling tower cells erected on site by contractor or with Kelvion supervision.
- Customized or modular. Largest cell size 300 m²
- Cooling capacity up to 3000 m³/h.cell – 30 MW

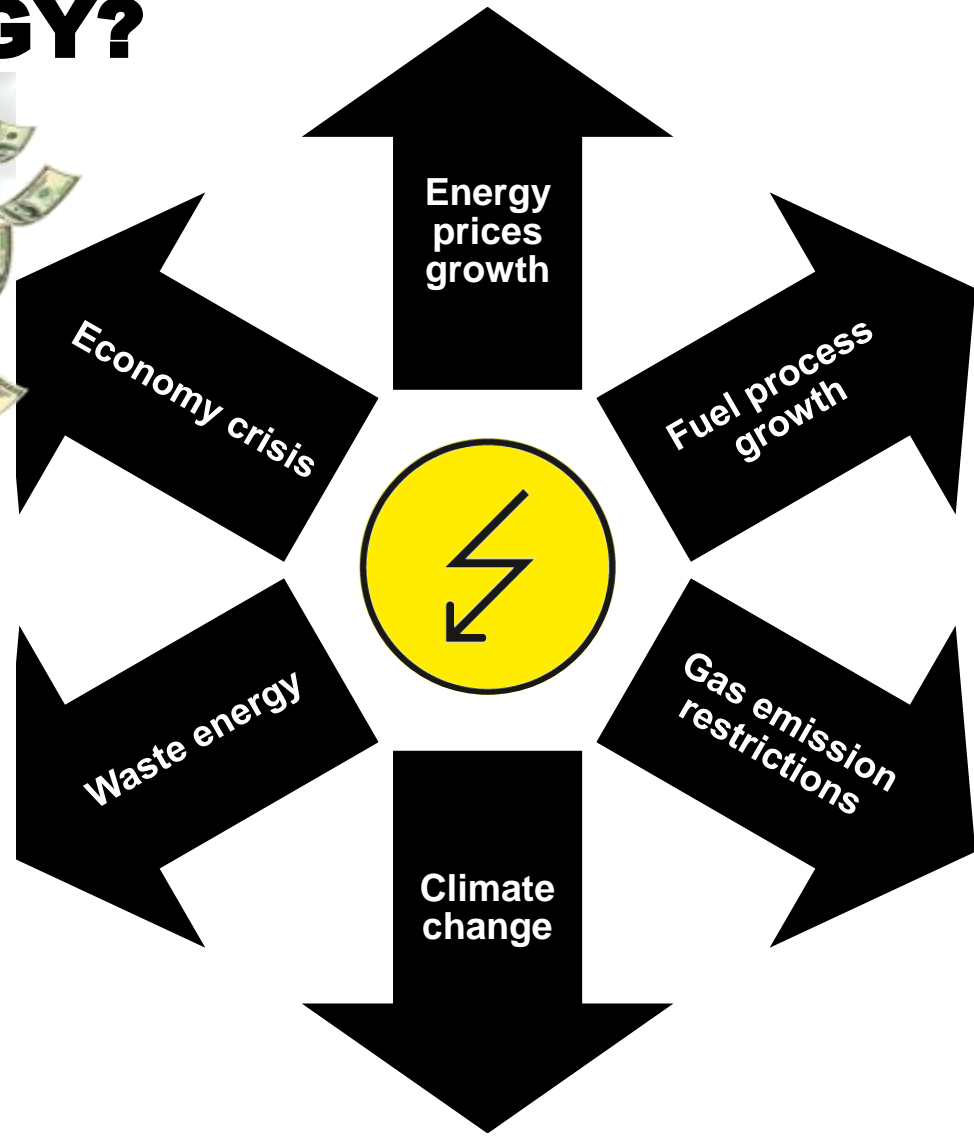
- Special adapted cooling towers for direct cooling of industrial waters with high solid content.
- Special application and customer specification



4.

SAVE ENERGY WITH ECONOMIZER

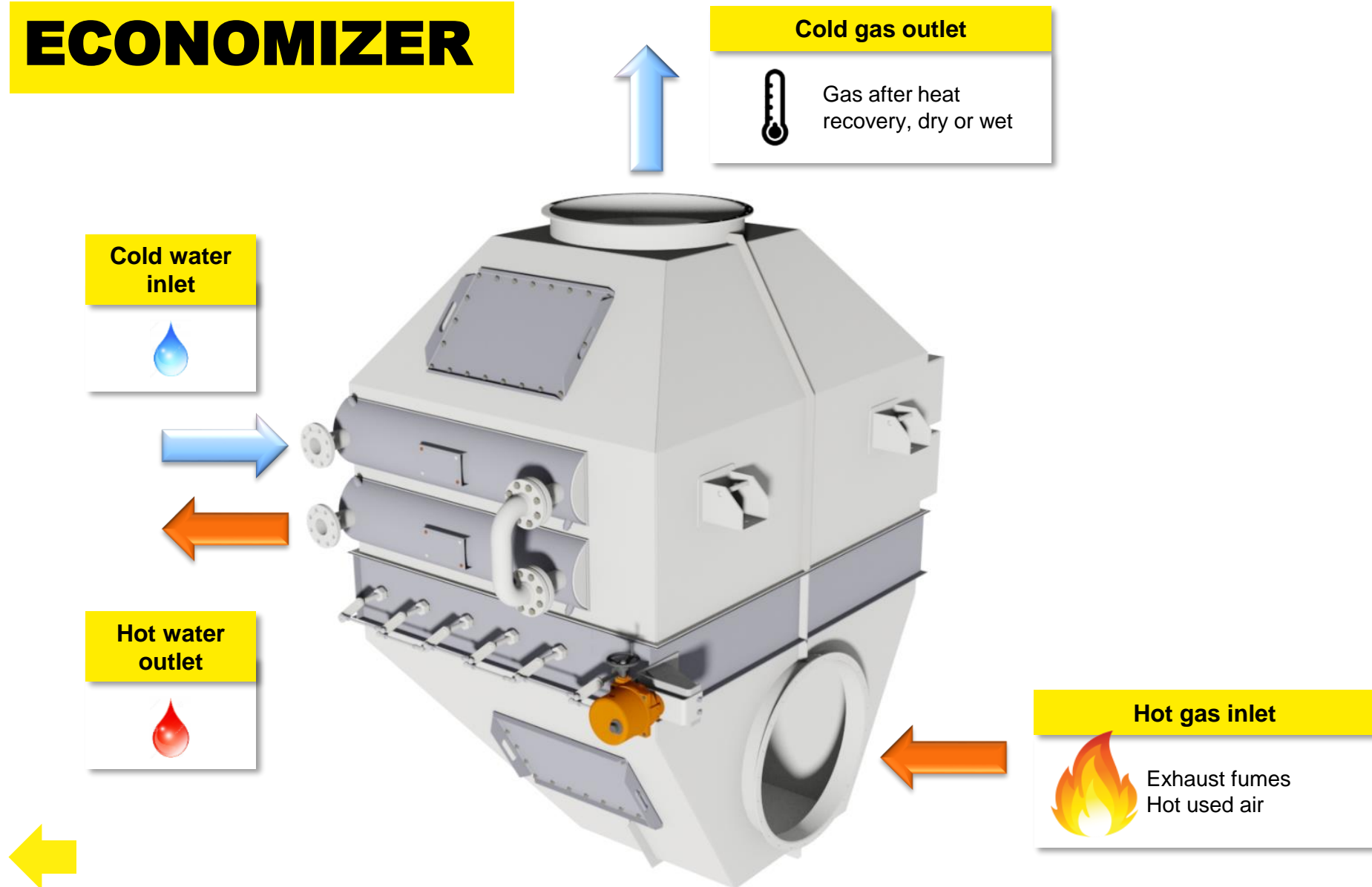
WASTING ENERGY?



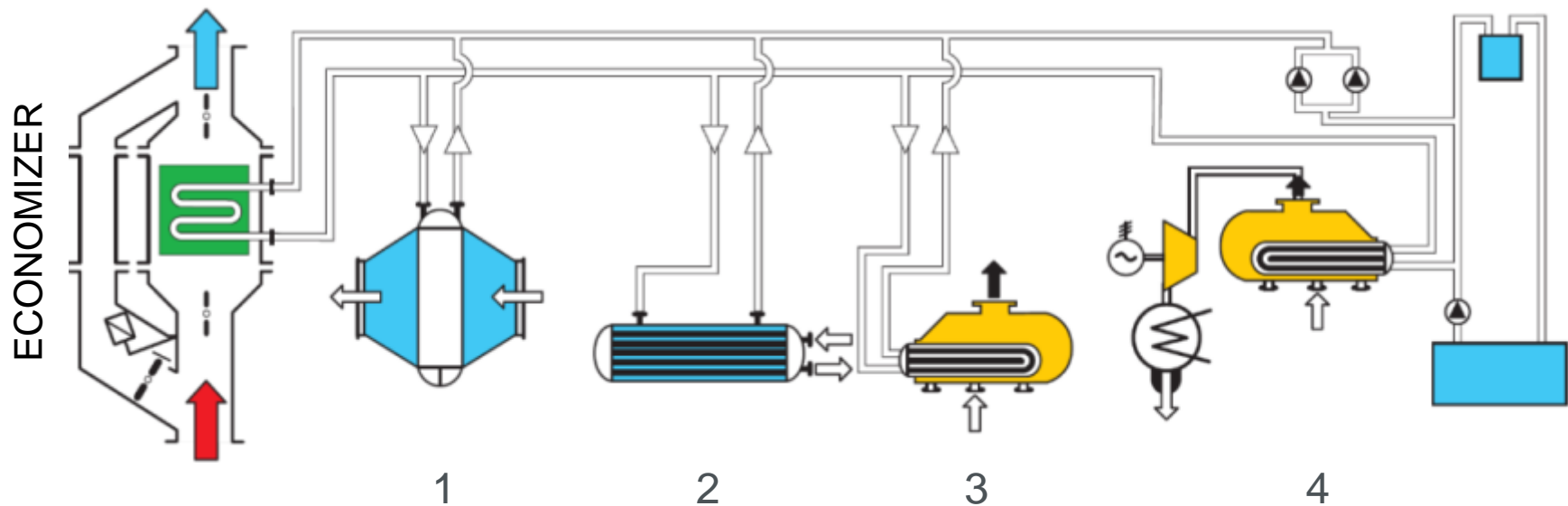
SAVE IT !



ECONOMIZER



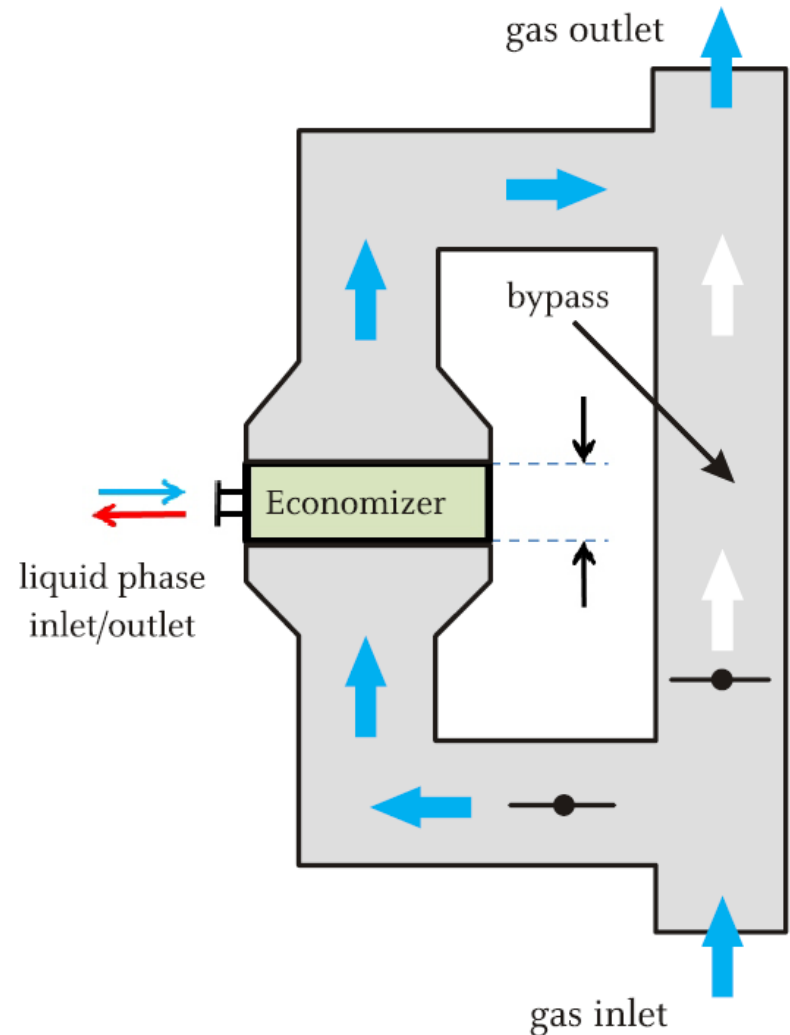
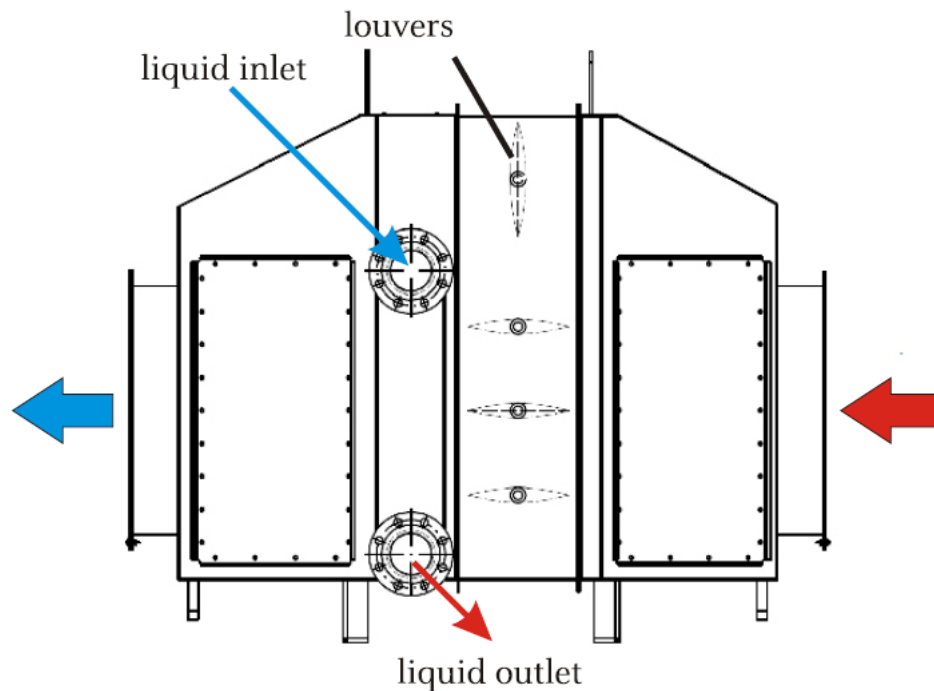
APPLICATIONS & CUSTOMERS PROCESSES



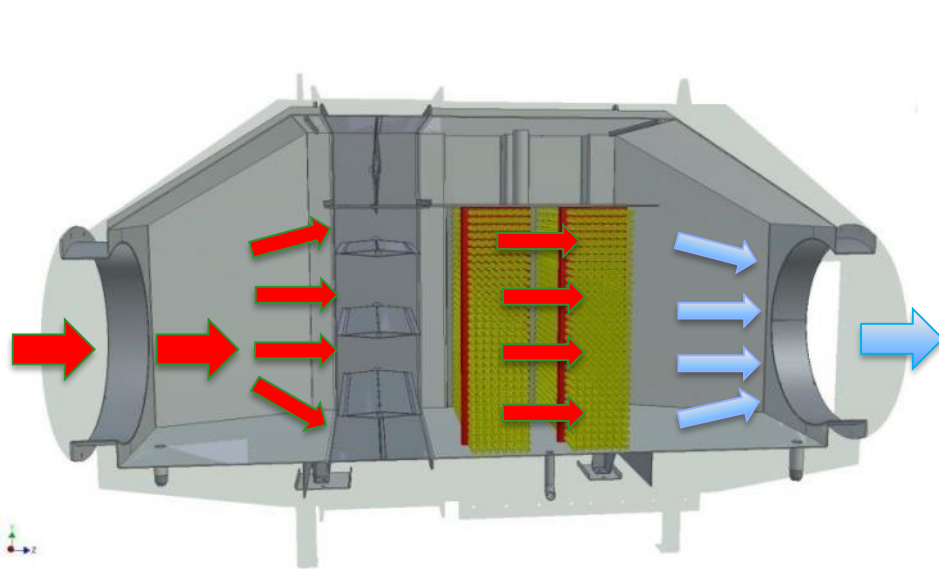
1. Air Heater
2. Water Heater
3. Steam production
4. Electricity production

PRODUCT SPECIFICATIONS – BYPASS

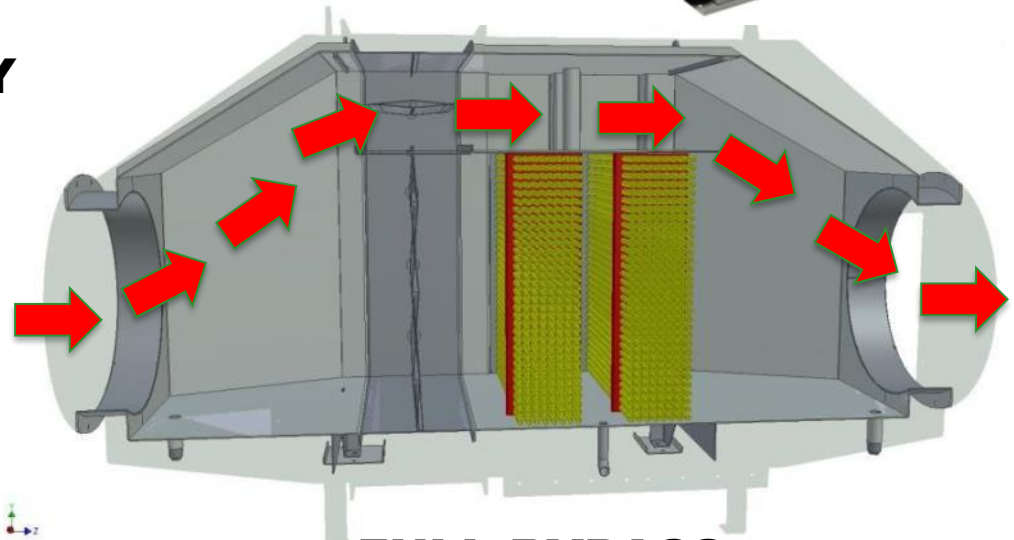
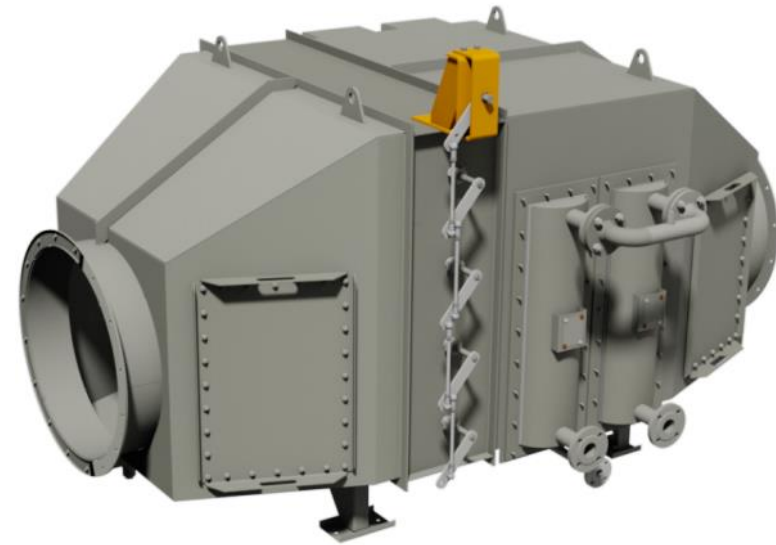
Can be delivered as separate exchangers or in casing with bypass



PRODUCT SPECIFICATIONS – BYPASS



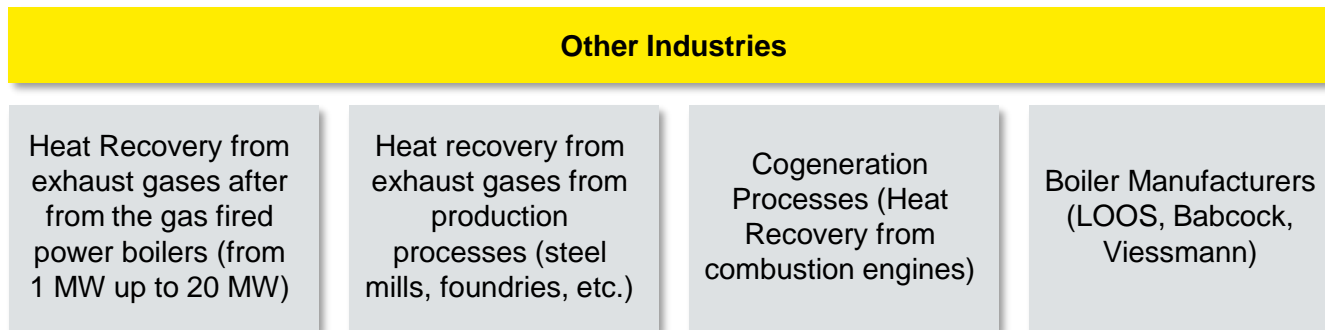
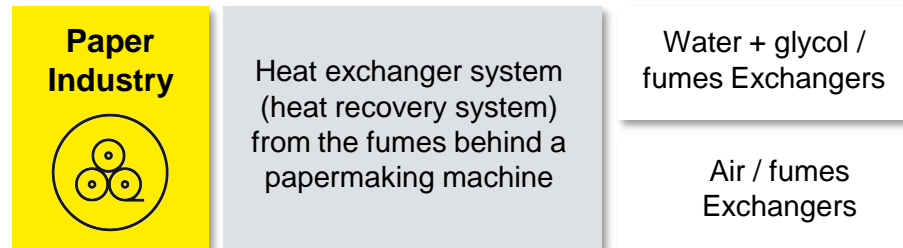
FULL HEAT RECOVERY



FULL BYPASS



ECONOMIZER APPLICATIONS

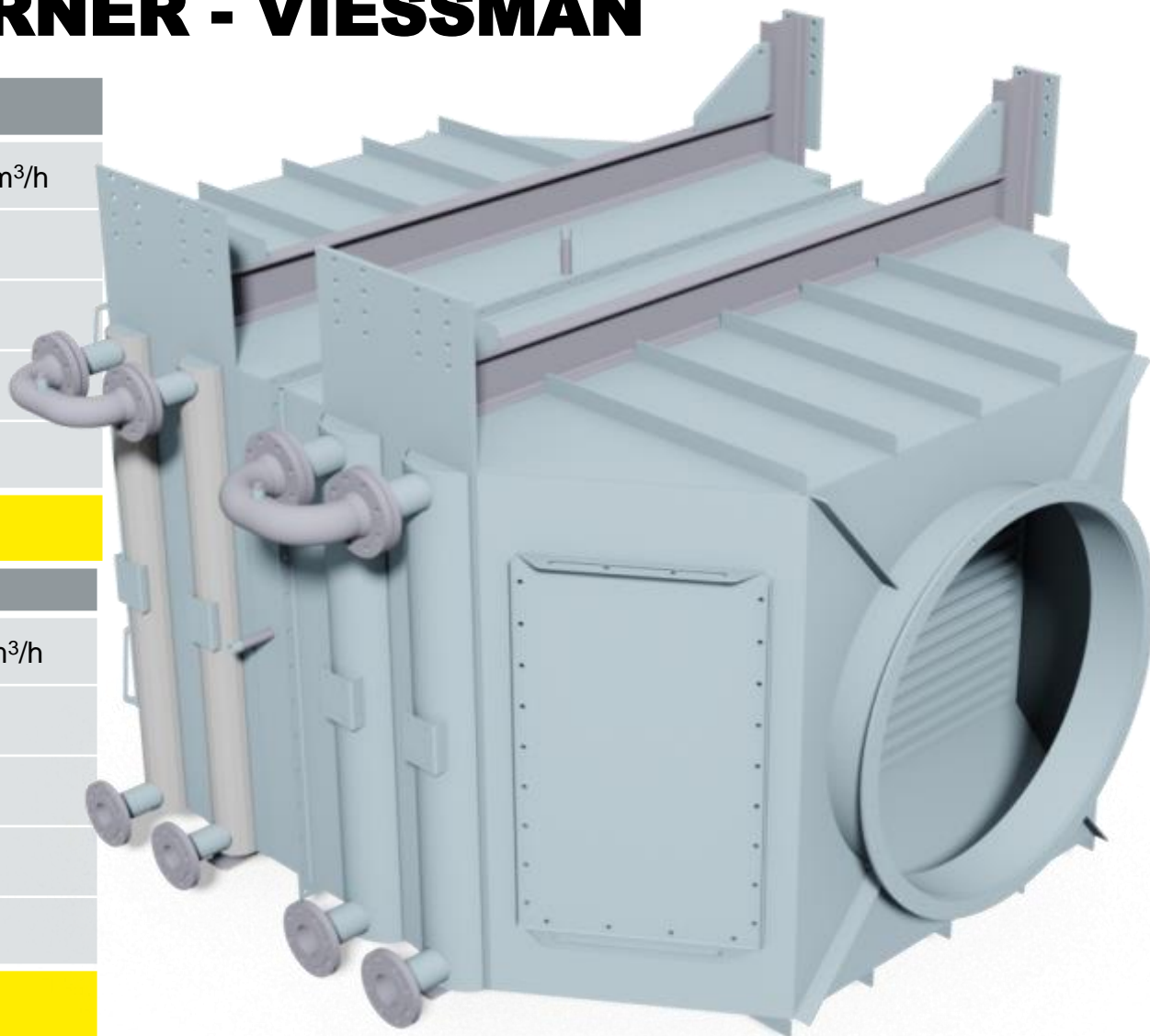


REFERENCE LIST AND EXAMPLES

GAS FIRED BURNER - VIESSMAN

I stage – Carbon Steel, Dry

Gas volume flow	21957 Nm ³ /h
Gas inlet temperature	294°C
Gas outlet temperature	118,5°C
Water inlet temperature	102°C
Water outlet temperature	149°C
Capacity	1460 kW



II stage – stainless Steel, Wet

Gas mass flow	21957 Nm ³ /h
Gas inlet temperature	118,5°C
Gas outlet temperature	78°C
Water inlet temperature	10°C
Water outlet temperature	60°C
Capacity	890 kW

Kelvion

REFERENCE LIST AND EXAMPLES

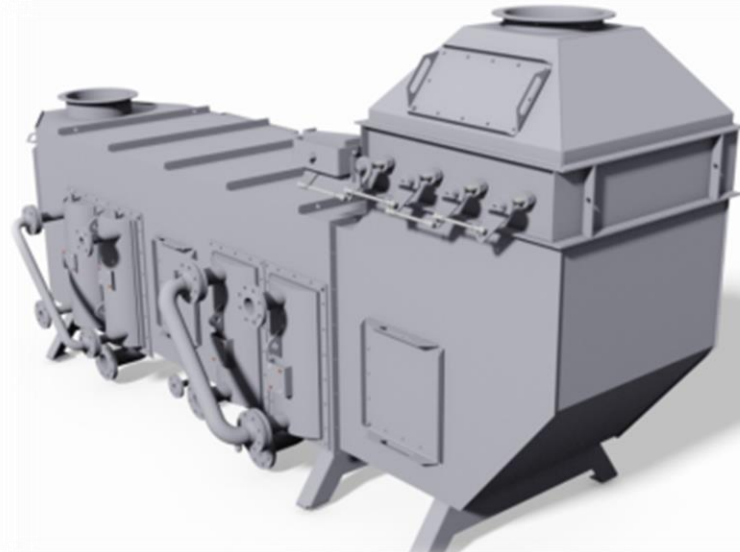
ECONOMIZER

October 2017

Two stage heat recovery for dairy plant.

Dry stage – carbon steel

Wet stage – stainless steel



I stage	
Gas mass flow	3 250 kg/h
Gas inlet temperature	176 °C
Gas outlet temperature	95 °C
Water mass flow	24 050 kg/h
Water inlet temperature	85 °C
Water outlet temperature	88 °C
Capacity	84 kW

II stage	
Gas mass flow	3 250 kg/h
Gas inlet temperature	95 °C
Gas outlet temperature	40 °C
Water mass flow	9 434 kg/h
Water inlet temperature	5 °C
Water outlet temperature	20 °C
Capacity	164 kW



REFERENCE LIST AND EXAMPLES

ECONOMIZER - LIPICO OIL SINGAPORE



	Tube Side	Shell Side
Utilities	Water	Exhaust air
Capacity	288KW	288 kW
Medium Flow	12.7 m3/h	17000 m3/h
Inlet Temperature	70	330
Outlet Temperature	90	230
Pressure Drop	58907 Pa	23 Pa
Design Pressure	15 bar	

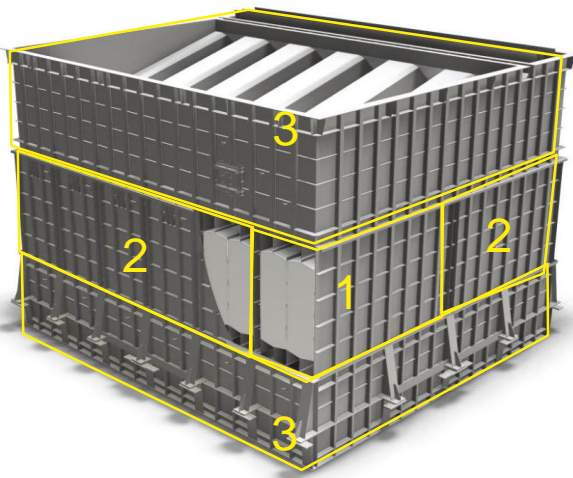


5.

**SAVE ENERGY WITH
REKOLUVO/REKOGAWO**

WELDED PLATE HEAT EXCHANGERS : HEAT RECOVERY

- Two products :
 - REKULUVO: Recuperative Air Preheater for Combustion air preheating
 - REKUGAVO: Recuperative Gas Preheater in flue gas purification (DeNOx, Cat.Ox., ...)



1. **Assembly of plate units in transportable casings**
Plate packs are tight welded to casing.
Welding occurs on top and bottom
2. **Casing side to side build up to any size**
Special expansion joints take care of thermal expansion in three dimensions
3. **Assembly with distribution hoods**



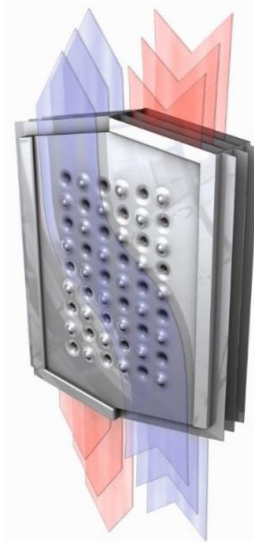
CROSS- / COUNTERFLOW REKULUVO / REKUGAVO



Co-current

Is used to prevent temperature falling below the dew point thanks to:

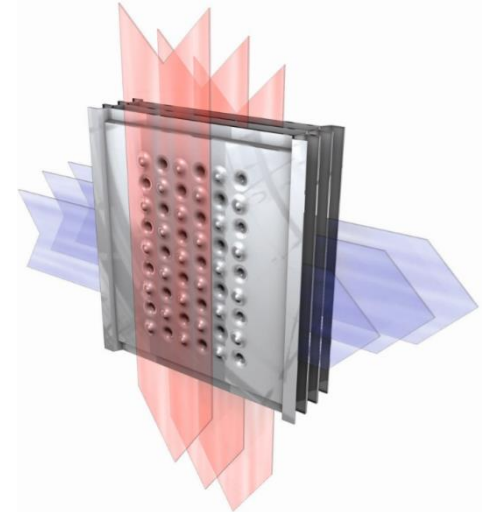
- Highest possible plate temperature
- Equal distribution of plate temperature



Counter-current

Designed for:

- Pure performance
- Highest thermal efficiency
- Max. heat recovery *up to 90 %*
- Medium to very large flow rates
- Ultra-compact design



Cross-current

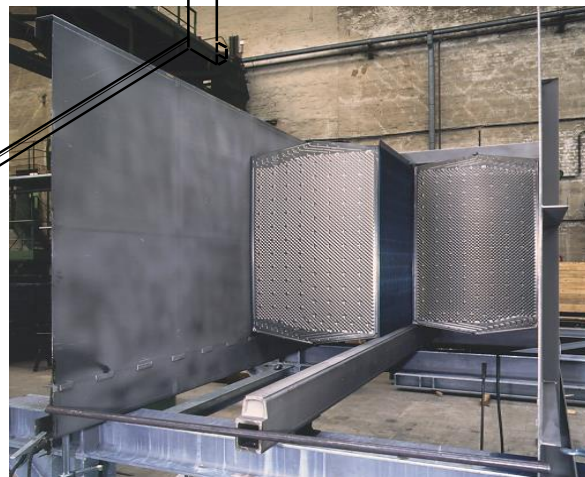
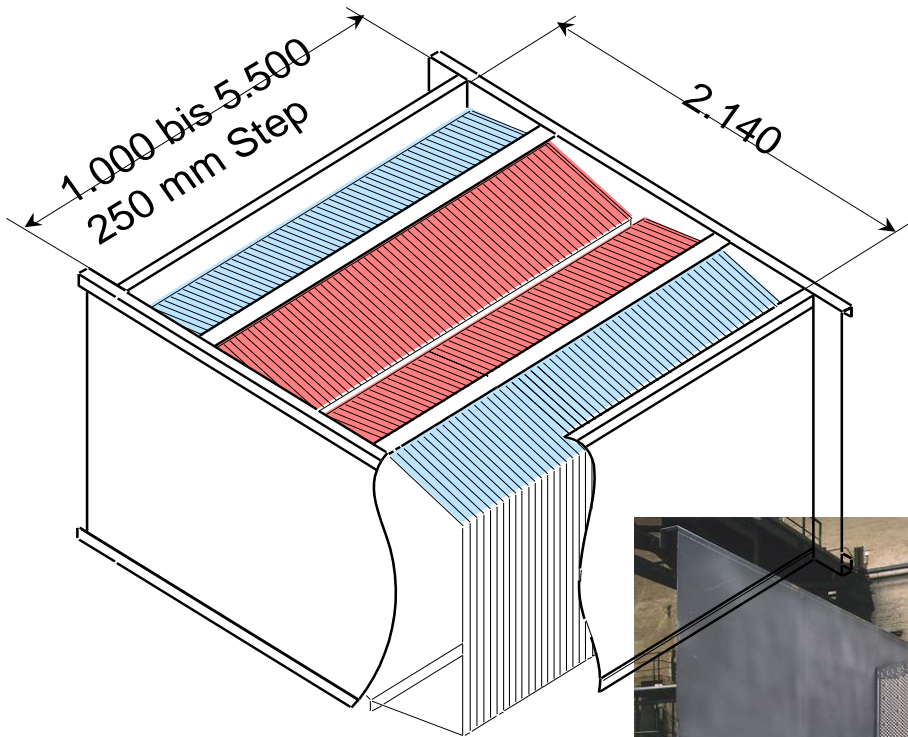
Ideal for:

- Small to medium flow rates
- Very high particle load on one side possible
- Low to medium heat recovery rate
- High operating temperatures

MARKETS AND APPLICATIONS FOR REKULUVO / REKUGAVO

Industry	Applications
Chemical industry	<ul style="list-style-type: none"> • Combustion air preheating • Flue gas reheating • Methanol, ammonia • Heat recovery in chemical processes • Power stations
Oil & gas industry	<ul style="list-style-type: none"> • Combustion air preheating • Power stations (SNOX)
Petrochemical industry	<ul style="list-style-type: none"> • Combustion air preheating • Power stations (SNOX)
Iron and steel works	<ul style="list-style-type: none"> • Combustion air preheating • Blast furnace gas preheating • Flue gas reheating (DeNOx)
Power plants	<ul style="list-style-type: none"> • Combustion air preheating • High-temperature energy storage systems
Waste incineration	<ul style="list-style-type: none"> • Flue gas reheating (DeNOx)
Cement industry	<ul style="list-style-type: none"> • Flue gas reheating (DeNOx) • Combustion air preheating

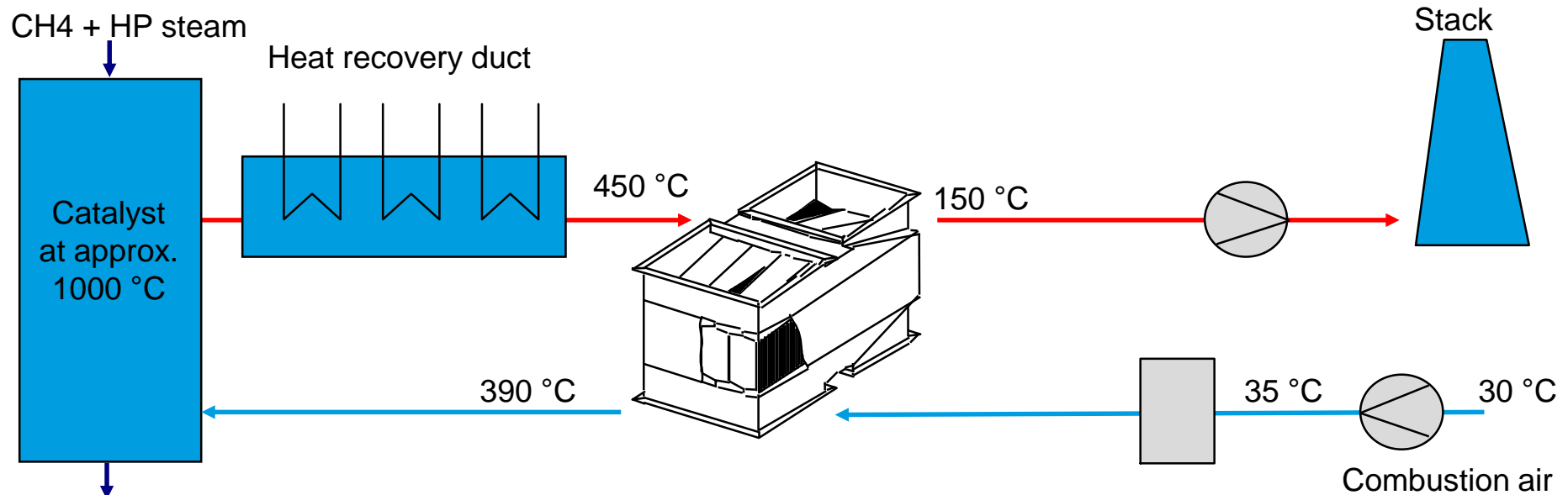
ASSEMBLY OF PLATES IN CASING IN TRANSPORTABLE UNITS



The plate packs are tight welded to the casing. The welding occurs on the top and on the bottom.

TYPICAL APPLICATION - REKULUVO

Typical PFD for REKULUVO in conventional syngas systems with a steam reformer

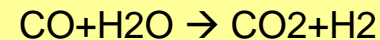
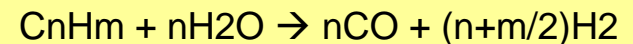
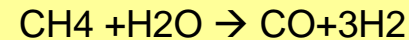


Features:

Typical flue gas range
Temperature differential
Pressure difference

50,000 – 1,000,000 Nm³/h
70 - 20 K
typical 100 mbar

FT steam reforming reaction:



REFERENCES – REKULUVO IN AMMONIA PLANTS

This REKULUVO was supplied 2003 for an ammonia plant in Trinidad. The complete heat transfer is done in a single pass with an efficiency of 93,8 %. The lifting time was 1,5 days.

Flue gas flow	217,510 Nm ³ /h
Inlet temperature	320 °C
Outlet temperature	110 °C

Air flow	182,264 Nm ³ /h
Inlet temperature	50 °C
Outlet temperature	301 °C

Heat recovery	18 MW
Therm. efficiency	93,8 %

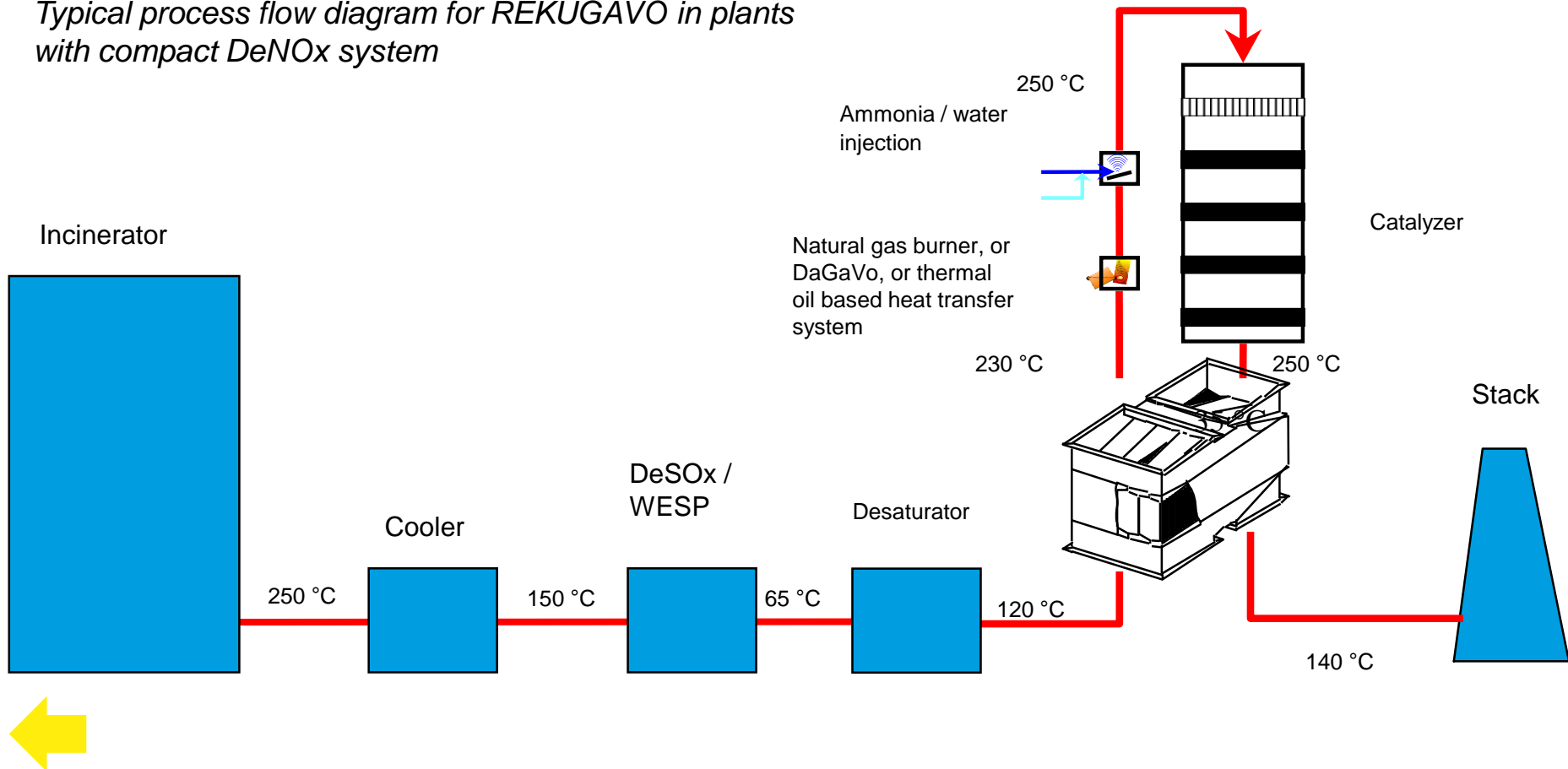
Width, length, height	(9,4 x 4,5 x 12) m
Heat exchange surface	16,669 m ²
Total weight	157 t

Ammonia plant N2000 / Trinidad



TYPICAL APPLICATION - REKUGAVO

Typical process flow diagram for REKUGAVO in plants with compact DeNOx system



REKUGAVO IN CHEMICAL INDUSTRY



Plant for the production of a basic chemical

The heat exchanger is integrated into the production process. There are reactants in the form of a gas mixture heated up and the product after the reactor is cooled down, in order to achieve an equilibrium shift product.

REKUGAVO Typ C-2-2,2-1658-SS08-8W-HP1/2St

Thermal duty	2,7 MW
Volume flow	29.000 Nm ³ /h
Reaktant-Gas-Temperature	91 °C to 376 °C
Produkt-Gas-Temperature	500 °C to 285 °C
Pressure drop	18 mbar
Dimensions	(4 x 3 x 5)m
Heat exchange surface	710 m ²
Total weight	20 t



6.

**BECOME PARTNER OF
KELVION**

WHY KELVION

- Successor to the GEA Heat Exchangers Group – long history of engineering
- We offer our customers one of the world's largest product portfolios in the field of heat exchangers – one stop shop
- Quality 'Made in Germany'
- Long experience of production of Heat Exchangers – we know what we are doing!



WHAT DO WE EXPECT FROM YOU

- Good and proven connections to Power Generation industry
- Supplying already other process components into Power Generation industry
- Motivated sales attitude



THANK YOU FOR YOUR ATTENTION!



Ronny Essmann

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