BE PETROTHAI GROUP

Adaptive Innovation Partner

NET ZERO SOLUTION PROVIDER

พันธมิตรนวัตกรรม เพื่อธุรกิจพลังงานไทย

Technology Partners

Market & Trusted Customers

- E & P
- PETROCHEMICAL
- REFINERY
- GAS

More Information
Please Contact :
Tel : +66 2 260 1295
Email : inquiry@bepetrothai.com

PETROTHAI · INCYAM · PTC PETROTHAI · BE CONCEPT · BE CONSULTING

BE PETROTHAI GROUP

Engineering Management Service

Customer
- Requirement/ Problem
- Information
- Plant/ process data
- Operating data

Manufacturer
- Technology

Feasibility Study

Fact Finding
- Customer requirement/ Pain point
- Process flow
- Equipment function

Assessment
- Information survey
- Site survey

Find out Solution
- Simulation
- Technology selection

Conceptual Design
- Technology
  - Technology selection
  - Benefit
- Constructability
  - Construction works
  - Limitation & Modification work required
- Budget +/-30%

Customer
- Product specification
- Engineering Standard

Manufacturer
- Product Sizing & Selection
- Engineering Standard

Detailed Design

Engineering Design
- Sizing and selection

Engineering Alignment
- Engineering standard & Project specification
  - Design & Specification
  - Source of material
  - Production & Testing

Scope of Supply
- **Scope of Supply**
  - Goods : itemized
  - Service : activities
- **Detailed Engineering**
  - Preliminary datasheet and drawing
  - Bill or quantity
  - Vendor document schedule
- **Project schedule**
- **Budget +/-10%**

Manufacturer
- Procurement : Sub - vendor
- Production

Contractor
- **Service**
  - Inspection
  - Construction service
  - Commissioning & Performance test
- **Resource**
  - Manpower
  - Tools

Project Execution

Engineering
- Quality engineering
- Safety engineering

Resource Management

Execution
- Goods : Production & Testing
- Service : Installation & Commissioning

Progressive Measurement

Risk Management

Successful Contract
- Quality control
- Safety control
- Time control
- Budget control

ITP & Work Procedure

Resource Plan

Progressive Report

Recovery Plan

NET ZERO SOLUTION PROVIDER

Energy Recovery

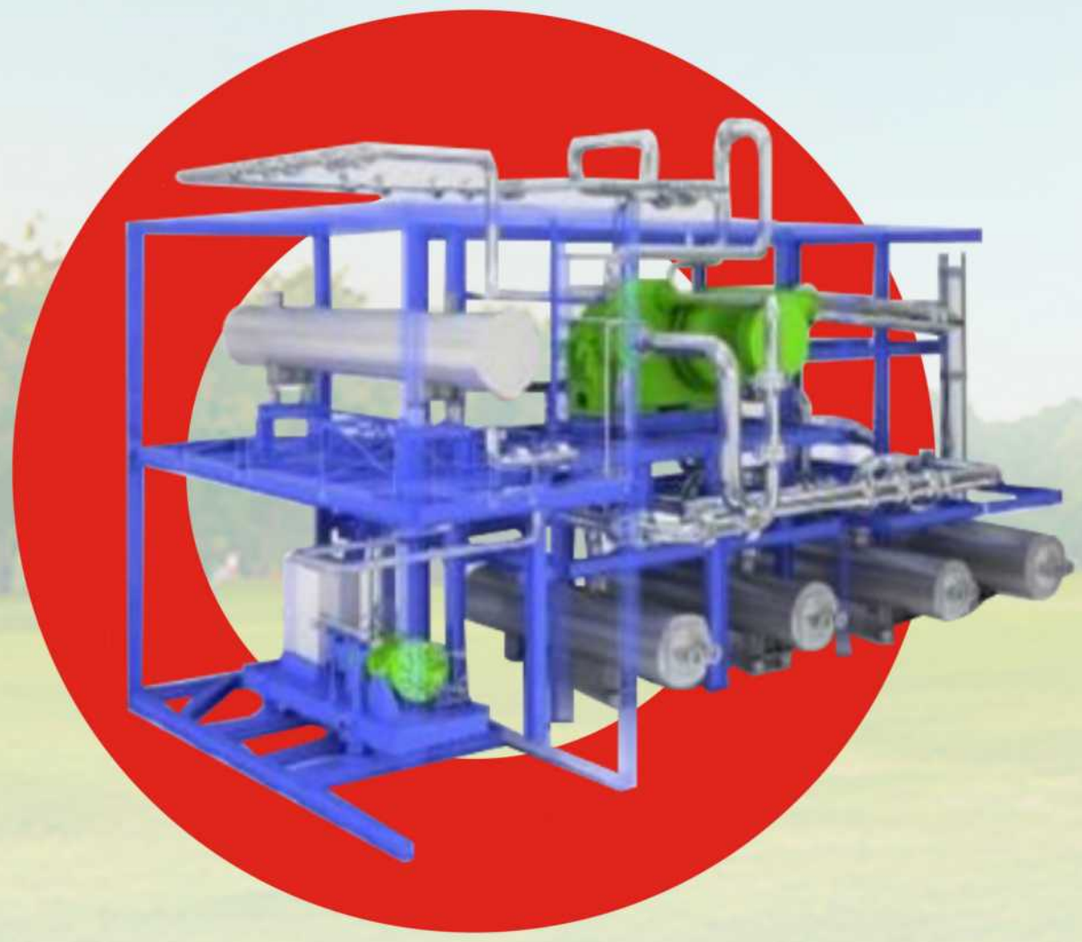
Reuse Waste Heat to Power

- Organic Rankine Cycle
- Waste Heat Recovery

Energy Saving

Reduce GHG

- XP Flare
- Column Internal Improvement
- Twisted Tube
- Radiant Coil SCOPE HT E



Carbon Capture Utilization & Storage

Reduce CO_2

System

- NET Power Technology

Machinery

- CO_2 Gas Compressor
- CO_2 Liquid Pump

New Energy

Replace Hydrocarbon to H_2

Power Generation

- Hydrogen Gas Turbine

Combustion Process

- Hydrogen Burner

Production Plant

- Hydrogen Generator

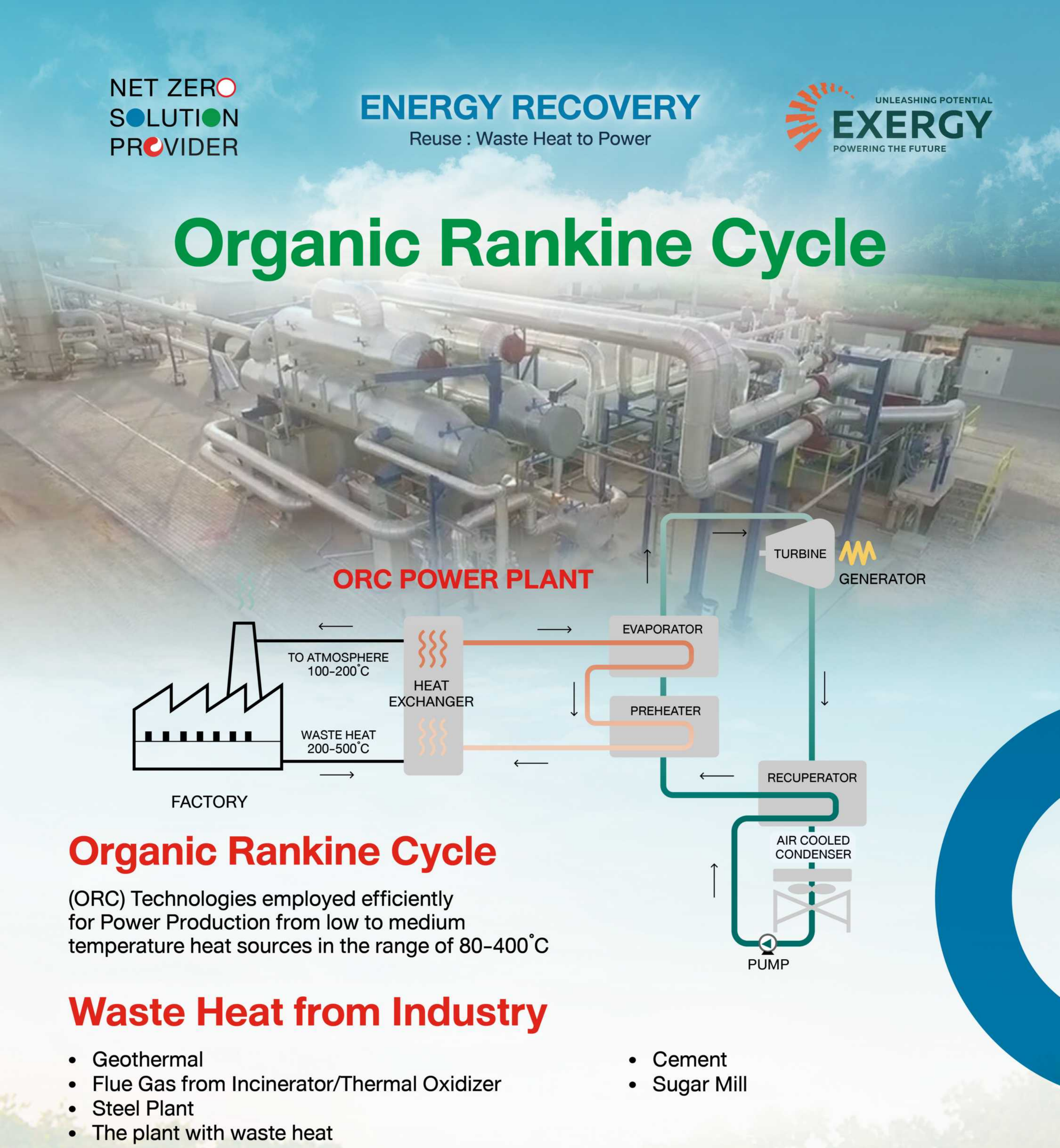
NET ZERO SOLUTION PROVIDER

ENERGY RECOVERY

Reuse : Waste Heat to Power

UNLEASHING POTENTIAL EXERGY POWERING THE FUTURE

Organic Rankine Cycle



Organic Rankine Cycle

(ORC) Technologies employed efficiently for Power Production from low to medium temperature heat sources in the range of 80-400˚C

Waste Heat from Industry

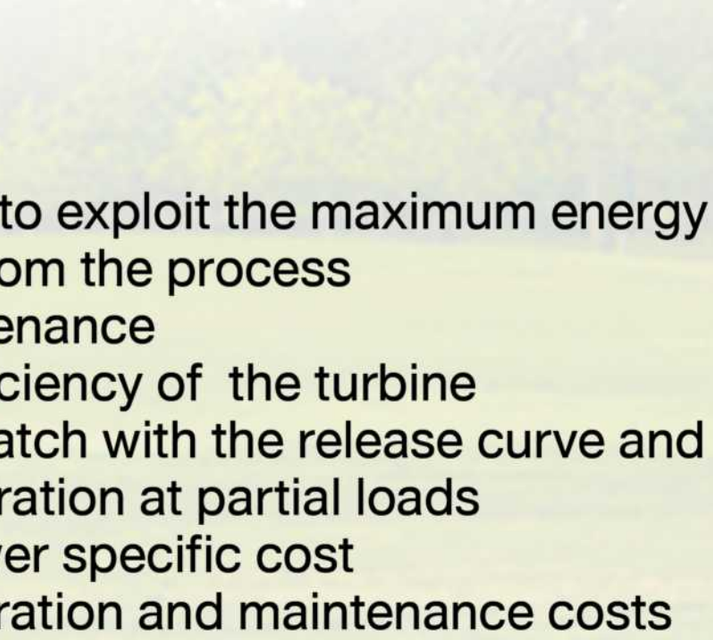
- Geothermal
- Flue Gas from Incinerator/Thermal Oxidizer
- Steel Plant
- The plant with waste heat
- Cement
- Sugar Mill

Advantages

- No need of operators thus lower running cost
- No limitations and constraints on placement, better fitting available soil and production process requirements
- Higher amount of productive hours
- Easy maintenance
- No need of water consumption
- Hight Sustainability
- Possibility to exploit the maximum energy available from the process
- Low maintenance
- Higher Efficiency of the turbine
- Optimal match with the release curve and better operation at partial loads
- Lower power specific cost
- Lower operation and maintenance costs

Case study

- **Plant size** : 5MWe
- **Application** : Heat Recovery Gas Turbines
- **Heat Source Temperature (Diathermic Oil)** : 294˚c -140.8˚c
- **Water or Cooling Agent** : Cold water from LNG regasification cycle as heat sink
- **Temperature Water** : 5-38˚c
- **Environmental Savings** : <23,460tCO_2/y
  : <7,497 TOE/y



NET ZERO SOLUTION PROVIDER

ENERGY RECOVERY

Reuse : Waste Heat to Power

UNLEASHING POTENTIAL EXERGY POWERING THE FUTURE

Organic Rankine Cycle

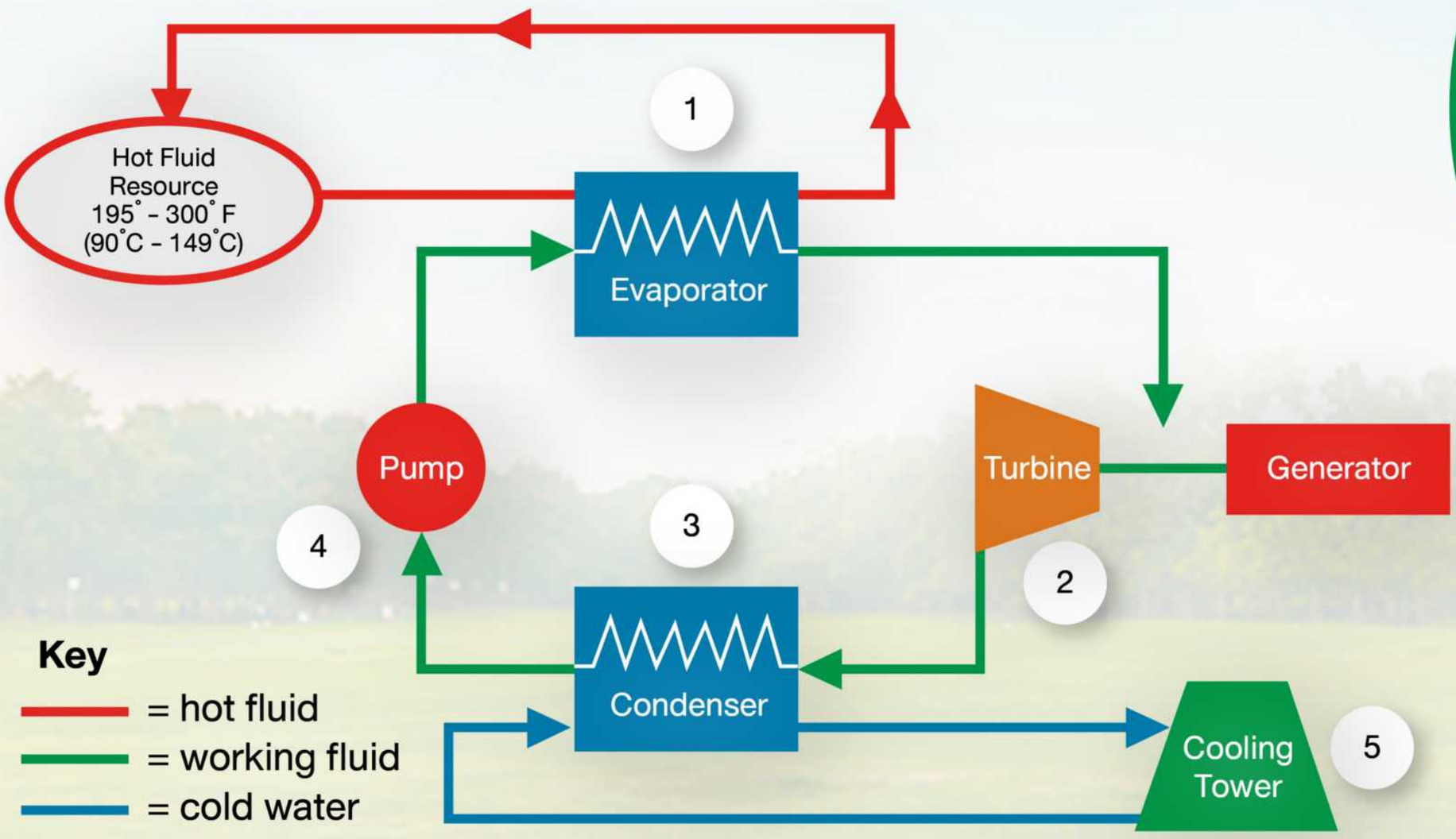
Pure Cycle

Standard Package

Specification

Size :	**5.8 x 2.3 x 3.5 m**
Output Power :	**272/280 kW**
Frequency :	**50/60Hz** (Customer determine)
Voltage :	**380 ~ 460V** (Customer determine)
Heat Source :	**Steam**
Heat Temperature :	**101~150˚C**
Heat Flowrate :	**2.5 ~ 5 t/h**
CW inlet temperature :	**25 ~ 35˚C** (Change with the ambient)
CW Flowrate:	**300t/h** (Delt T = 8˚C, for each unit)
Empty Weight :	**14 t / unit**
Operating Weight :	**17 t /unit**

System Operation



In the Specified conditions, the expected performancesof **TICA's ORC Purecycle 280 units** are following :

	Hot Source				Cooling Water			Power Output	
	Inlet Temp. ˚C	Inlet Press. KPa.a	Outlet Temp. ˚C	Flow Rate t/h	Inlet Temp. ˚C	Outlet Temp. ˚C	Flow Rate t/h	Gross kW	Net kW
Unit 1	126	500	80.6	55	30	35	465	245.2	228
Unit 2	126	500	80.6	55	30	35	465	245.2	228
Unit 3	126	500	80.6	55	30	35	465	245.2	228
Total				**165**			**1,395**	**735.6**	**684**

NET ZERO
SOLUTION
PROVIDER

ENERGY RECOVERY

Reuse : Waste Heat to Power

BIH

Waste Heat Recovery Unit

A reputation for engineering excellence, quality and responsiveness to individual client's expectations.

Case study : Distribution Plant

NET ZERO SOLUTION PROVIDER

ENERGY SAVING
Reduce GHG

JOHN ZINK HAMWORTHY COMBUSTION

XP Flare

Steamizer XP

40% – 60%
Increased smokeless capacity for a given steam flow rate

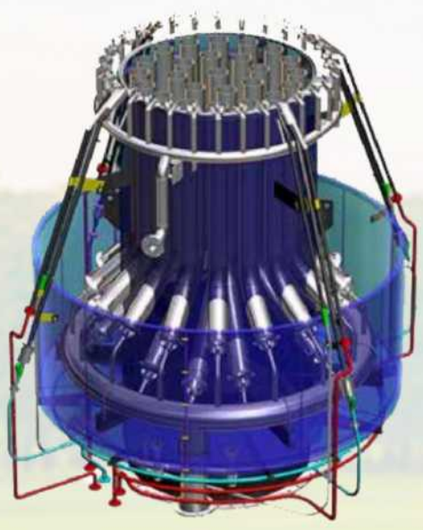
- Minimize Smoke
- Reduce steam consumption
- 30% – 40% less steam for smoke suppression

FEATURES

BENEFITS

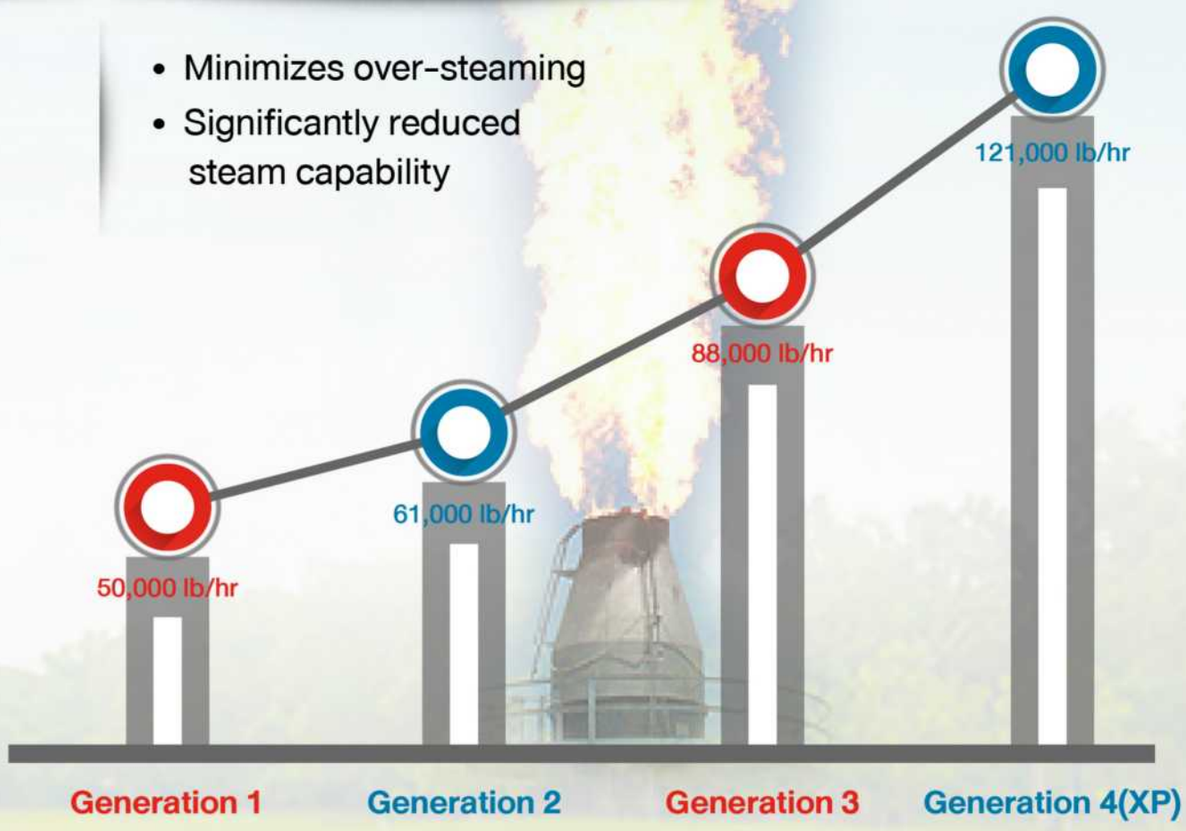
FEATURES	BENEFITS
• Ultra-high smokeless capacity • Low noise design	• Minimizes environmental / community impact of flaring
• Eliminates steam capping	• Extended tip life
• Low steam/gas ratio for smokeless flaring • Single steam-line option	• Reduced steam consumption • Simple operation
• No center steam required • Ultra-low minimum steam capability	• Minimizes over-steaming • Significantly reduced steam capability

Traditional



Steamizer HSA
Flare tip

QS
Upper Steam Flare



Propylene Smokeless Performance
Flow Rate (lb/hr)

Case Study : Aromatic Plant
Equipment : XP Flare

Steam Saving	Existing Flare Tip	XP Flare tip with Reduced steam (CSR)
Smokeless R0 % of max capacity	8% (135tph)	10% (168tph)
Smokeless R1 % of max capacity	10% (170tph)	13% (221tph)
Cooling Steam	3,200 kg/h	500 kg/h
Purge Gas	18.6 M3/h	74.5 M3/h
Yearly Steam Saving	-	33,419.4 tons
6years CO_2 saving (vs existing technology) TCO_2e		32,000 tons (approx.70% Reduction)

NET ZERO SOLUTION PROVIDER

ENERGY SAVING

Reduce GHG

KOCH HEAT TRANSFER

TWISTED TUBE®

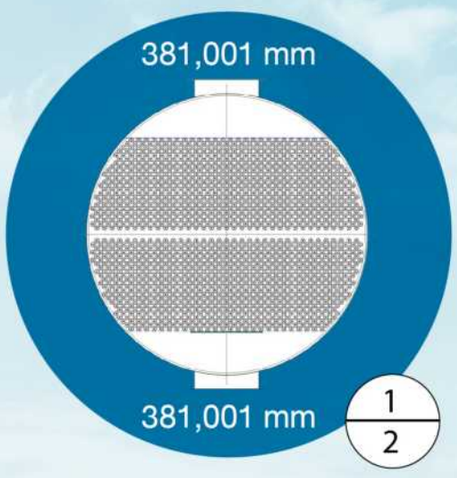
Bundle Construction

- Tubes are firmly supported.
- Vibration Free : Vcr > 305 m/s (1000ft./sec)
- No single tube can vibrate.

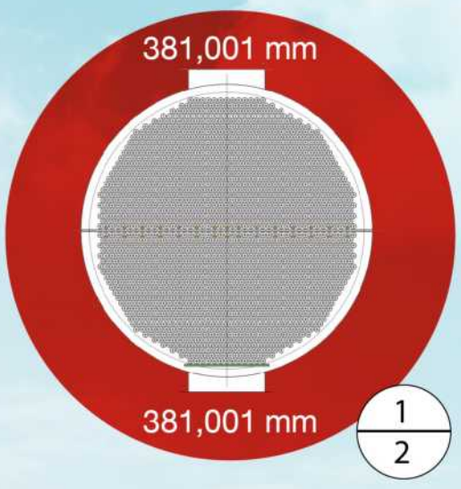
$$Q = U_0 * A * F * LMTD$$

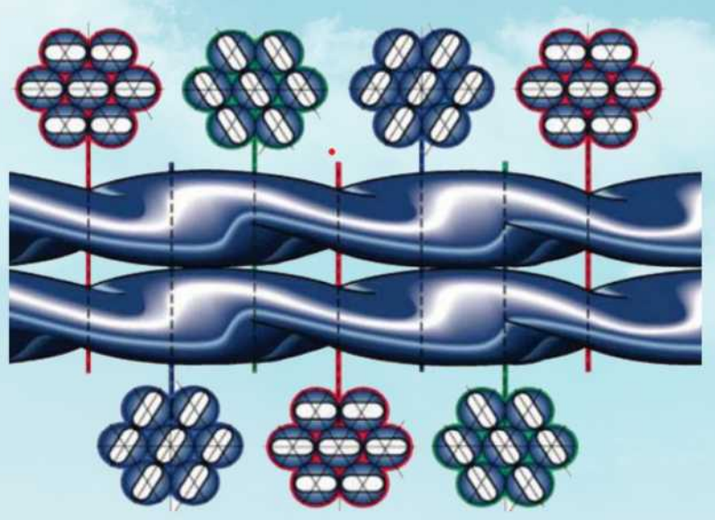
Q = Heat duty | U_0 = Overall Heat Transfer Rate | A = Surface Area | F = Temperature Correction Factor | LMTD = Log Mean Temperature Difference

Pain tube

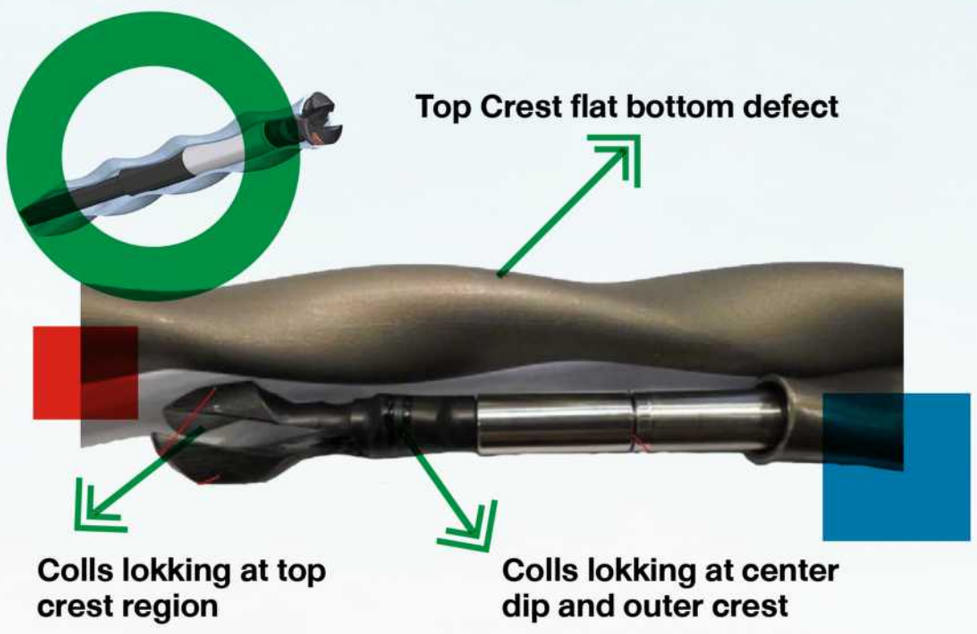


TWISTED TUBE®





Inspection



TECHNICAL INFORMATIONS

INSPECTION EQUIPMENT

BRAND:	Eddyfi	SOFTWARE:	Magnifi
MODEL:	Ectance 2	TECHNIQUE:	RFT (Twistec probe)
PROBE:	6 mm.	FREQUENCY:	2.8 KHz.

CLIENT/EQUIPMENT DETAILS

CLIENT:	PTT GSP	LOCATION:	GSP6 plant
EQUIPMENT NO:	3603-E003A	MATERIAL:	A-179
TUBE SIZE (ODxWT):	19.05 x 2.11 mm.	TOTAL TUBE:	4750
LENGTH:	6000 mm.	INSPECTED TUBE:	395
TEST SIDE:	Tube sheet / Front	TEST DATE:	11-12 JULY 2021

Cleaning

SHELLSIDE PRE-CLEANING

- Remove shroud
- Do not remove bands

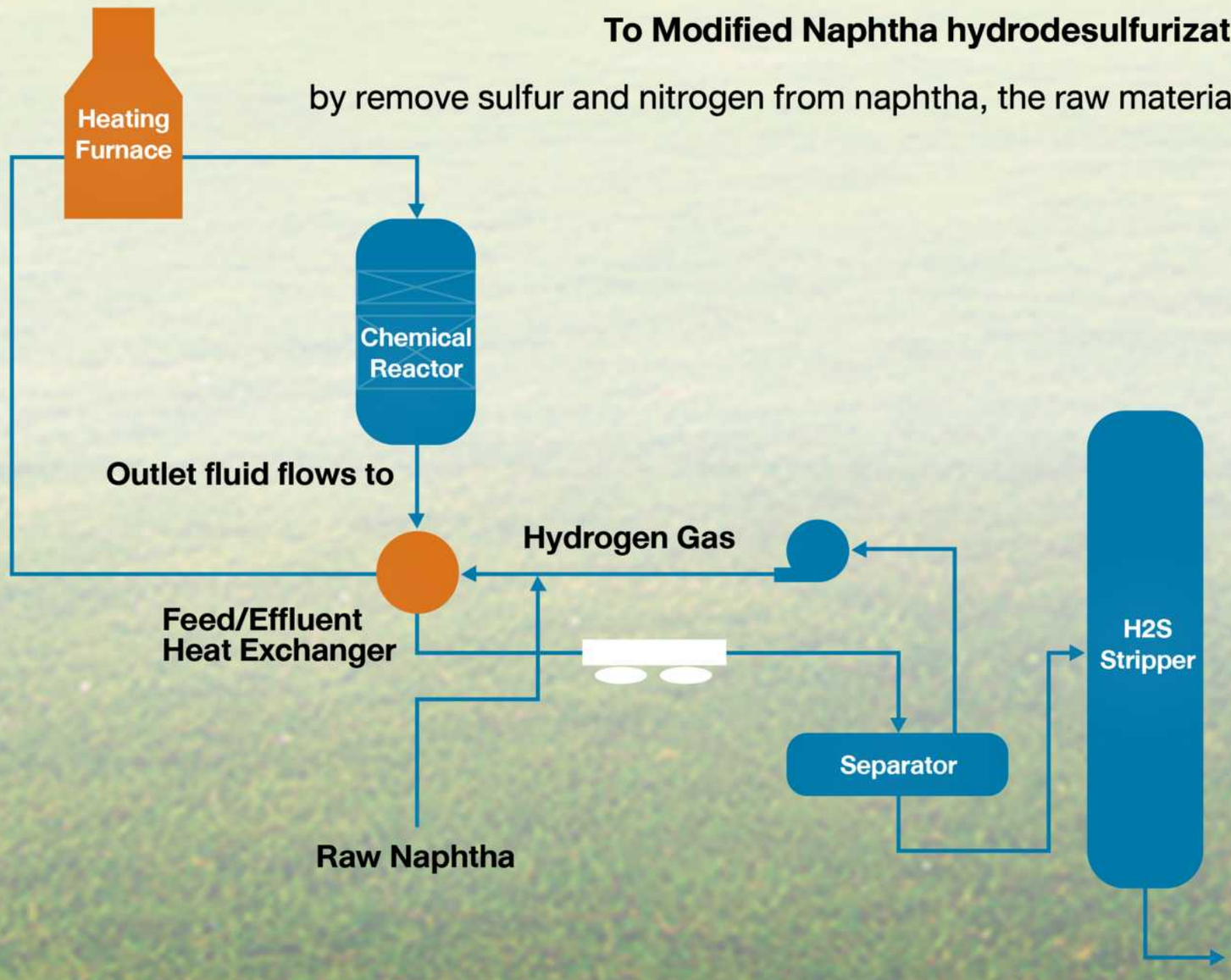
SHELLSIDE HYDROBLASTING

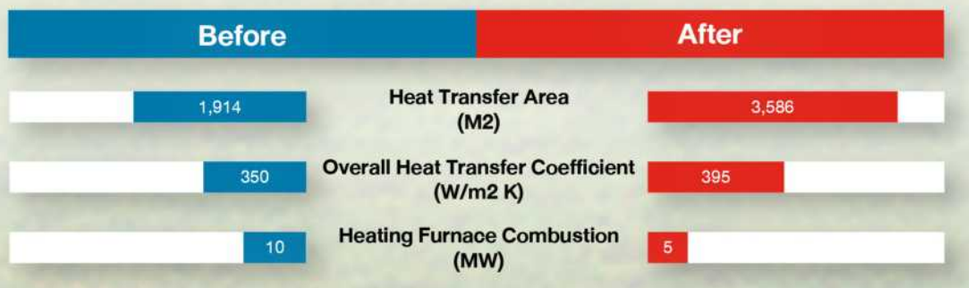
- Cleanable triangular pitch bundle due to cleaning lanes.

Case Study : Refinery Plant

To Modified Naphtha hydrodesulfurization equipment

by remove sulfur and nitrogen from naphtha, the raw material for catalytic reforming equipment





Benefits of modification : Energy Conservation

- Improved heat transfer efficiency reduces the amount of combustion in the heating furnace
- ~ 5MW Energy savings

NET ZERO SOLUTION PROVIDER

ENERGY SAVING
Reduce GHG

KOCH-GLITSCH

Column Internal Improvement

- Decrease Reboiler / Condenser Energy
  - Decrease Fuel Cost
  - Decrease Steam Consumption
- Increase Turndown Ratio
- Increase Capacity / Efficiency

FLEXITRAY® Valve Trays

FLEXIPRO® Valve Trays

Next Generation FLEXIPRO® valve trays

- Capacity increase up to 30%
- Enhanced push and sweeping effect over the tray deck to remove solid deposits – Mitigates the risk of fouling and achieves longer run lengths
- Fixed valve – Increased reliability
- Fixed valve – Uniform vapor distribution maintains tray efficiency over the full operating range

INTALOX® ULTRA Random Packing

Bridging the gap between capacity and efficiency.
An innovatively designed structure that maximizes the effective surface area.
The low pressure drop and high capacity of this packing:

- Allows smaller diameter for new columns
- Reduces energy consumption
- Reduces foam generation
- Reduces pressure drop
- Increases capacity

SUPERFRAC® High PerformanceTrays

The SUPERFRAC® tray is a high performance cross-flow tray that has the highest combined capacity and efficiency of all single-pass cross-flow trays tested at Fractionation Research Inc. (FRI)

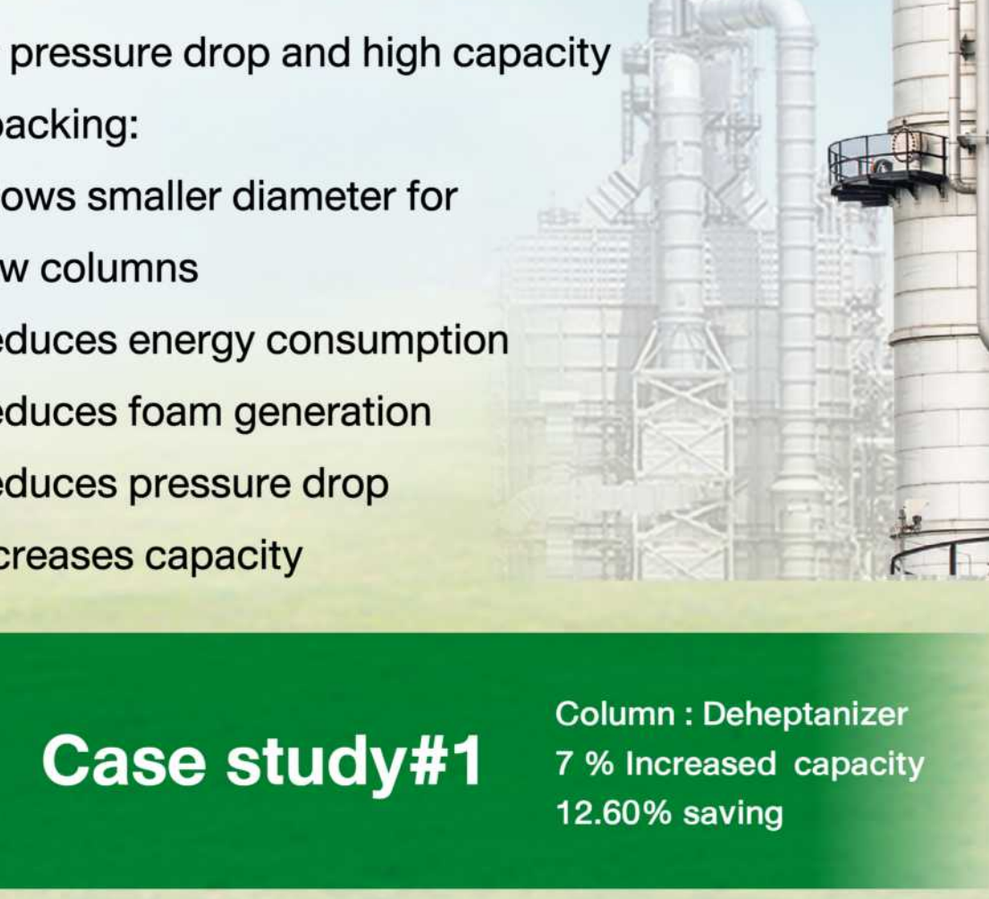
- Advanced downcomer technology
- Active area enhancements
- Inlet area enhancements
- Increase capacity and efficiency

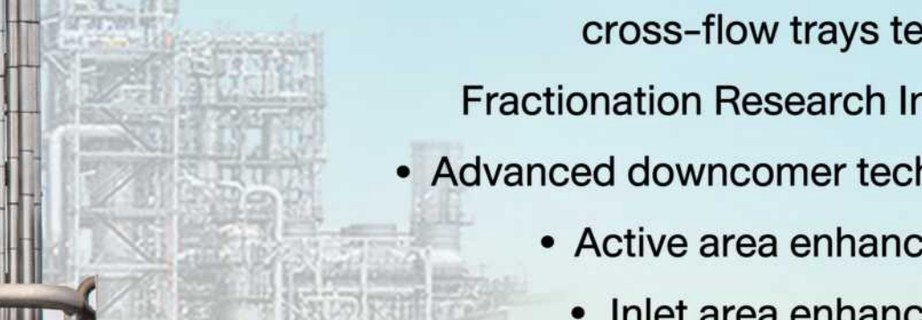
Case study#1

Column : Deheptanizer
7 % Increased capacity
12.60% saving

Case study#2

Quench Oil Tower
Plant : Olefin





Random packing : Cascade miniring

Random packing : Intalox Ultra

New generation high performancepacking facilitates
13% additional capacity
36% reduction in overall pressure drop

NET ZERO SOLUTION PROVIDER

ENERGY SAVING
Reduce GHG

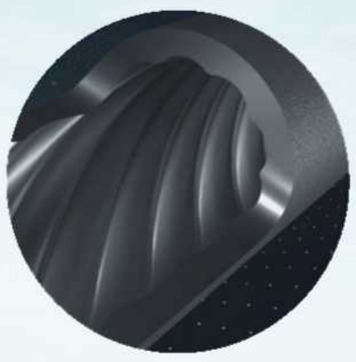
Schmidt+Clemens

Radiant Coil SCOPE HT E

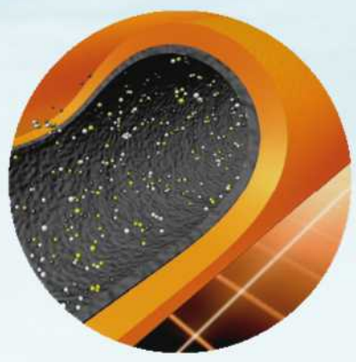
Longer Runs – Lower Coking Rates

Longer Runs
Lower Coking Rates

SCOPE FUSION HTE



BARE TUBE

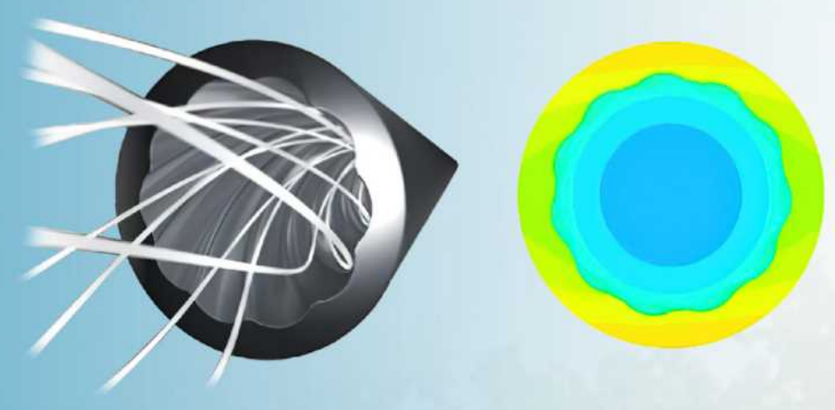


Rotating Flow Pattern

- Improved heat distribution across tube shell
- Reduced gas temperature gradients
- Balancing of sunny/shady sides
- Less carburization/maintenance
- Customizable profile (amount of fins & profile depth)

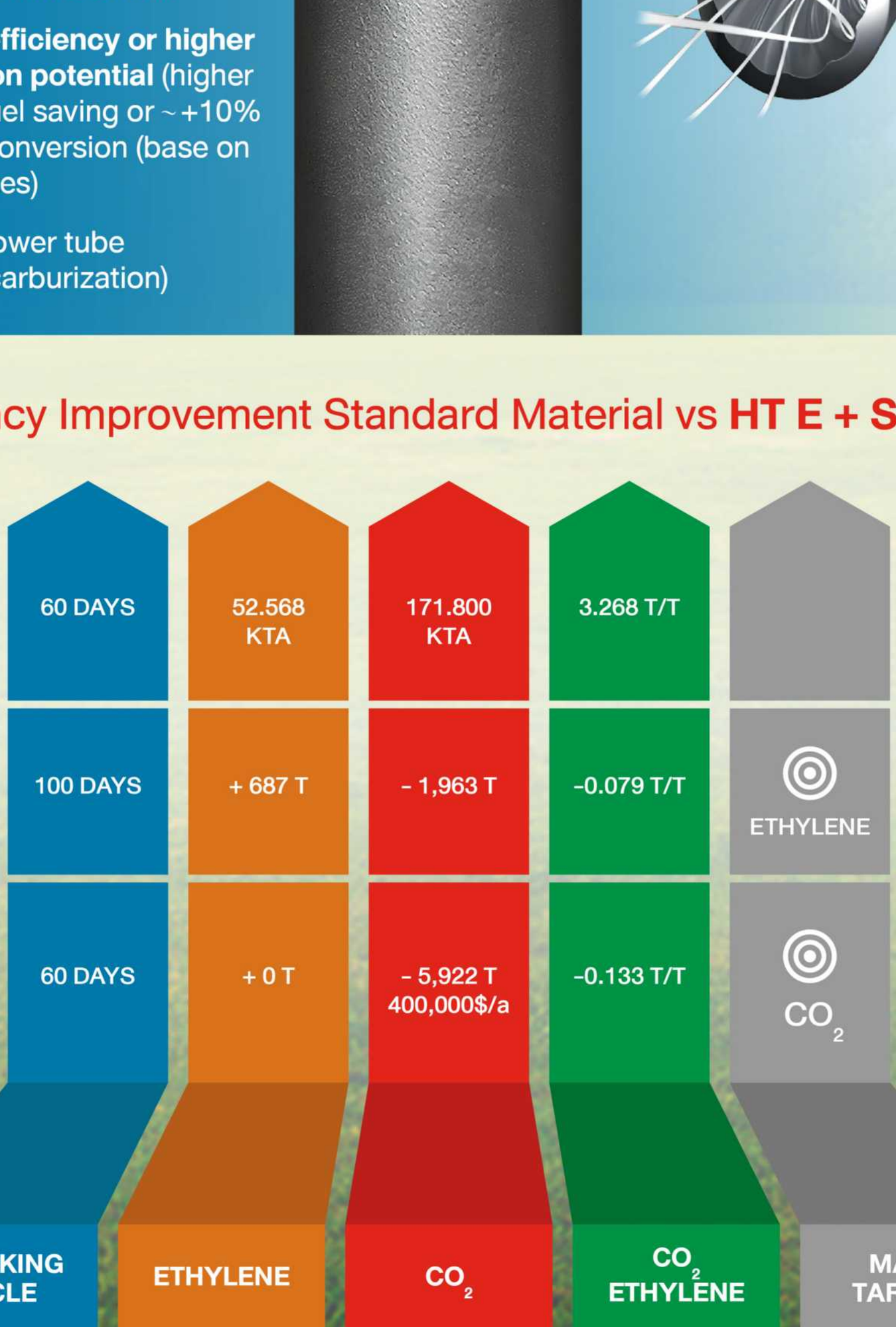
Performance

- **Increased run length** (lower TMT & coke formation) by factor of ~1.5 to 2
- **Higher product selectivity** (gas temperature balancing, less over-/ undercracking) ~1% more olefins
- **Increased energy efficiency or higher feed rate/conversion potential** (higher heat transfer) ~3%fuel saving or ~+10% feed rate or ~+2% conversion (base on identical cooking rates)
- **Increase coil life** (Lower tube tempeartures, less carburization)



Efficiency Improvement Standard Material vs **HT E + SCOPE**

CASE STUDY :
Olefin Plant



Standard Alloy
45Ni35CrSi / ET45Micro
Furnace Limited

Centralloy® HT E
+ SCope®
Furnace Limited

Centralloy® HT E
+ SCope®
Scheduled Decoking

NET ZERO
SOLUTION
PROVIDER

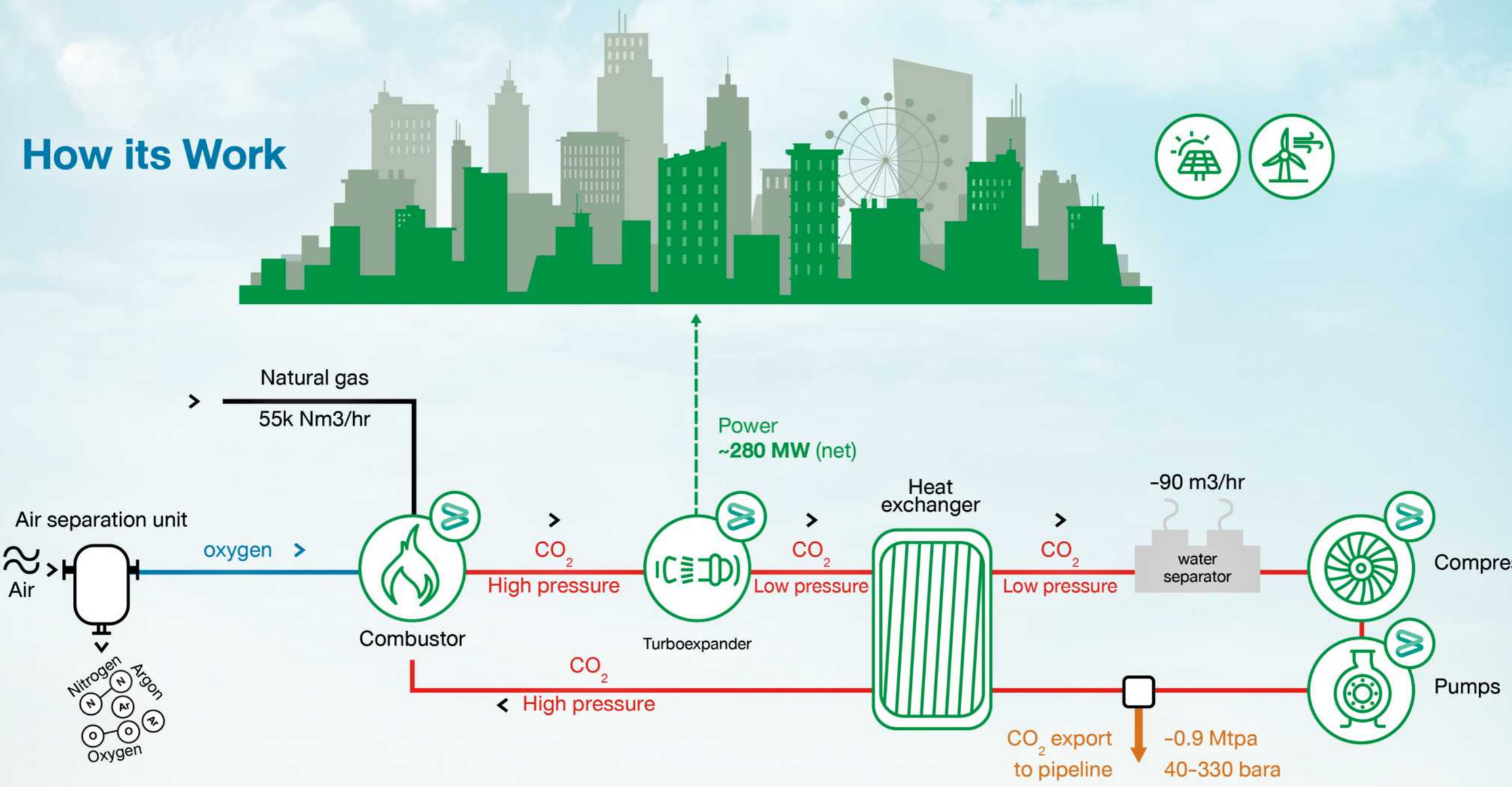
CARBON CAPTURE
UTILIZATION & STORAGE
Reduce CO_2

Baker Hughes

System

NET Power Technology

How its Work



- Traditional plants burn nature gas in air, producing diluted CO_2 and NOx, which make CO_2 separation expensive and efficiency-robbing.
- NET Power plants use **oxy-fuel combustion**, combusting pure O_2 with methane, and continuously recycle a stream of CO_2 in a loop.
- By eliminating the N2 NET Power platform makes **CO_2 separation as easy as simply spilling it** already at high pressure and high purity, ready for transportation and storage.
- In addition, an intimate heat integration network reduces waste and increases all-in ISO **efficiency above 50%.**

NET ZERO SOLUTION PROVIDER

CARBON CAPTURE UTILIZATION & STORAGE

Reduce CO_2

Baker Hughes

Machinery

CO_2 Liquid Pump

Super Critical CO_2 Characteristics and Pump Selection

CO_2 Compressibility Low Viscosity

Rotordynamic
low damping effect

New Impeller Family
density variation up to 25%

Acoustic Resonance
different fluid characteristics

Performance Assessment
validation for liquid and critical CO_2

Benefits

Speed and rotor stability

Maximized Pump Delta P

Wet and Dry seals available

Water vs CO_2 correlation laws

Customer Value

Efficiency and footprint

Optimized seal technology selection

Accuracy of the performance prediction

NET ZERO SOLUTION PROVIDER

CARBON CAPTURE UTILIZATION & STORAGE

Reduce CO_2

Baker Hughes

Machinery

CO_2 Gas Compressor

Modular integration CO_2 system for easier installation & operation

UNIQUE BH CAPABILITY

Advantages & Compressor only

- 10% Less Power
- Operational Flexibility
- Common Controls & Auxiliaries
- Reduced CAPEX/OPEX
- Smaller Footprint

CO_2 up to 540 bar

World's Highest Pressure CO_2 Pump

Supercritical CO_2

Integrally Geared CO_2 Compressor

CO_2 Gas

NET ZERO SOLUTION PROVIDER

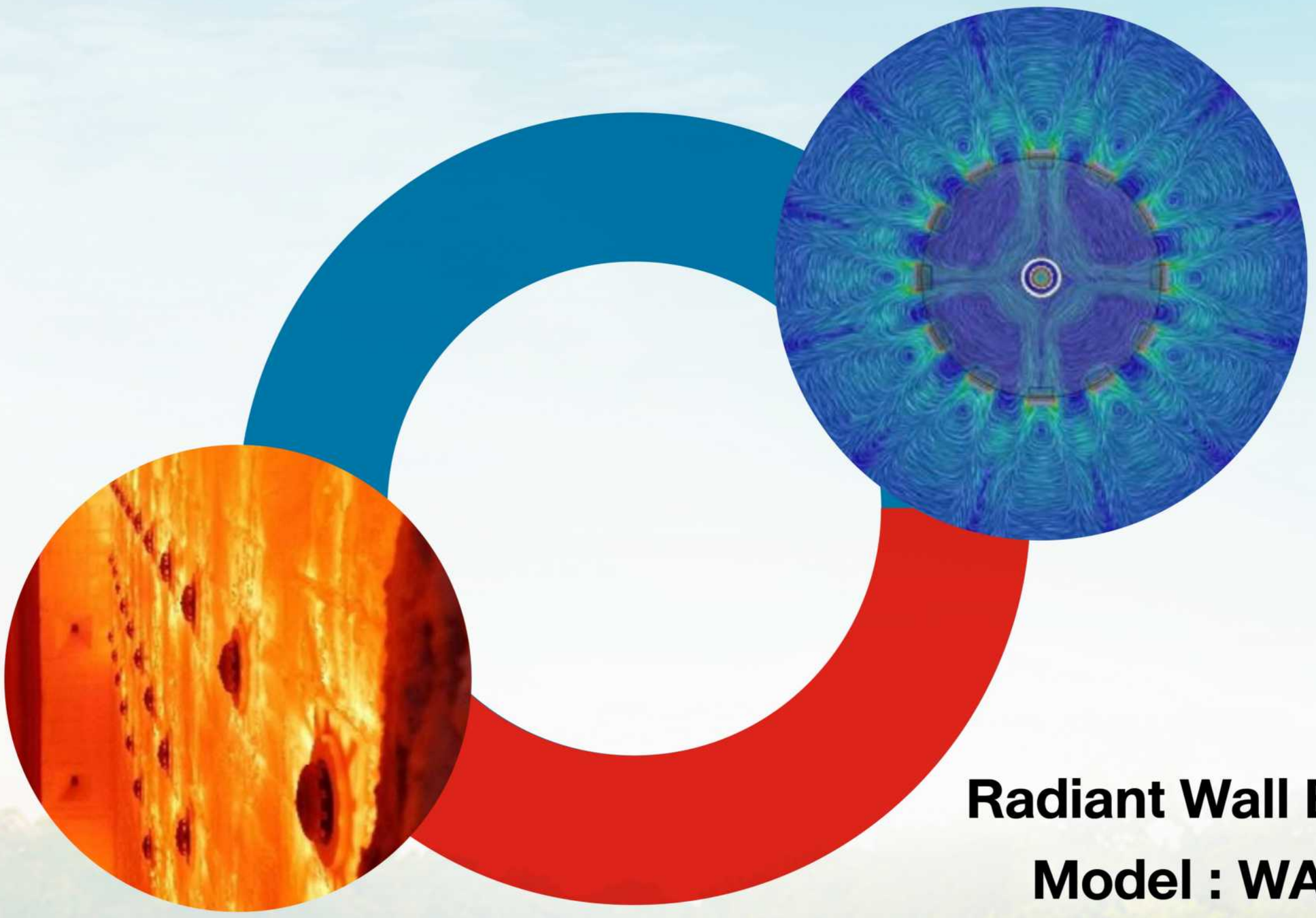
NEW ENERGY
Replace Hydrocarbon to H2

JOHN ZINK HAMWORTHY COMBUSTION

Hydrogen Burner

The WALFIRE burner draws upon decades of radiant wall burner experience in reforming and olefins furnaces across the globe to deliver superior performance and benefits.

+100% No-flashback guarantee,due to diffusion concept
+The lowest possible NOx emission for such applications



Radiant Wall Burner
Model : WALFIRE

Performance

- Less than 82 dBA noise at 3ft or 1m
- Fuel flexibility including up to 100% hydrogen
- Extremely low gas pressure required <0.5 bar(g) for 0.3MW
- Specifically designed to provide a radial flame that lies flat against the fired Wll preventing flame projection into the process coils
- Customizable flame geometry to fit tightest installations
- Very large air ports which are virtually impossible to plug during normal operating conditions (dust/sand)

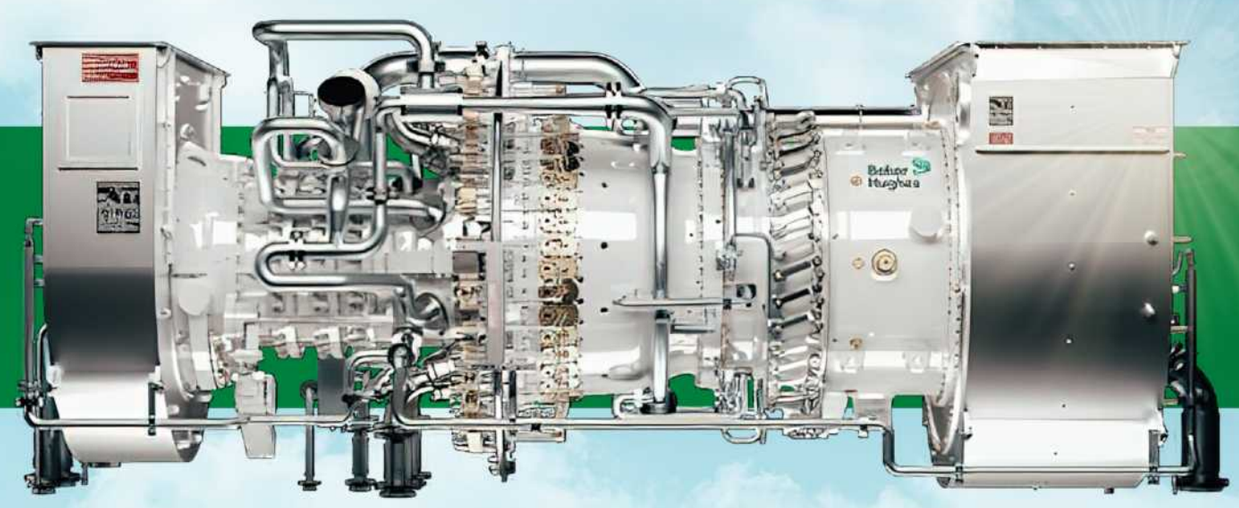
Case Study : 100% Hydrogen Duct Burner HRSG Plant

NET ZERO SOLUTION PROVIDER

NEW ENERGY
Replace Hydrocarbon to H2

Baker Hughes

Hydrogen Gas Turbine



Model :
NovaLT™

Design to minimize total cost of ownership

- **Availability** > 99%
- 35,000 hours **MTBM**
- Remote **Operability**
- Best in class **efficiency**, full and partial load
- **Maintainability** : engine swap in 24 hours

	LT5	LT12	LT16
Shaft Output	5.5MWe	13MW/12.5MWe	17.5MW/16.9MWe
Efficiency @ full load	31.5/30.7%	36.8/35.3%	37.5/36.4%
Efficiency @ 70 % load (feat. VATN LT12/16)	28.3%	32%	33.1%
Shaft nominal speed	16,630 rpm	8,900 rpm	7,800 rpm
MTBM	24,000 fire hours	35,000 fire hours	35,000 fire hours
NOX emissions	15 ppm	15 ppm*	15 ppm*

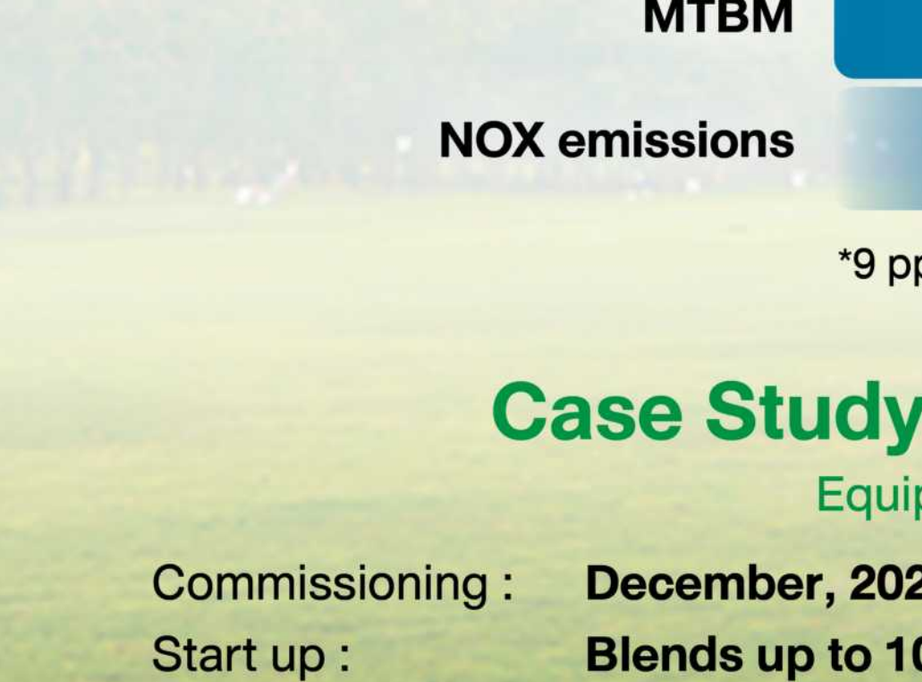
*9 ppm available on request

Case Study : Commercialize in Canada

Equipment : **Gas Turbine NovaIT ™16**

Commissioning : **December, 2024**

Start up : **Blends up to 100% H2. switch from NG to gas blends up to 100H2 on the fly**



	Capacity	% efficiency
Powergen Simple Cycle	16.9 MWe	36.4% Elect. efficiency
MECH Drive Simple Cycle	17.5 MWe	37.5% Elect. efficiency
Combined Cycle	22.0 MWe	48% Elect. efficiency
Cogeneration (CHP)	31tph Steam output	80% CHP efficiency
Maintenance	35k-70k (FFH)	• No annual inspection • Fast engine exchange • Minimized inventory
Nox Emissions	• 15 ppm with SCR at exhaust (today) • 15pp, DLN (From 2026)	

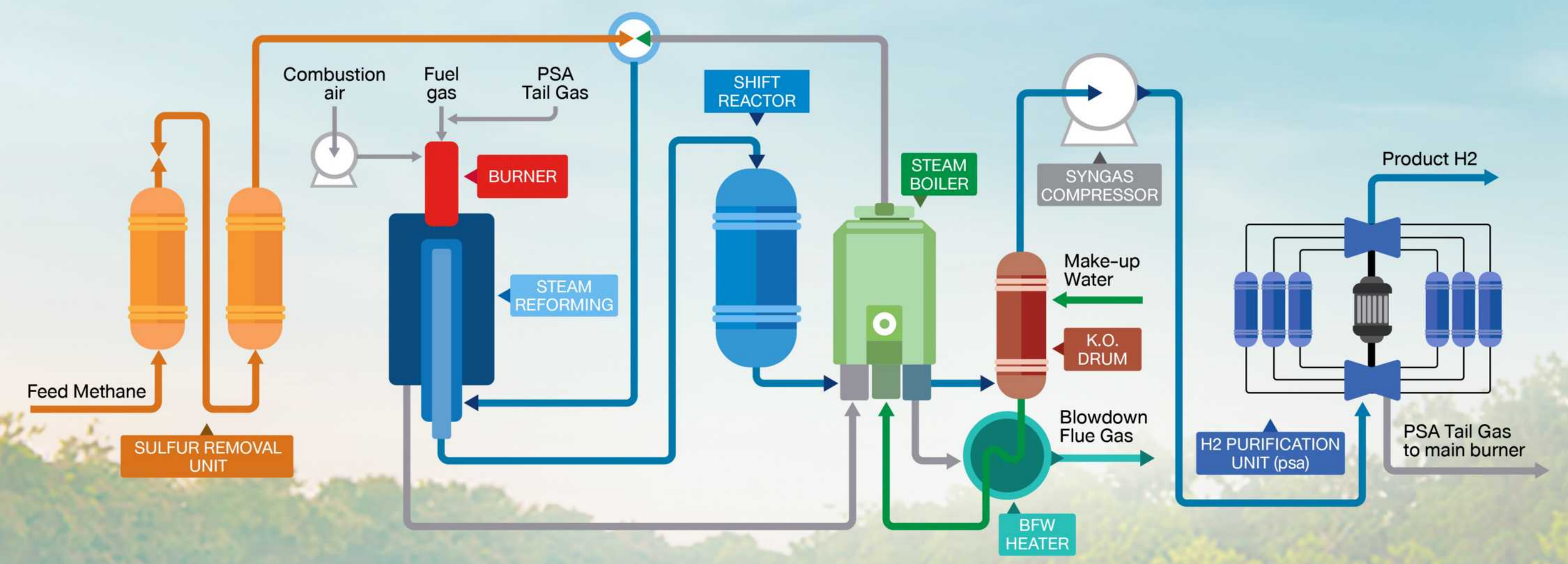
NET ZERO SOLUTION PROVIDER

NEW ENERGY
Replace Hydrocarbon to H2

ASC FILTRI
a mott company

Blue Hydrogen Generator

Steam Methane Reforming (SMR) with **Carbon Capture and Storage** (CCS) uses innovative and high efficient adsorbent media, producing Hydrogen from natural gas or biomethane while capturing resulting carbon dioxide emissions. Therefore, SMR with CCS is a promising technology for reducing greenhouse gas emissions from Hydrogen production.



Input
Feed & Fuel Specifications

Natural Gas Analysis Pressure : 1 bar(g) (minimum)	Typical Range	Maximum	Design Case
Methane (vol%)	80–100		95.3
Ethane (vol%)	0–10		2.6
Propanes+ (vol%)	0–1	1.5	0.7
Inerts (Co2, N2) (vol%)	0–10		0.7
Oxygen (vol%)		0.2	
Total Sulfur (ppmv)	0–12	20	5

Operation Support
Utilities for the Production of 100Nm3/h of H2 the following utilities are require :

Natural gas : **41 Nm3/h**
Municipal water : **105–140 kg/h**
Cooling Water : **12.5m3**
Electricity power : **40kW (400V, 3 phases, 50Hz) for combustion air blower, syngas compressor, air coolers, extractor fan (ventilation system) to purge container , feedwater pump, RO water pump and PSA**

Output
Specifications :

Product Flow : **Standard flow 35–200 Nm3/h net hydrogen (up to 500–1,000 Nm3/h upon request)**
H2 purify : **Typically 99.95% less than 10ppm CO**
Delivery Pressure : **Typically 11bar(g), up to 40–50bar(g) upon request.**
Turndown : **40% of design capacity**
Thermal Efficiency : **approximately 69% (LHV net H2/LHV feed + fuel) or about 398 LHV Btu feed + fuel/net scf H2**

Dimension

- **The system components will be integrated using a high–cube ISO container**
- **For the production of 50Mn3/h of H2 the container dimensions are 2.44m (wide) x 9m (long) x 2.74m (high)**