



Revamp Projects:

Replacement or Improvement?

COBRAS, Florianopolis, Brazil

**Outotec**  
More out of ore

# Agenda

## General Considerations

### Example I

*Analysis:*

*“Stack Issue” at Smelter Operations*

### Example II

*Capacity Increase: Design Changes in main Equipment  
Atlantic Copper - Replacement of Converter (AC1)*

### Example III

*Capacity Increase: Use of new Process technologies  
LUREC™ technology as add-on module*

# Reasons for Revamp Projects

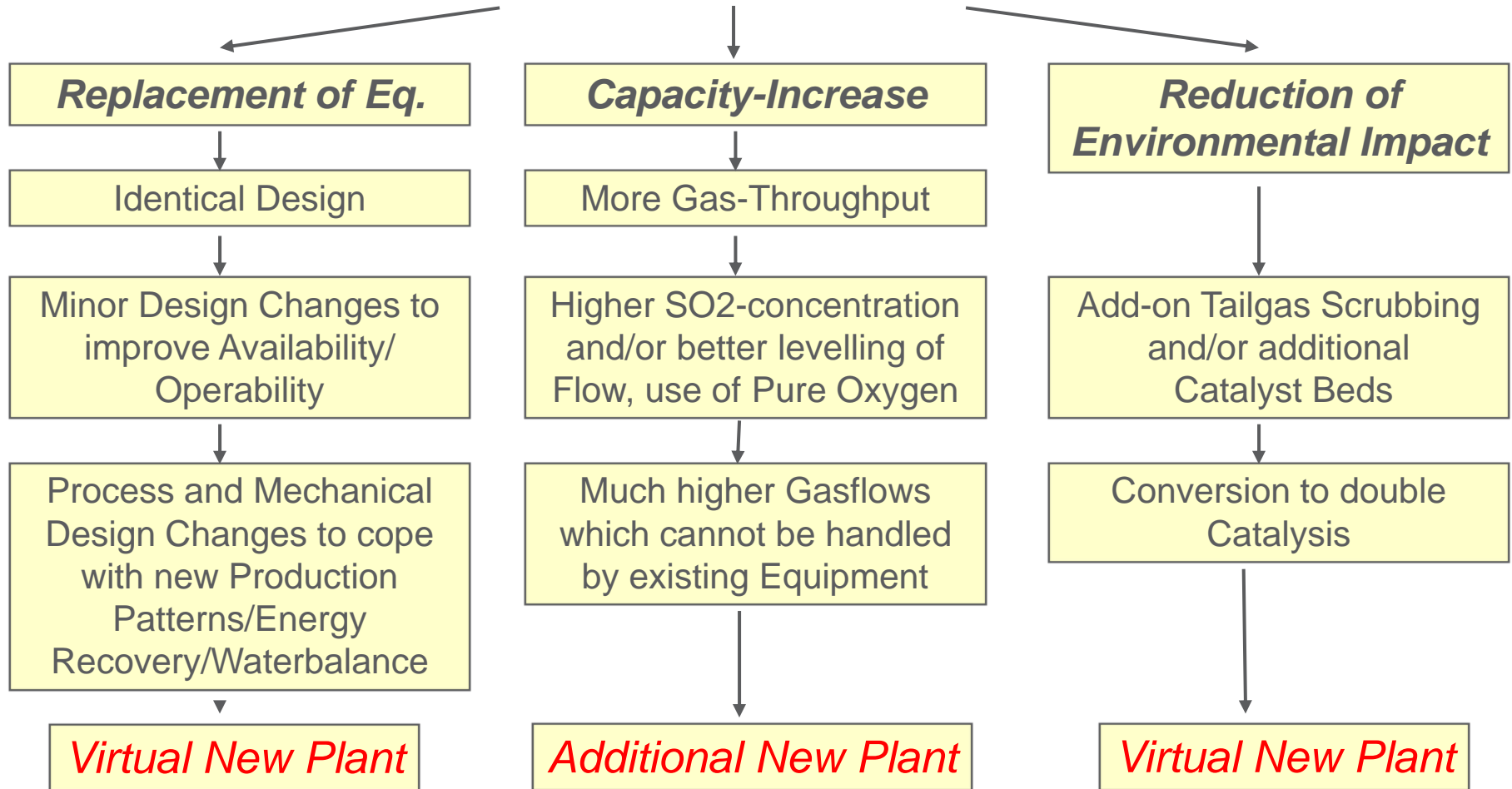
*Replacement/Adaption  
of Equipment*

*Capacity Increase*

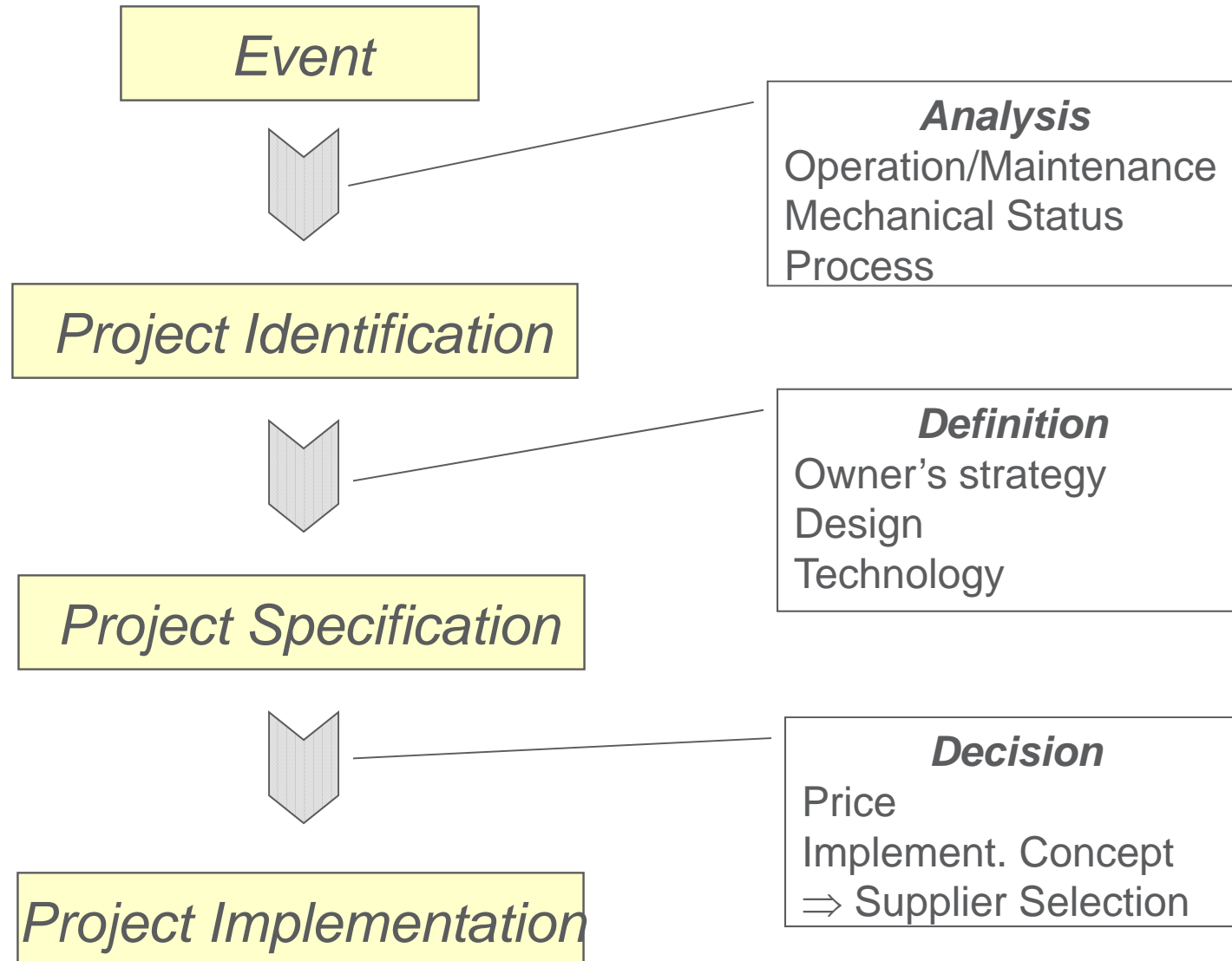
*Diversification*

*Reduction of  
Environmental Impact*

# Metallurgical Sulphuric Acid Plants Modification for Revamp



# Project Development



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# Analysis: „Stack Issue“ at Smelter Operations

## Example: Smelter

*Problem: After several years of operation permanent plume at stack occurred*

⇒ Check of operation parameters of FAT

e.g. acid concentration, temperature, acid flow

⇒ Replacement of irrigation system

⇒ Replacement of candle filters (partially)

⇒ Replacement of packing (planned)

⇒ Technical Assistance: Operation and plant inspection



## Operation:

- Gas and acid flows according design
- High vibration at blower
- Wet-ESP only partially in operation
- Hot-ESP only partially in operation
- As-content in product acid >20 ppm



## Conclusion:

Modifications in cooling system of smelter (radiative vs. evaporative) resulted in higher dust and SO<sub>3</sub> load

⇒ Gas cleaning sections (hot and wet) operated significantly beyond design parameters and failed (operational)

⇒ Dust and acid mist entered contact section

⇒ Separation of impurities in acid circuits/catalyst and increased mist load resulted in overloaded candle filter system

# Inlet Gas Duct to Gas Cleaning Section



## Drying Tower





## Inlet Gas Duct to Main Blower



Blower was stoppped every 14 days  
due to high vibration!!!

## Converter – 1<sup>st</sup> layer



## *„Curing the symptoms“*

resulted in:

- Increased maintenance cost
- Production Losses
- Product quality
- Environmental impact



After a profound analysis the project definition would have focus on Gas Cleaning Section (hot- and wet-ESP) and not on absorption tower

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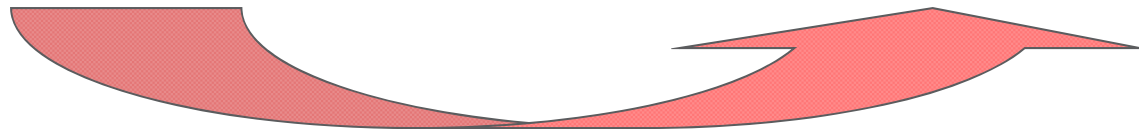
# Example: Atlantic Copper – Replacement of Converter (AC1)



1.735 tpd



2.220 tpd



- After 30 years of operation the Converter suffered:
  - Deterioration of brickwork
  - Increased SO<sub>2</sub>-emissions due gas slippage between brickwork and shell
  - No additional spare capacity in flow velocity and catalyst load
  
- Scope of Revamp Project:
  - New Converter (stainless steel)
  - New Heat Exchanger (internal)
  - Adaption of further equipments for the new capacity
  - Demolition of old Converter and construction of new converter within 23 days (annual maintenance shut-down), including purging/cooling down, and preheating



# Example: Atlantic Copper – Replacement of Converter

## Demolition of old Converter



## Converter – Prefabricated



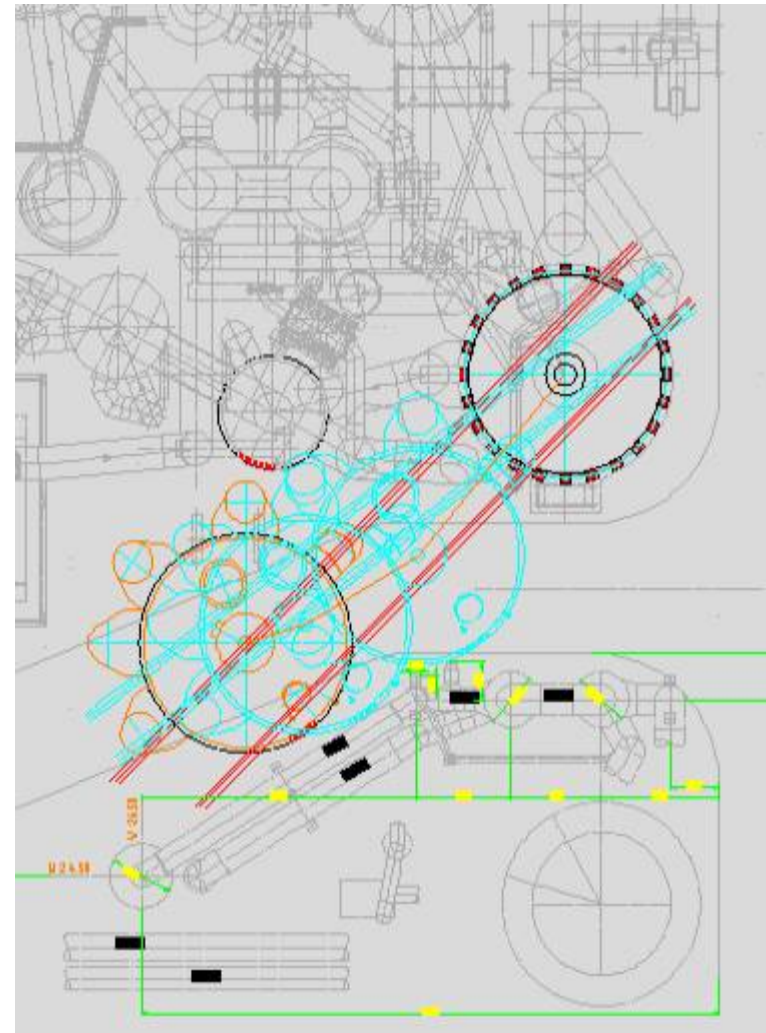
- Features:
- 4 bed-converter (prefabricated)
  - One internal heat exchanger
  - Material of construction: 304H
  - Outside diameter: 11,2 m

## Converter – Construction

- Construction of new converter next to old converter.
- New converter pulled in on the existing foundation



# Pulling Device for new Converter



Replacement of modified major process equipment result in improved plant performance:

- Capacity increase
- Reduced maintenance cost
- Reduced shut-down time
- Reduced environmental Impact



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## Example: The LUREC™-technology as add-on Unit

### Situation:

- Strong gases (30 – 60 %-vol. SO<sub>2</sub>) from smelter processes available
- Use of oxygen enriched air strategy for smelter capacity increase

### Processing Strong Gases

- Smaller equipment → reduced investment cost
- Lower gas flow → less energy demand
- Higher SO<sub>2</sub>-content → higher energy rec. potential

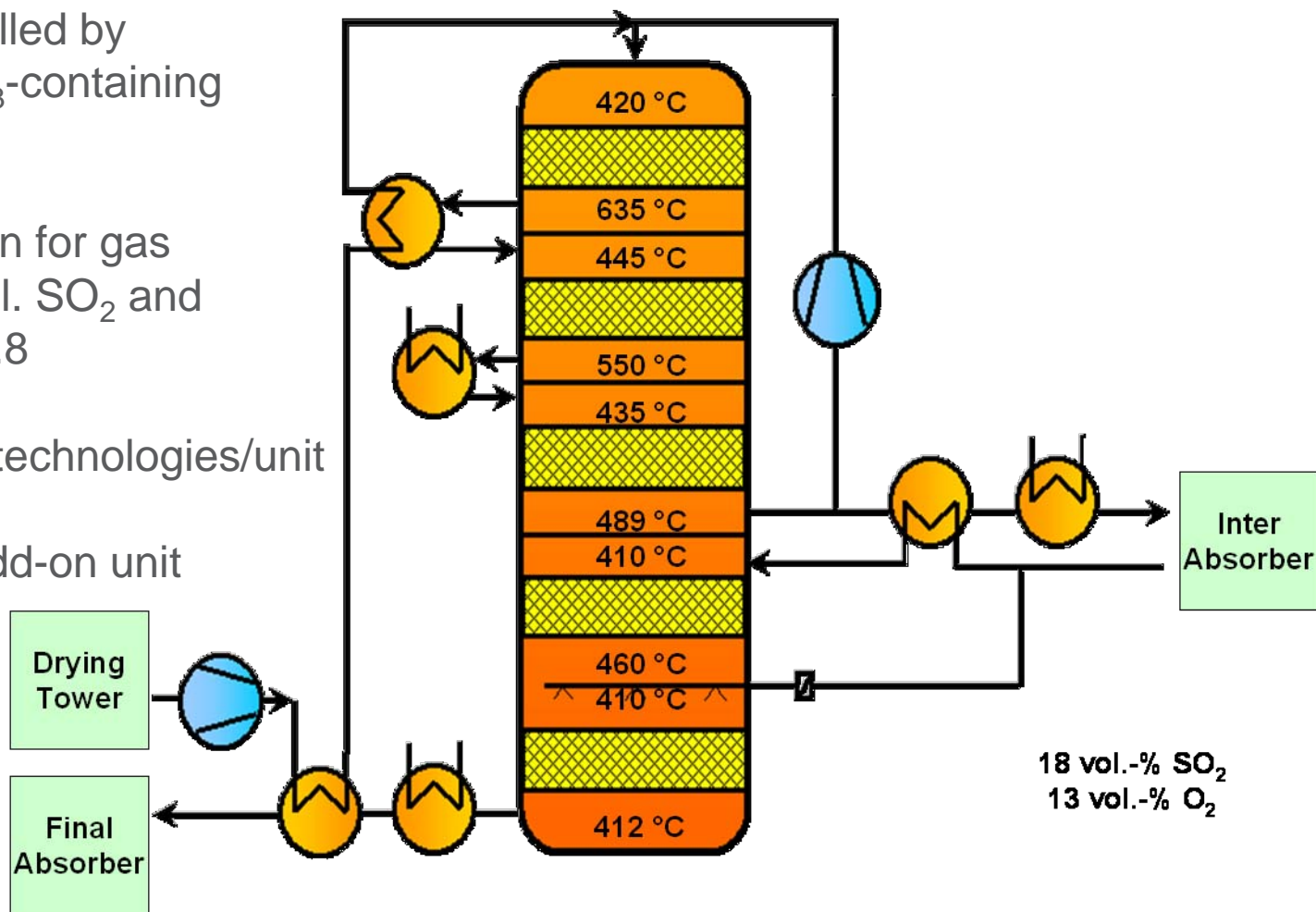


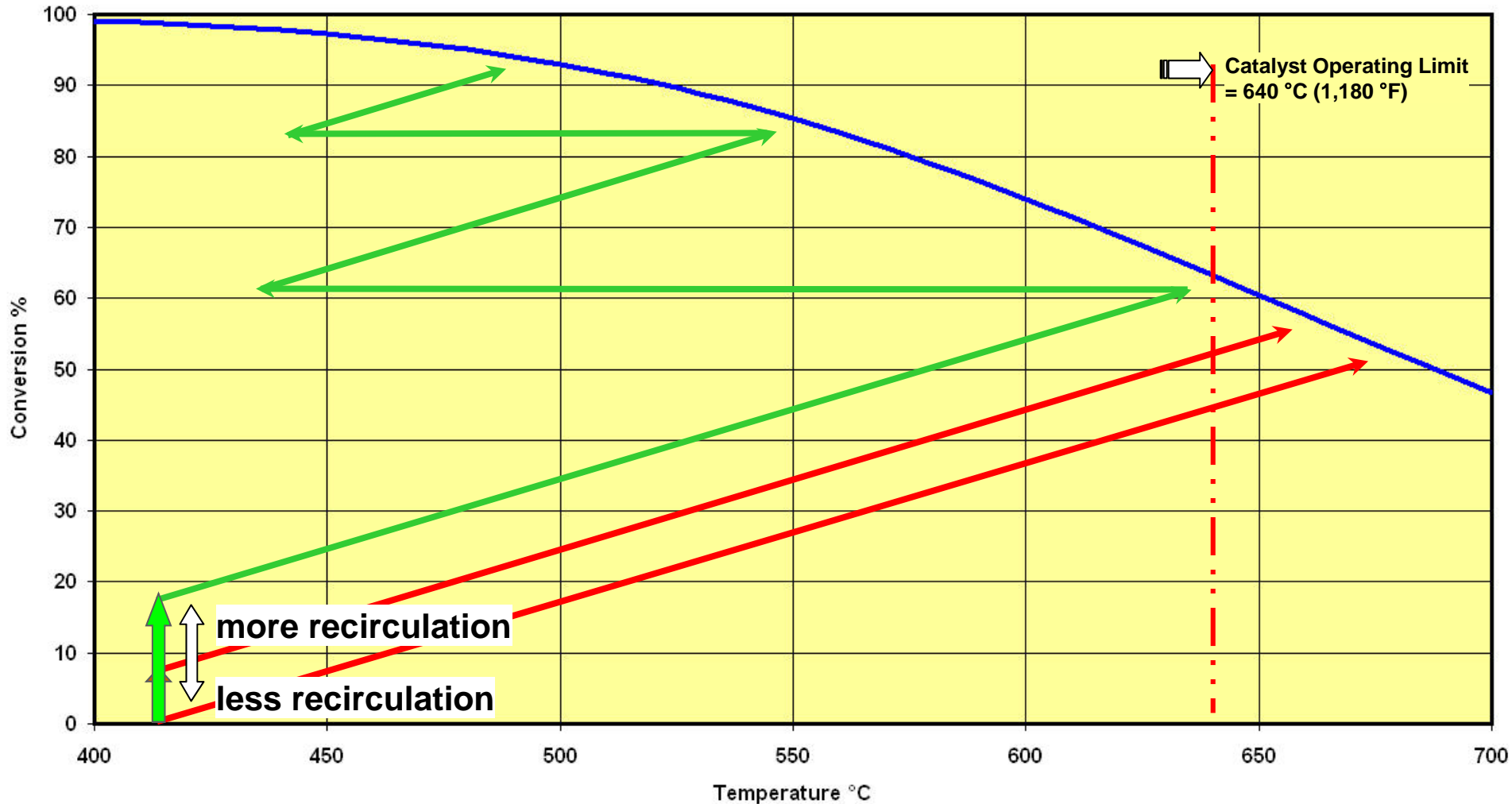
### Limitations

- Thermostability of catalyst (approx. 630 - 640 °C) requires dilution with air to 13.5 – 14 vol.-% maximum
- Existing plants: Design

## LUREC Process

- Process developed by Outotec Technology
- Temperature controlled by recirculation of SO<sub>3</sub>-containing gas
- Technical application for gas containing 20 %-vol. SO<sub>2</sub> and a O<sub>2</sub>/SO<sub>2</sub>-ratio of 0.8
- Only use of known technologies/unit
- Easy to install as add-on unit



LUREC™ Contact 18% SO<sub>2</sub> - 13% O<sub>2</sub>

⇒ Degree of recirculation limits the conversion and by this the reaction temperature

## ***LUREC Process***



Yanggu Copper Smelter/China (greenfield installation)

- Capacity: 2.300 tpd
- Gas Flow: 136.000 Nm<sup>3</sup>/h
- Gas Strength: 16 – 18 vol.-% SO<sub>2</sub>
- O<sub>2</sub>/SO<sub>2</sub>: 0,8
- Steam Production: 27 t/h (25 bar, g)

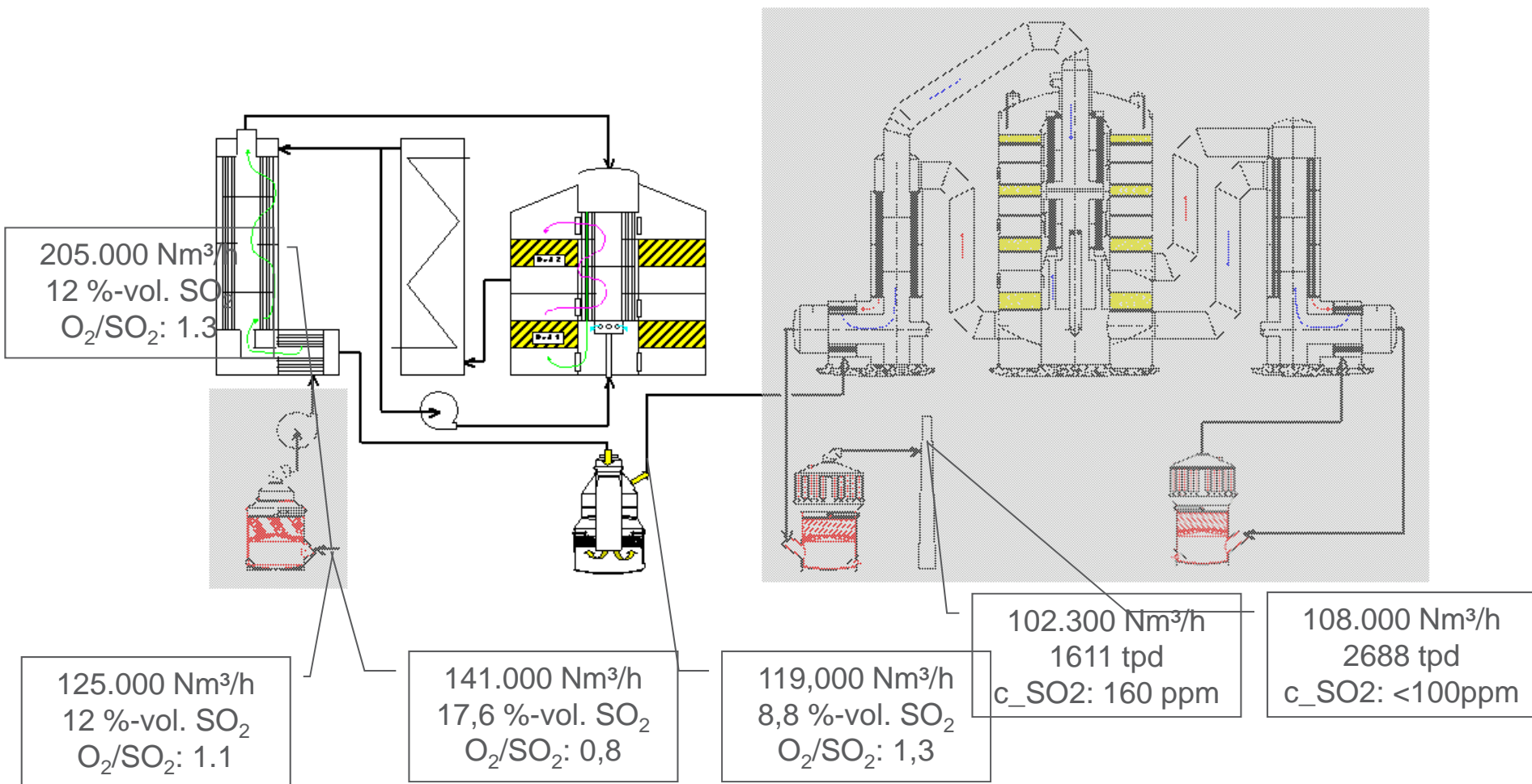
Start-up of the plant successfully carried out during July – August 2007

**New Contract awarded in August 2009 for new Lurec-plant (3.000 tpd) by Yanggu Copper**

## Add-on Unit

Basis: 50.000 Nm<sup>3</sup>/h; 30 %-vol. SO<sub>2</sub>; 2 %-vol. O<sub>2</sub>

Future: 55.000 Nm<sup>3</sup>/h; 45 %-vol. SO<sub>2</sub>; 2 %-vol. O<sub>2</sub>



## Application of LUREC technology as add-on module:

- Lower operation cost
- Lower plant emissions
- De-bottlenecking of existing plant equipment (lower gas flow, lower SO<sub>2</sub>-content, favourable O<sub>2</sub>/SO<sub>2</sub>-ratio, less thermal cycles)
- Minimised interactions to the operation of the existing plant
- High flexibility to fluctuations in the SO<sub>2</sub>-content
- No interference during construction with the operating of the existing plant



**Thank you for  
your Attention!!!**

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