

# THE HEAT



## Heat Transfer for Carbon Capture Projects

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# Carbon Capture with least OPEX & CAPEX

2022

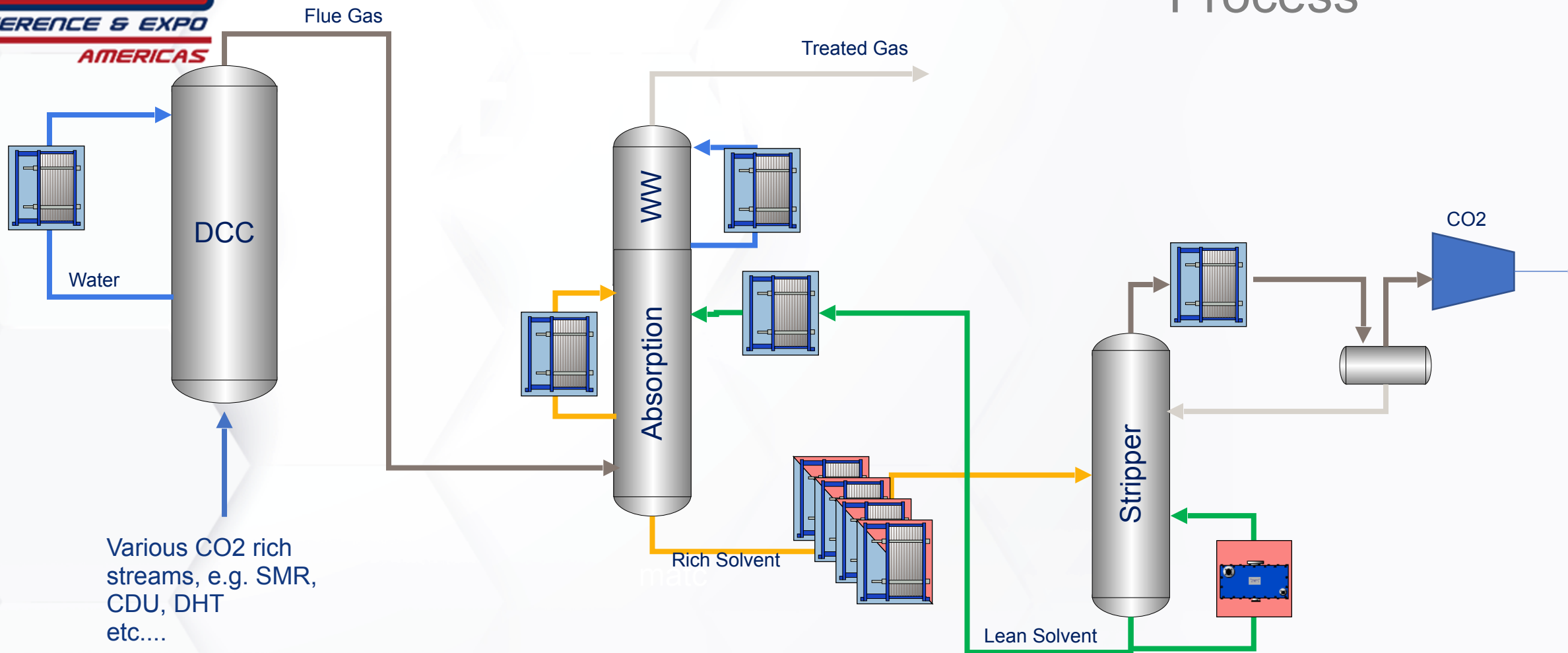
- Process Optimizations:

1. Maximized Waste Heat Recovery
2. Maximized Solvent Cooling and Energy Recovery from Lean Solvent
3. Maximized CO2 Cooling / Condensing
4. Optimized Water Management



# Conventional Solvent Based CO2 Capture Process

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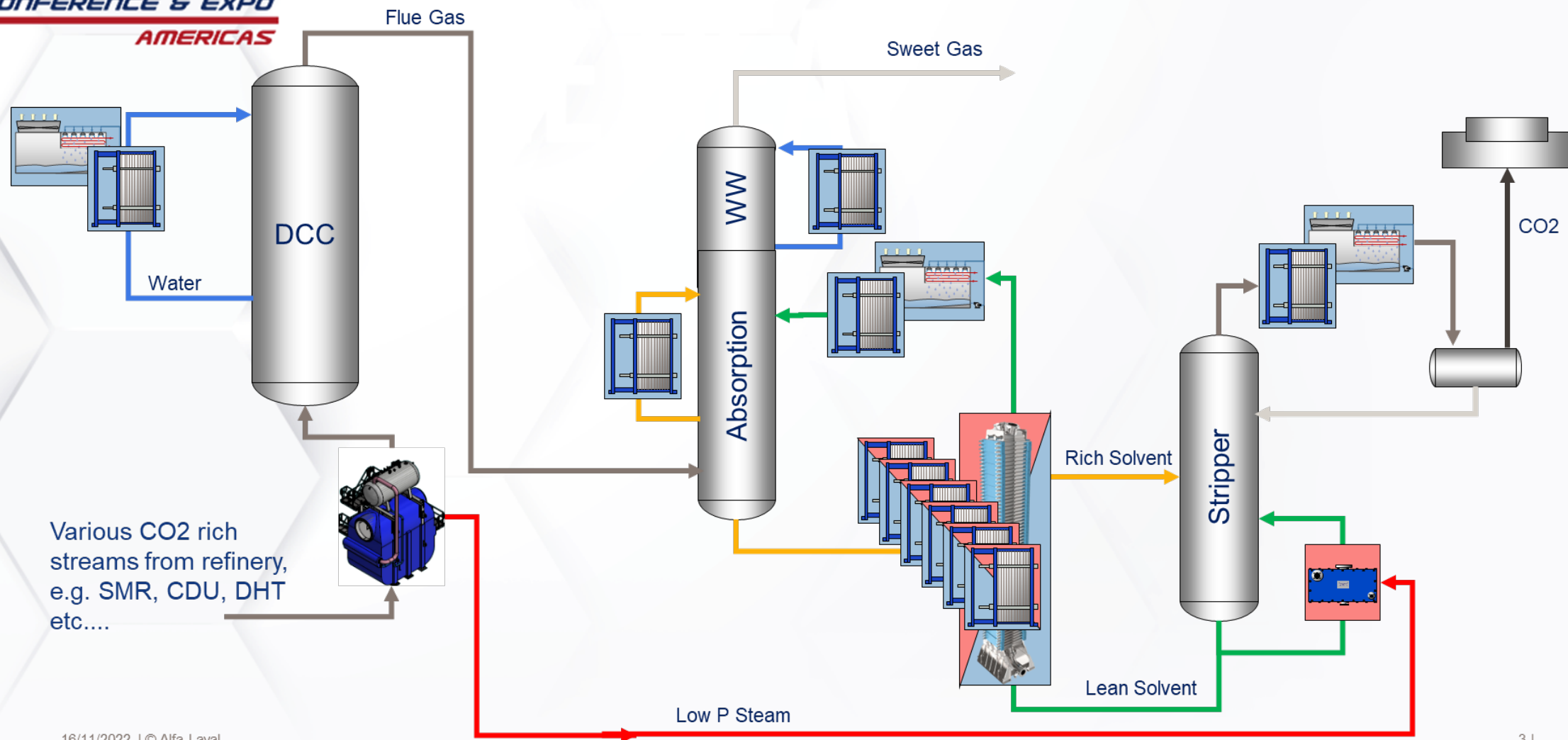
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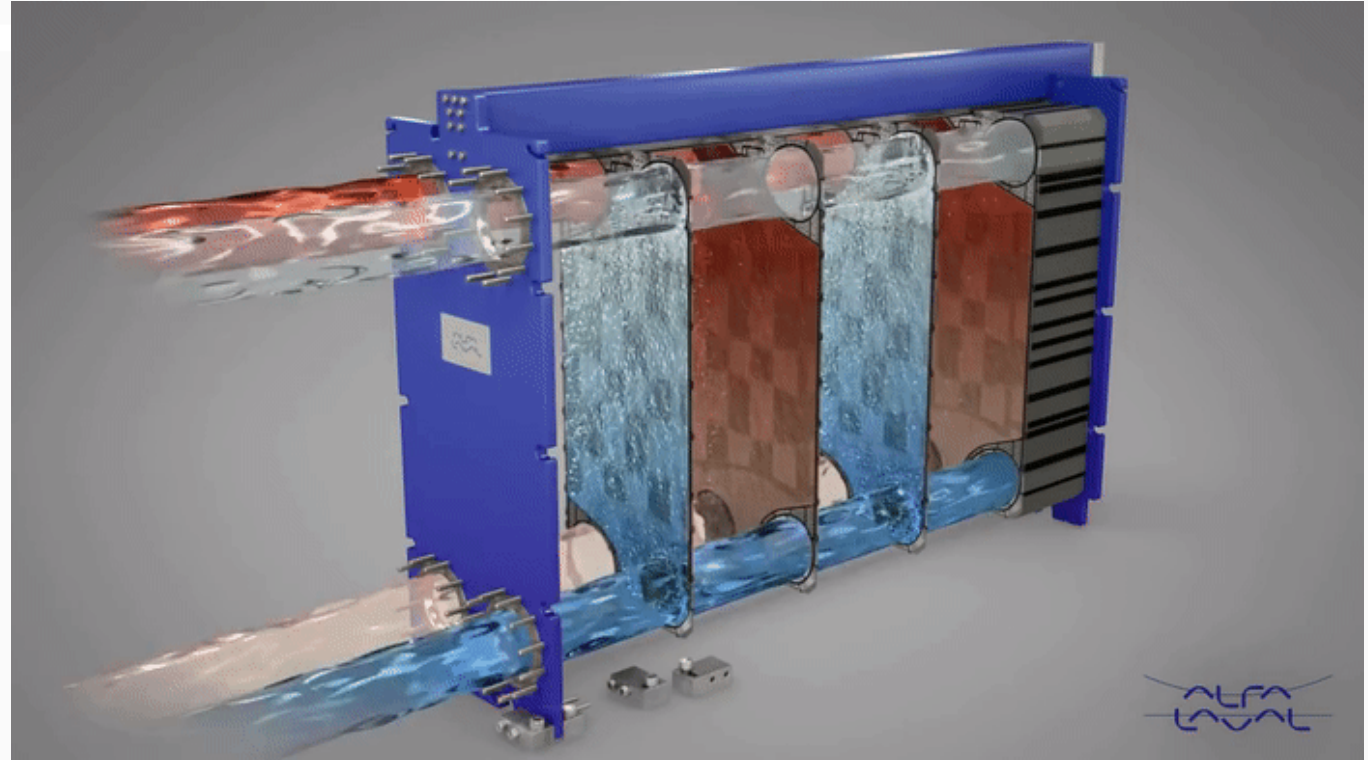


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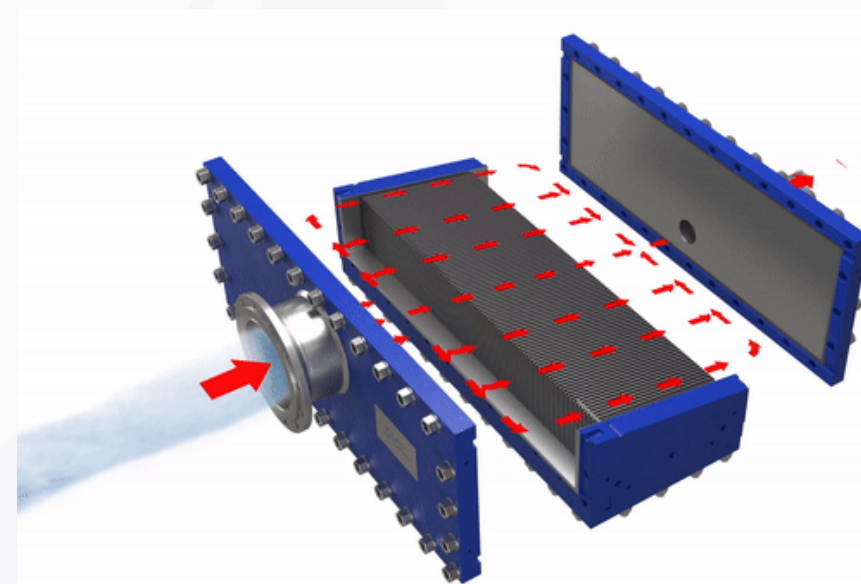
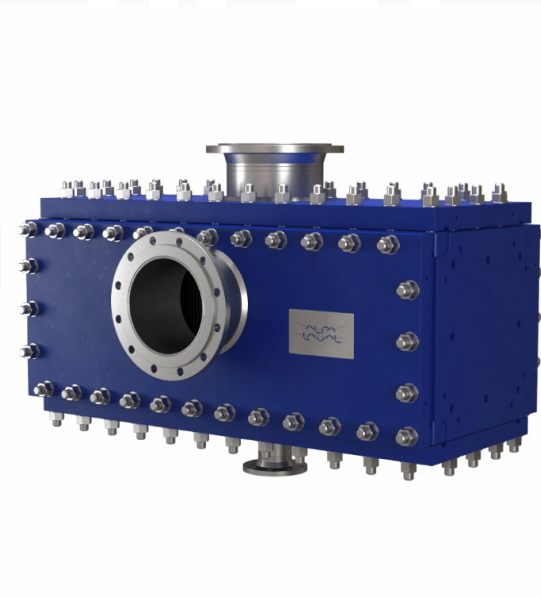
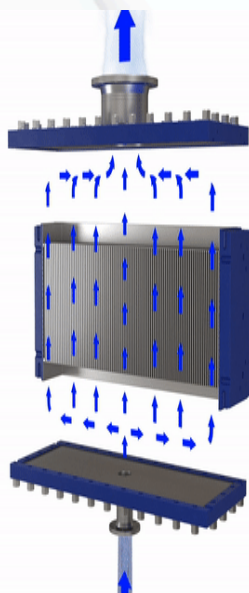
# Gasket Plate Heat Exchanger

2022



# Welded Block Heat Exchanger

2022



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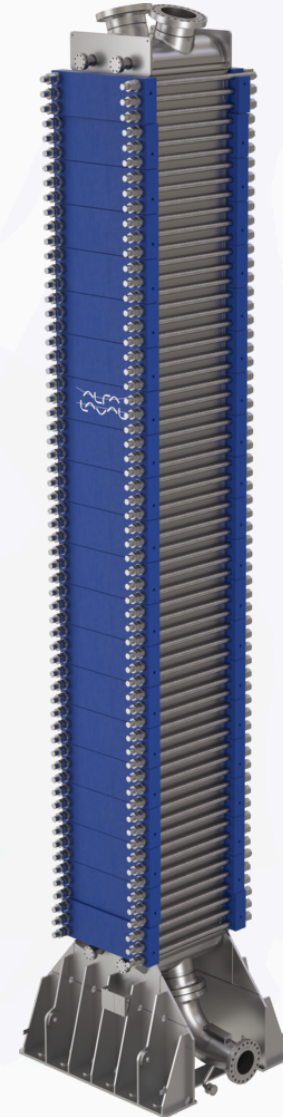
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# Welded Block Heat Exchanger

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- Packinox
  - Gasket free, no issues with amine/solvent leak
  - Minimal plot space
  - Possibility to handle 100% duty in a single exchanger



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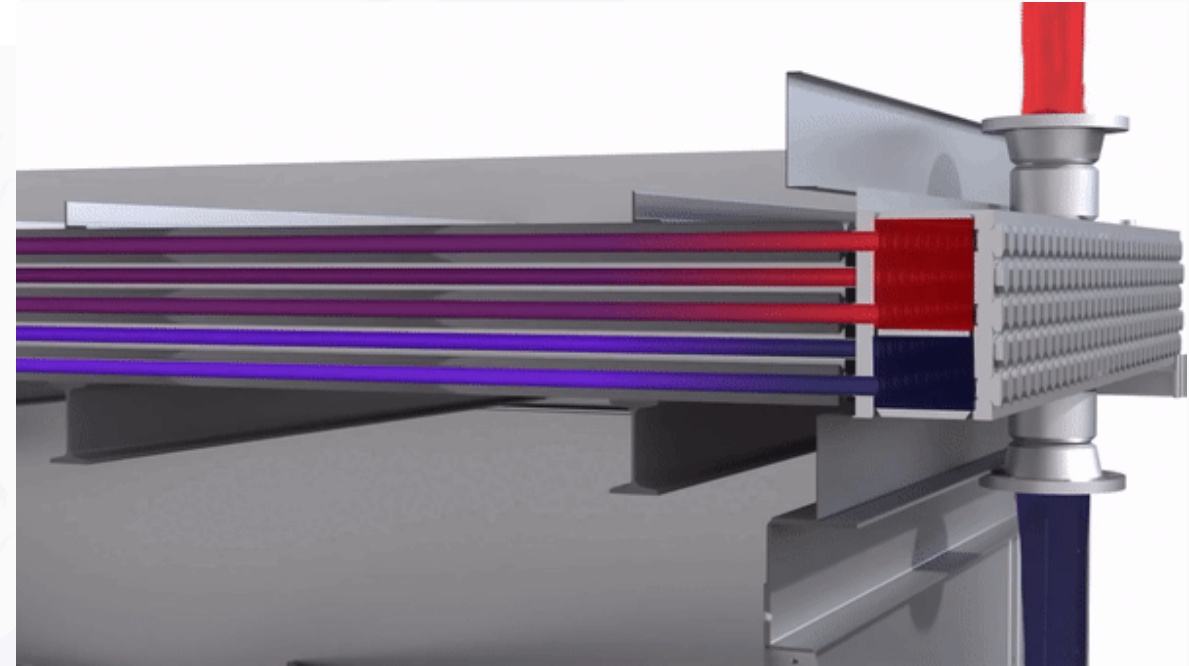
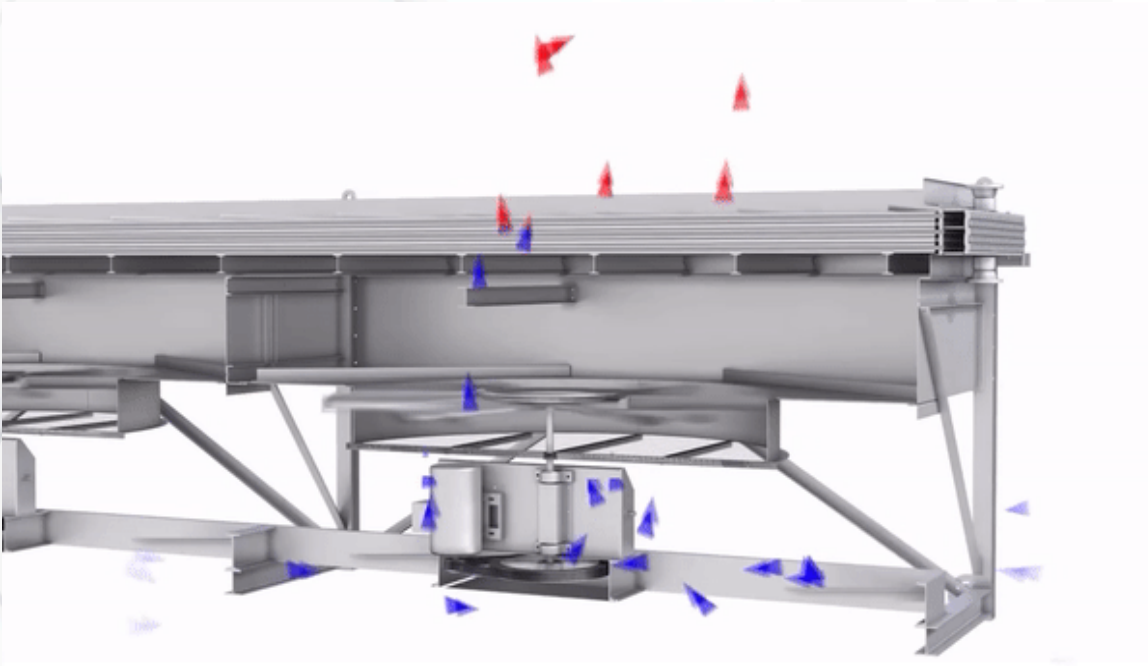
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# Air Cooler

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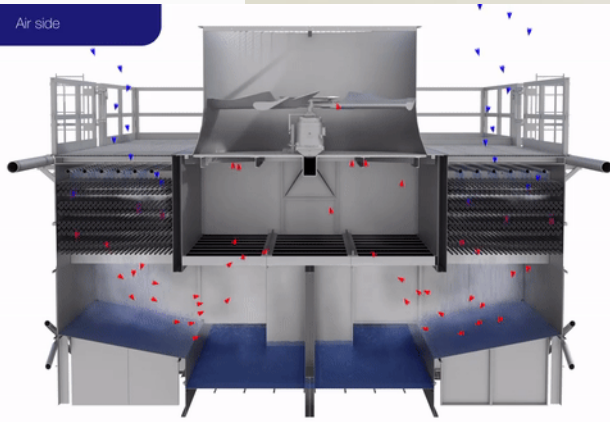
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# Closed Loop Evaporative Cooler

2022

## How it works



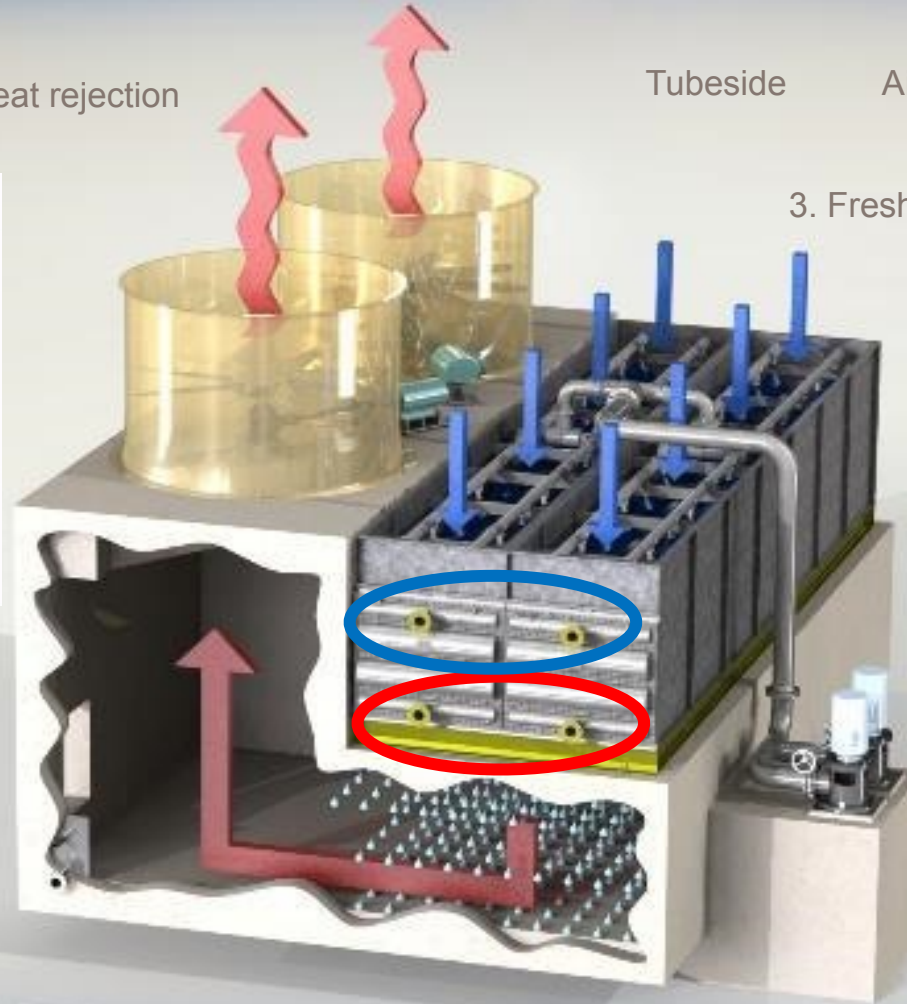
5. Heat rejection

Tubeside

Airside

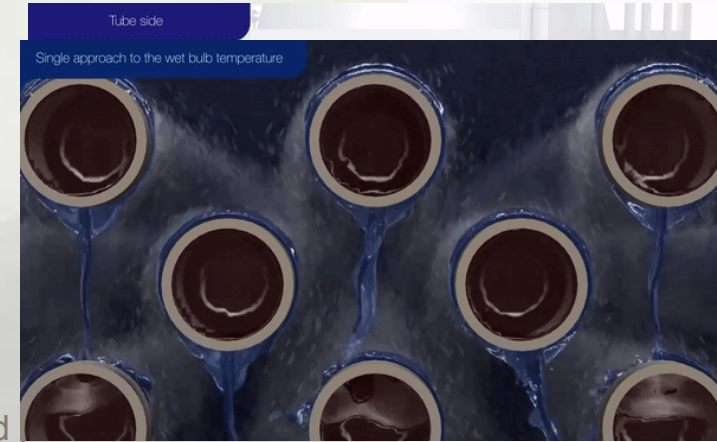
3. Fresh air intake

4. Co-current induced draft



2. Cold

1. Hot process IN



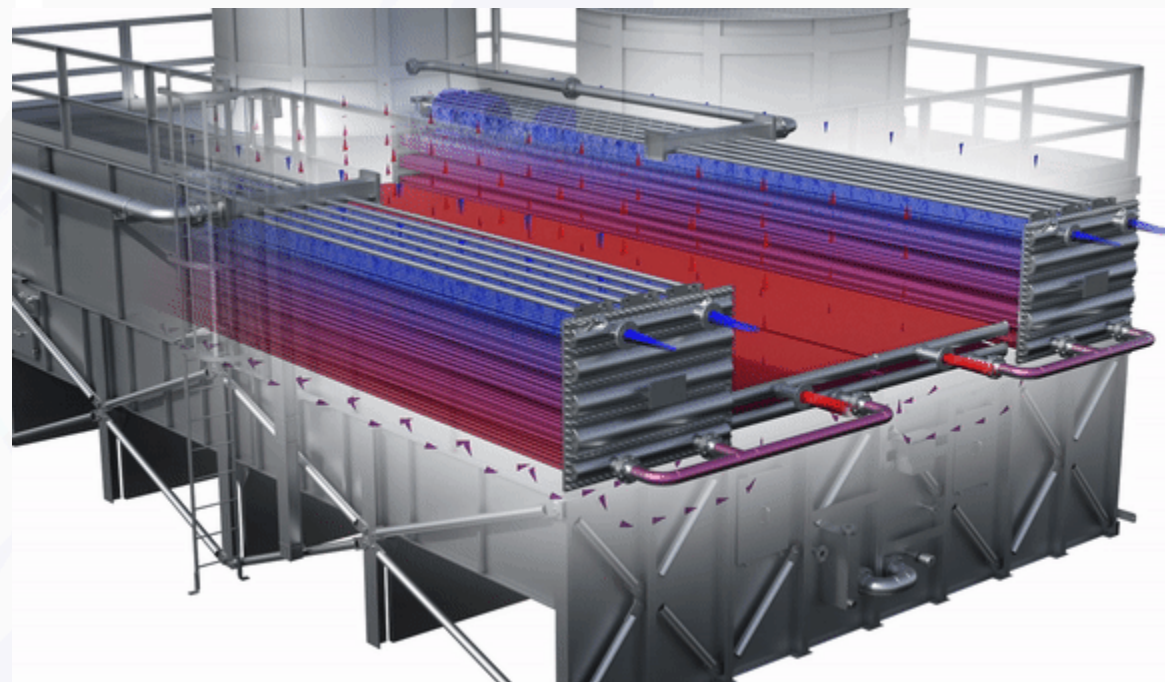
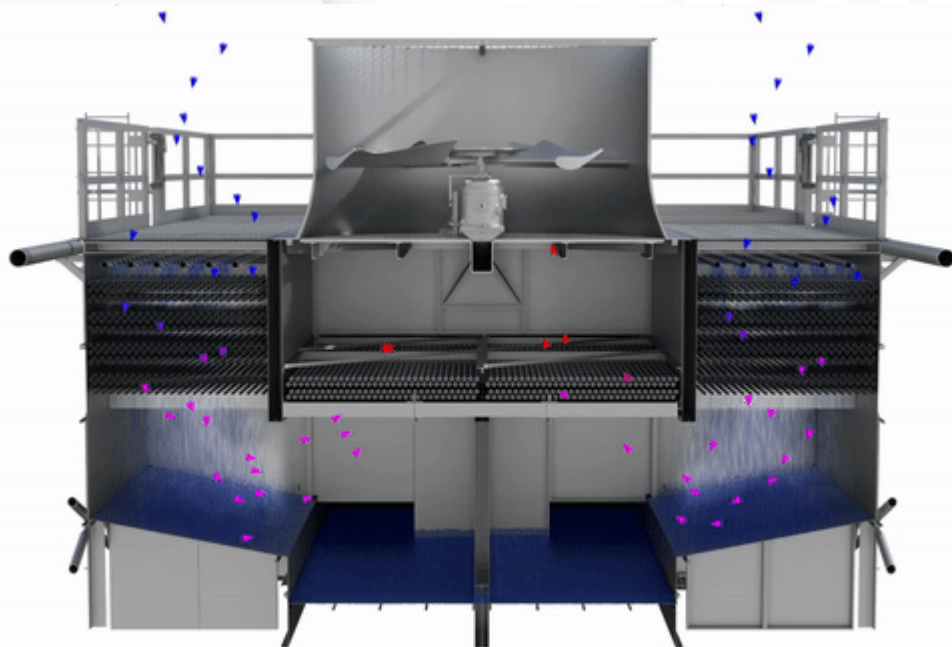
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# Hybrid Air Cooler ( HYAC )

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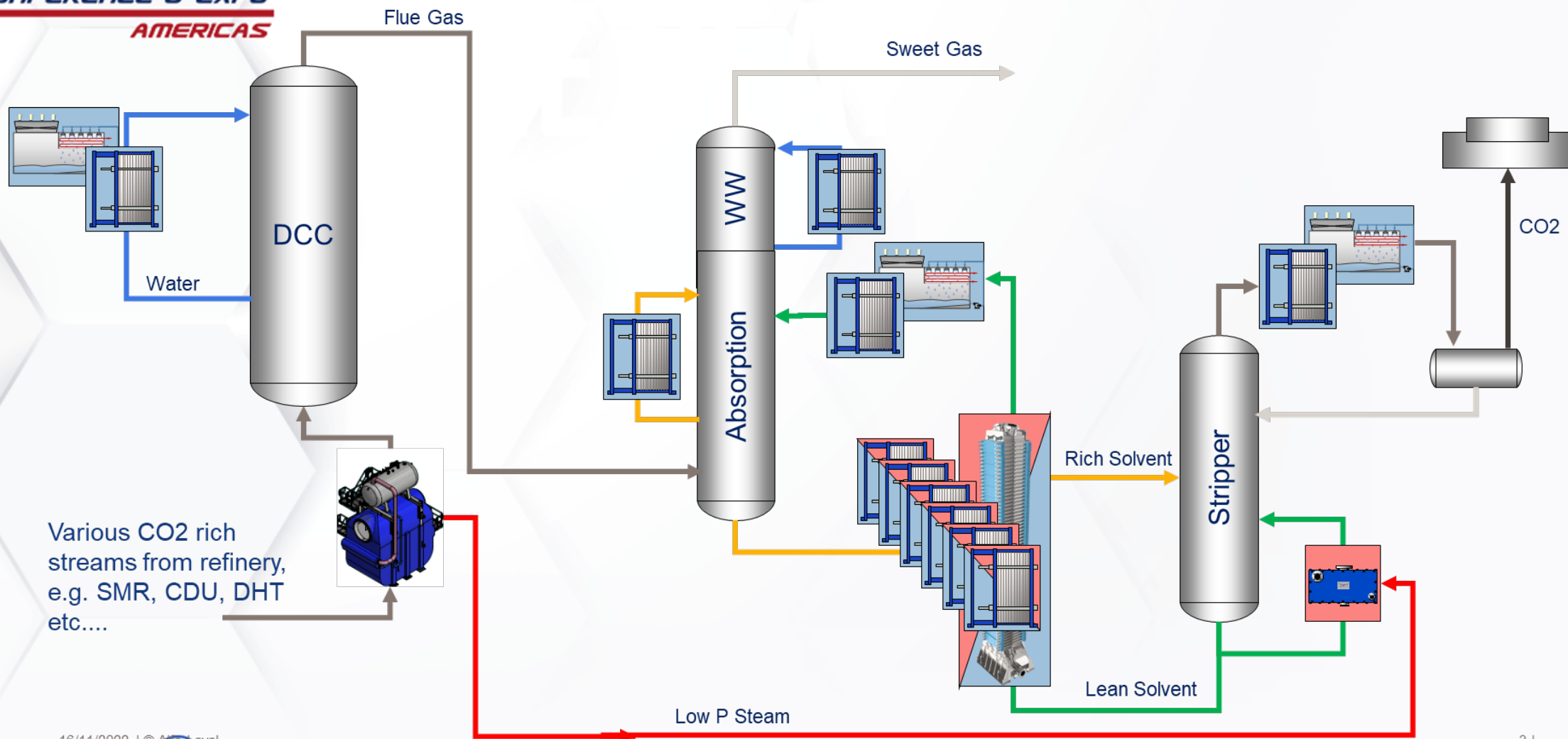
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Various CO<sub>2</sub> rich streams from refinery, e.g. SMR, CDU, DHT etc....

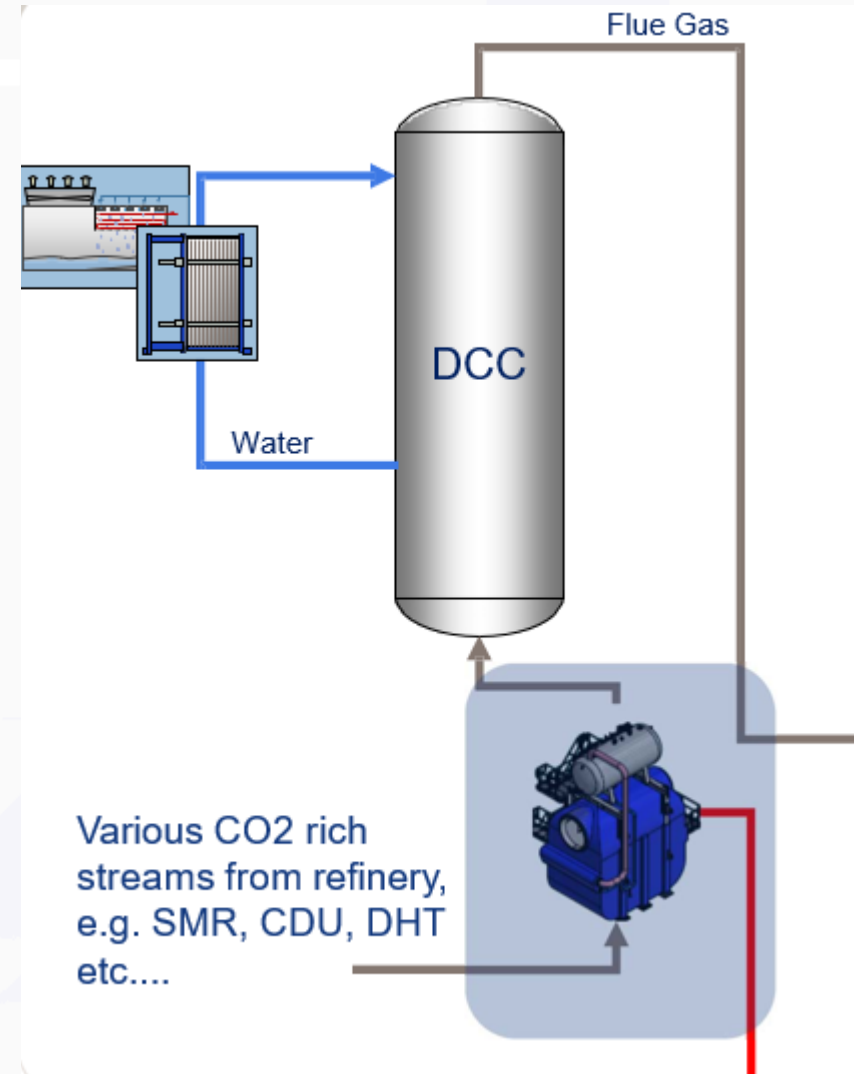
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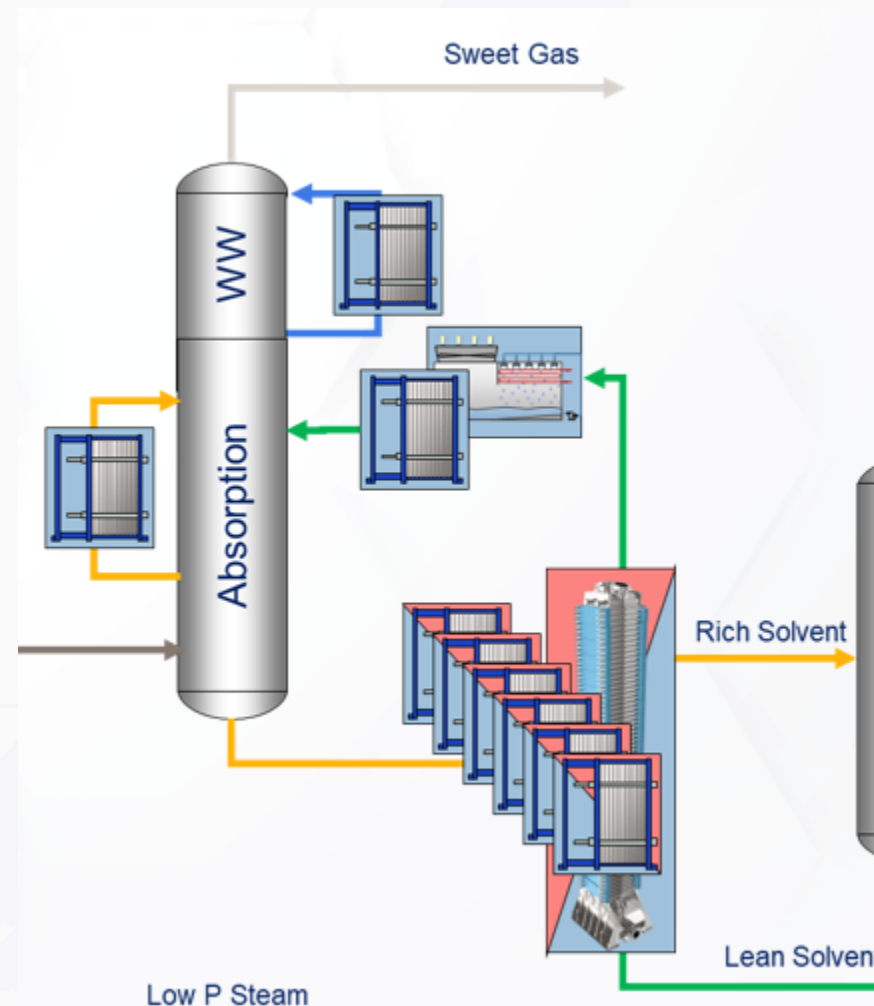
## 1. Maximized Waste Heat Recovery

- Waste Heat Recovery system generates low pressure steam
- Energy source for stripper reboiler
- Reduces DCC duty by 50%



## 2. Maximized Solvent Cooling and Energy Recovery from Lean Solvent

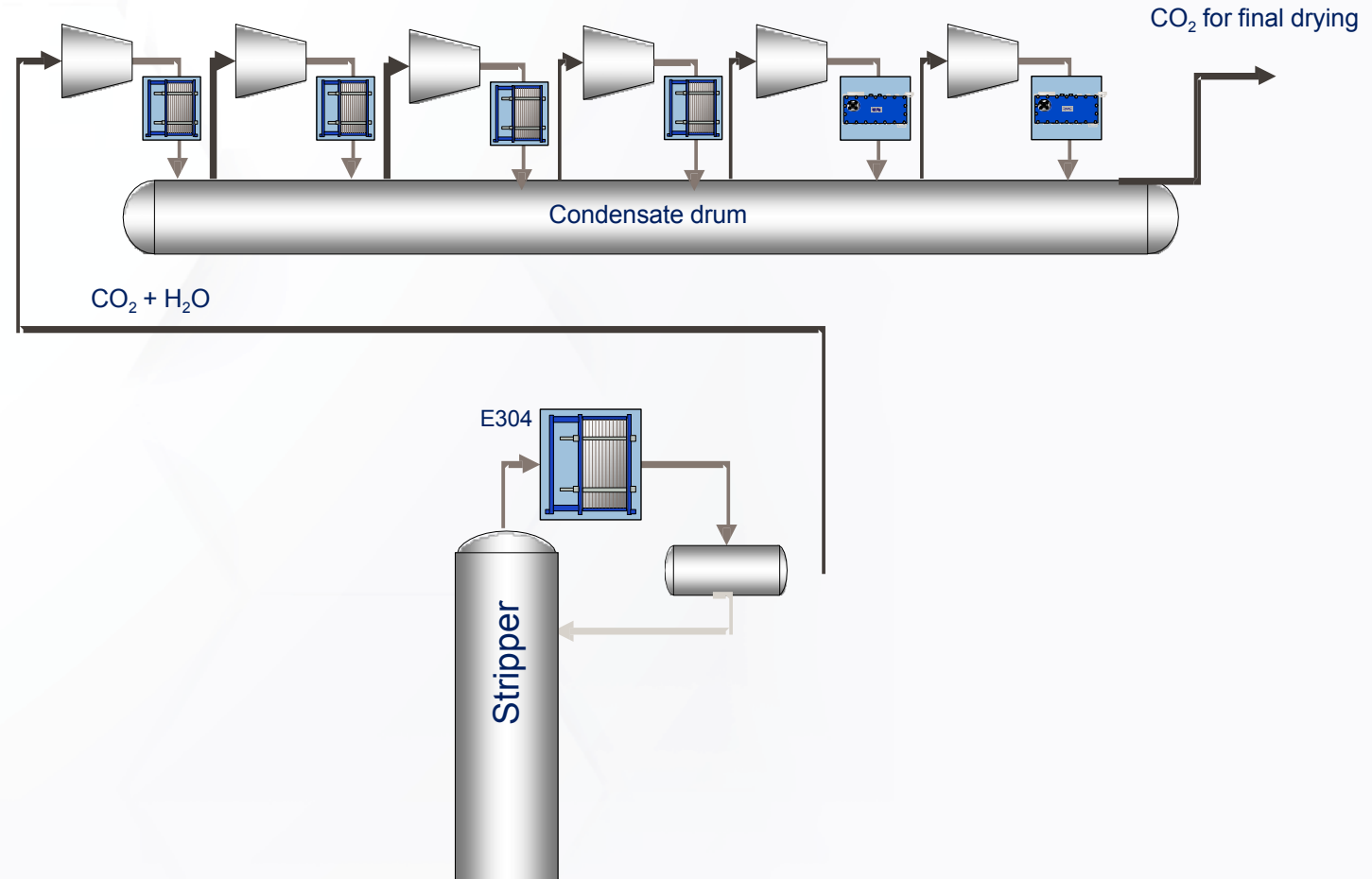
- Increase CO<sub>2</sub> capture efficiency
- Reduce cost of wash water system
- Reduce steam consumption in reboiler
- Reduce duty in lean solvent cooler
- 3% reduction in solvent circulation
- 3% reduction in reboiler steam consumption
- 36% reduction in wash water flow
- Boiler CO<sub>2</sub> emissions reduced





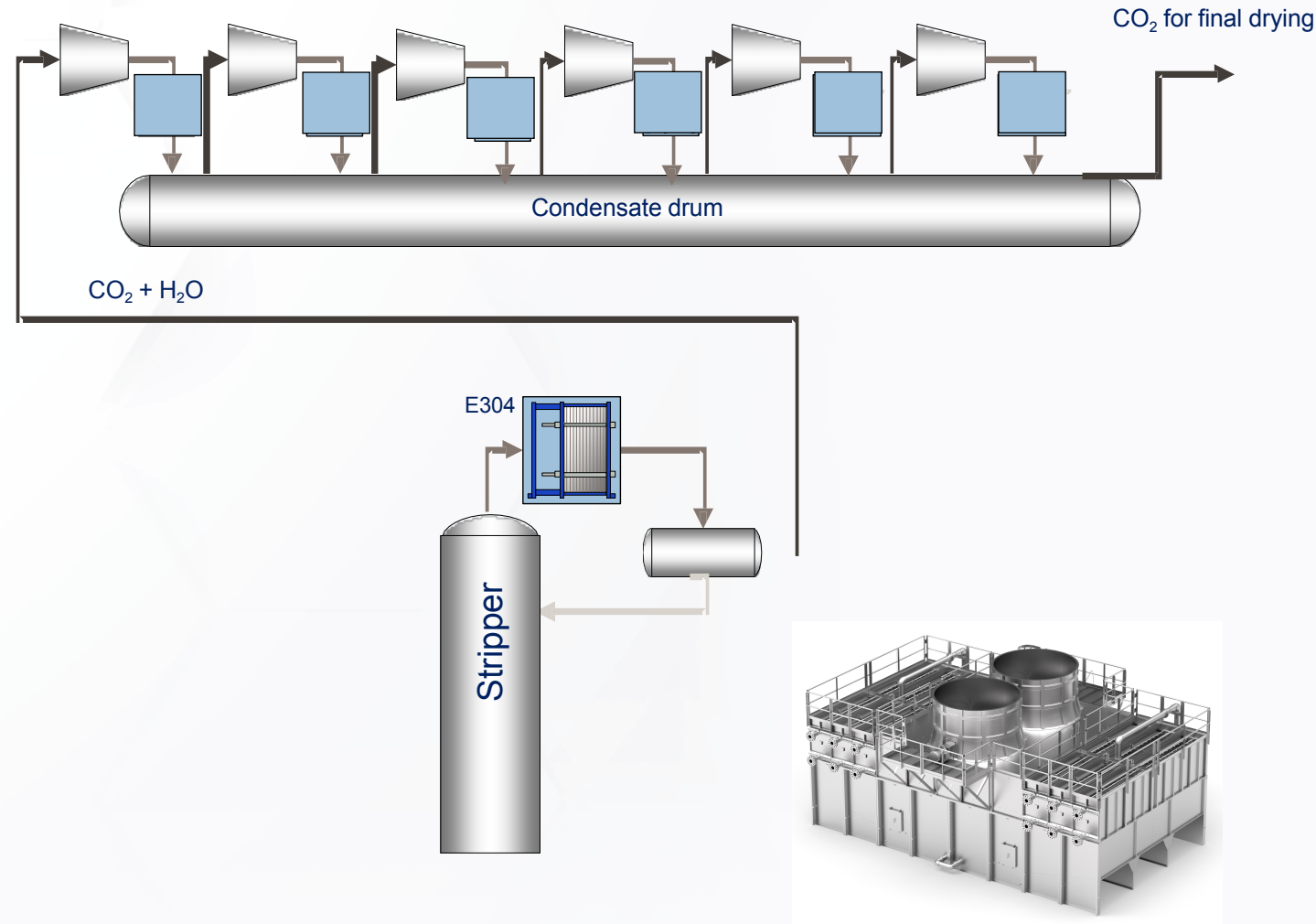
## 3. CO<sub>2</sub> Cooling / Condensing

- Overhead condenser and interstage coolers
- Reduced compressor load
- Less water in CO<sub>2</sub> gas sent to dryer
- 3% reduction in compressor power
- 30% reduction final water content in CO<sub>2</sub>



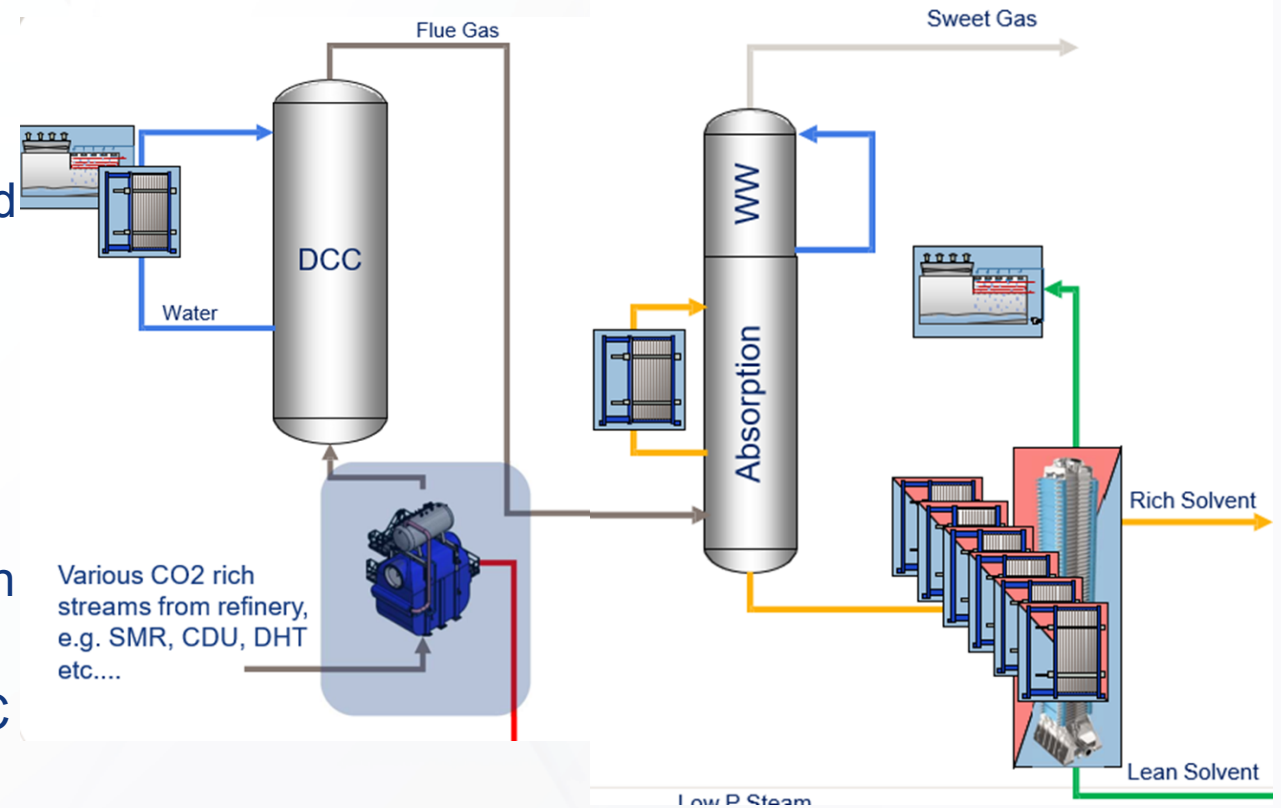
## 3. CO<sub>2</sub> Cooling / Condensing

- Overhead condenser and interstage coolers
- Reduced compressor load
- Less water in CO<sub>2</sub> gas sent to dryer
- 5% reduction in compressor power
- 30% reduction final water content in CO<sub>2</sub>
- Condensed water used for makeup to WSAC
- Hybrid Air Cooler 20-40% reduction in makeup water



## 4. Optimized Water Management

- Maximize wash water cooling
- Minimize saturation temperature of treated gas minimize water loss
- Maximized cooling water return temperature
- Maximize solvent recovery
- 50% Reduction in cooling water circulation
- Make up cooling water reduced by 27%
- Further water savings possible with WSAC and HYAC





- Process Optimizations:

1. Maximized Waste Heat Recovery
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## Energy efficiency

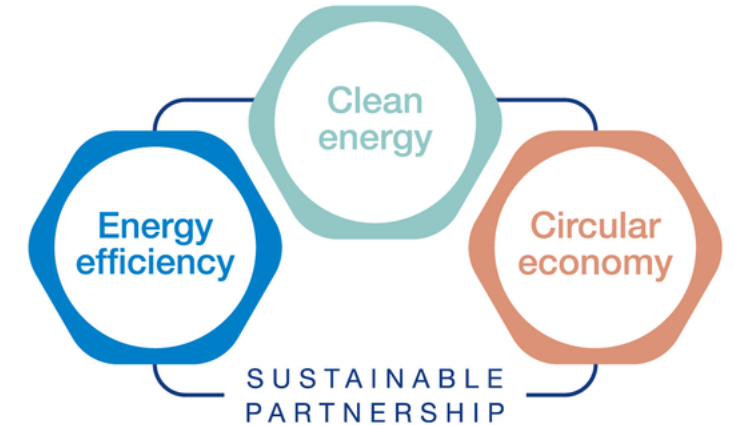
Waste heat recovery  
Emission reduction

## Clean energy

## Circular economy

Resource efficiency  
Reuse, reduce & recycle  
Product lifetime

## Sustainable partnership



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