

SAFETY AND EQUIPMENT SAFEGUARDING TO ADDRESS A FURNACE RUN-OUT

Anglo Platinum
Polokwane Smelter
by
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Cause for Collaboration: Engineering that's Ahead of the Game

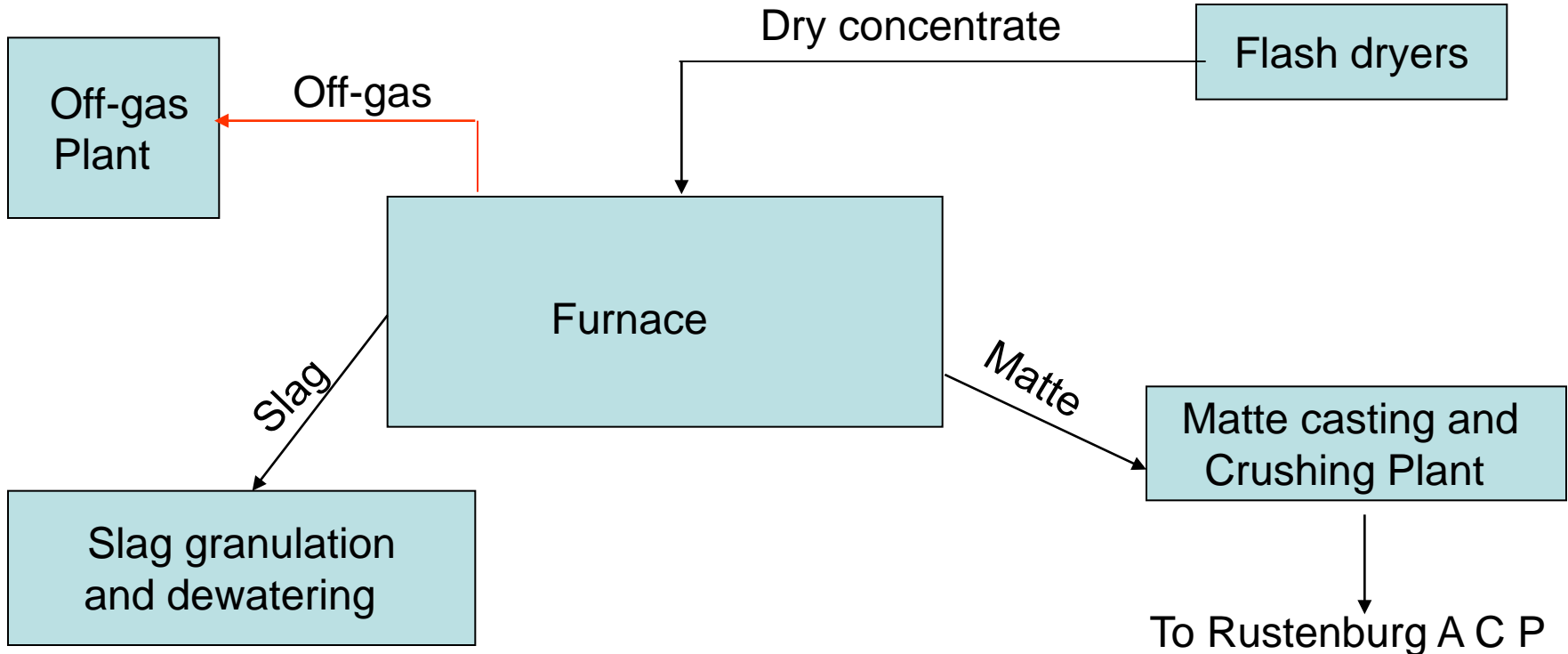
Agenda

- Furnace background information
 - Smelting process overview
 - Design
- Furnace run-out
 - Background information
 - Polokwane Smelter run-outs
 - Case study
- Improvement plan
 - Scope of work
 - Project benefit
- Questions



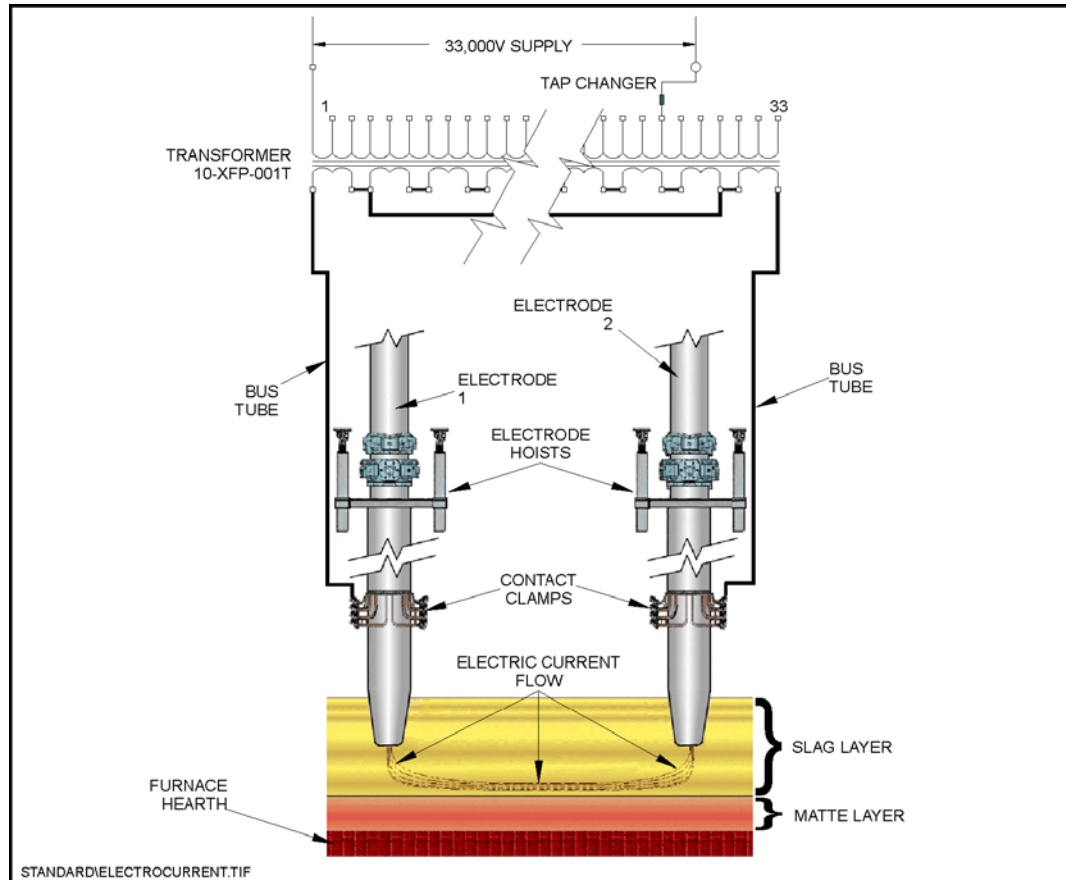
Furnace background information

Smelting process overview



Furnace background information

Smelting process overview



Furnace background information

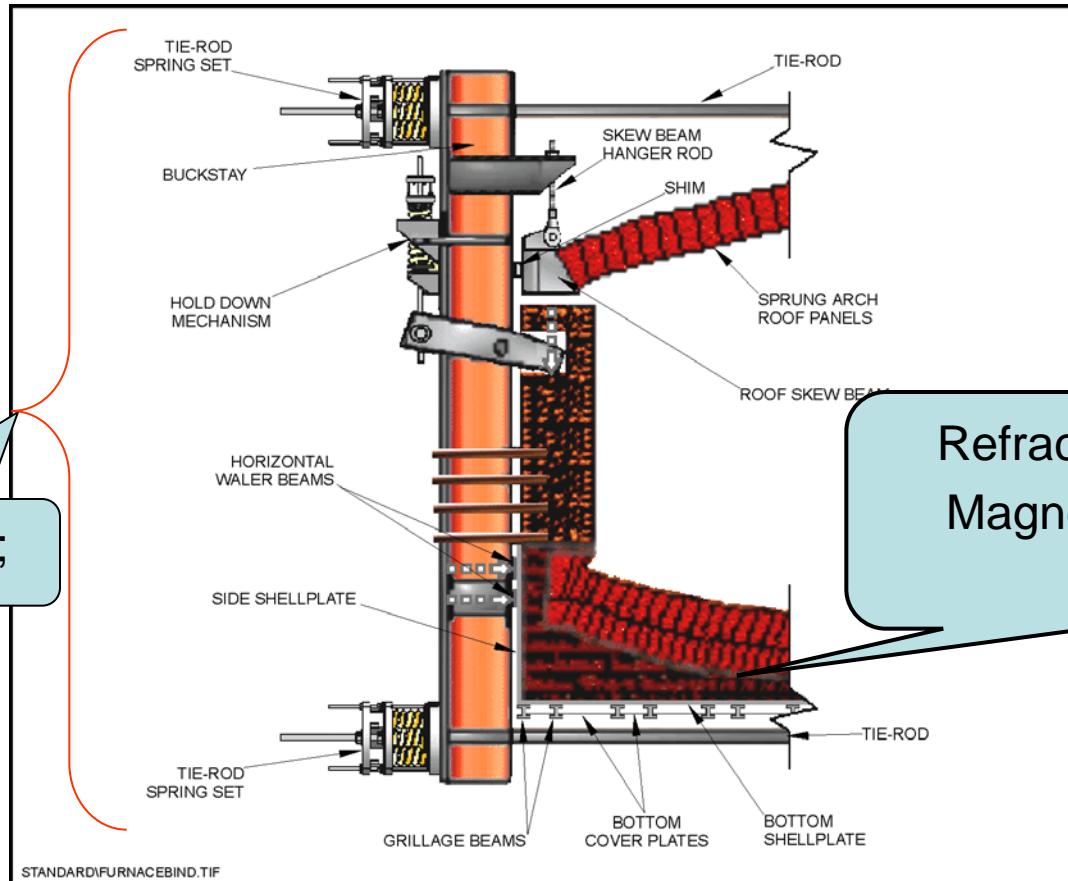
Design

- 6 in-line rectangular furnace (Hatch design)
- Capacity: 650,000 t/a (87 tph)
- Power: 80 MW (3 X 54MVA transformers)
68 MW max
- Products : Matte @ 1500 deg
Slag @ 1650 deg
Off-gas @ 600 deg



Furnace background information

Design



Binding system;

Refractory system;
Magnesia chrome
bricks

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Furnace background information

Design

- Furnace cooling system
 - Water cooling
 - copper coolers
 - Air cooling
 - furnace hearth and the sidewalls
- Control and Monitoring system
 - PLC controlled
 - System Control And Data Acquisition (SCADA)



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Furnace run-out

Background information

- Definition
 - A run-out is an uncontrolled flow of molten material from the furnace
- Possible causes
 - matte penetration between the copper coolers or the refractory walls of the furnace (binding/refractory failure)
 - Matte/slag levels exceeding maximum limits (operational error)
 - Water leaking inside the furnace (copper corrosion resulting in an explosion)
 - Loss of cooling water



Furnace run-out

Polokwane run-outs

- Run-out impact
 - Health and safety hazards
 - Equipment damage
 - Inadequate equipment protection
 - Production loss
 - Prolonged Mean time to repairs (MTTR)
 - Prolonged ramp up period

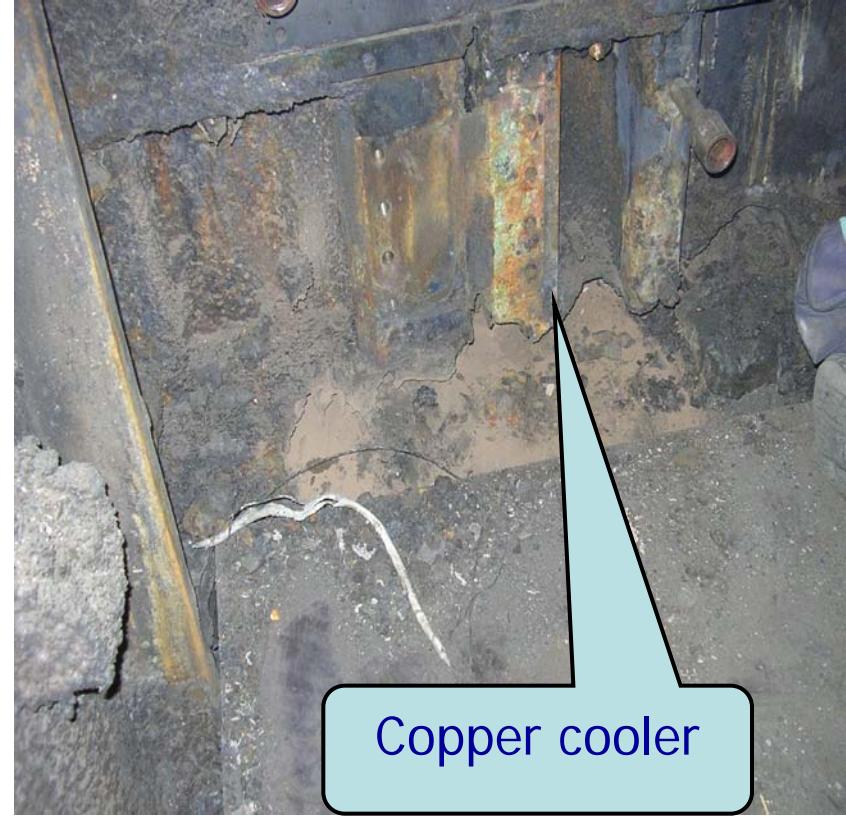
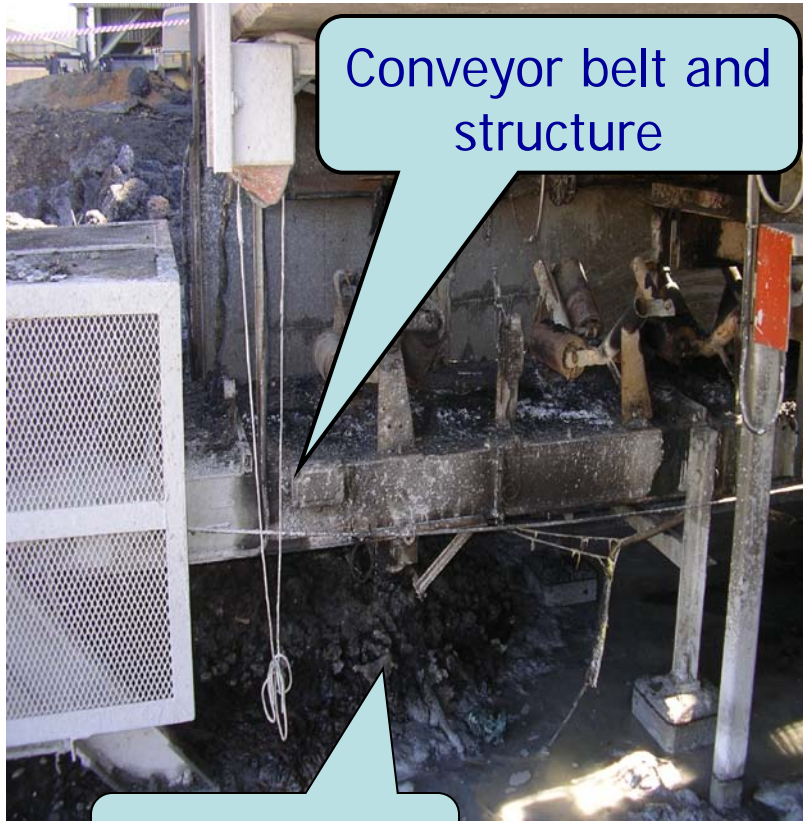


Furnace run-out Polokwane run-outs



Furnace run-out

Polokwane run-outs



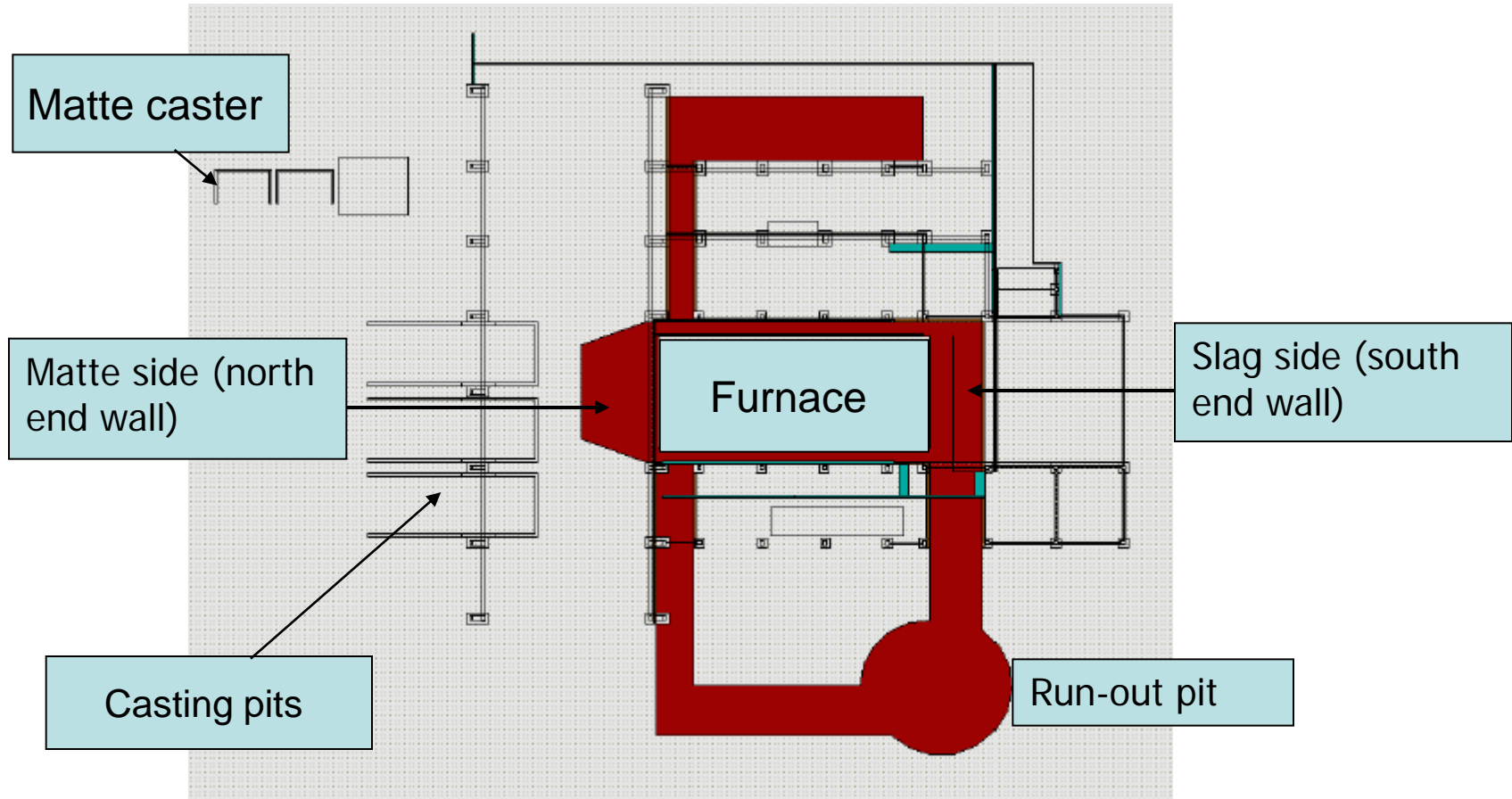
Furnace run-out

Case Study

- Objective:
 - To identify areas susceptible to heat
 - Outline ventilation requirements to dissipate heat
 - Assess possible insulation options (refractory, etc)
 - Identify unsafe areas
 - Identify safe exit routes during an emergency
- Tool/Method
 - Computational Fluid Dynamics (CFD)

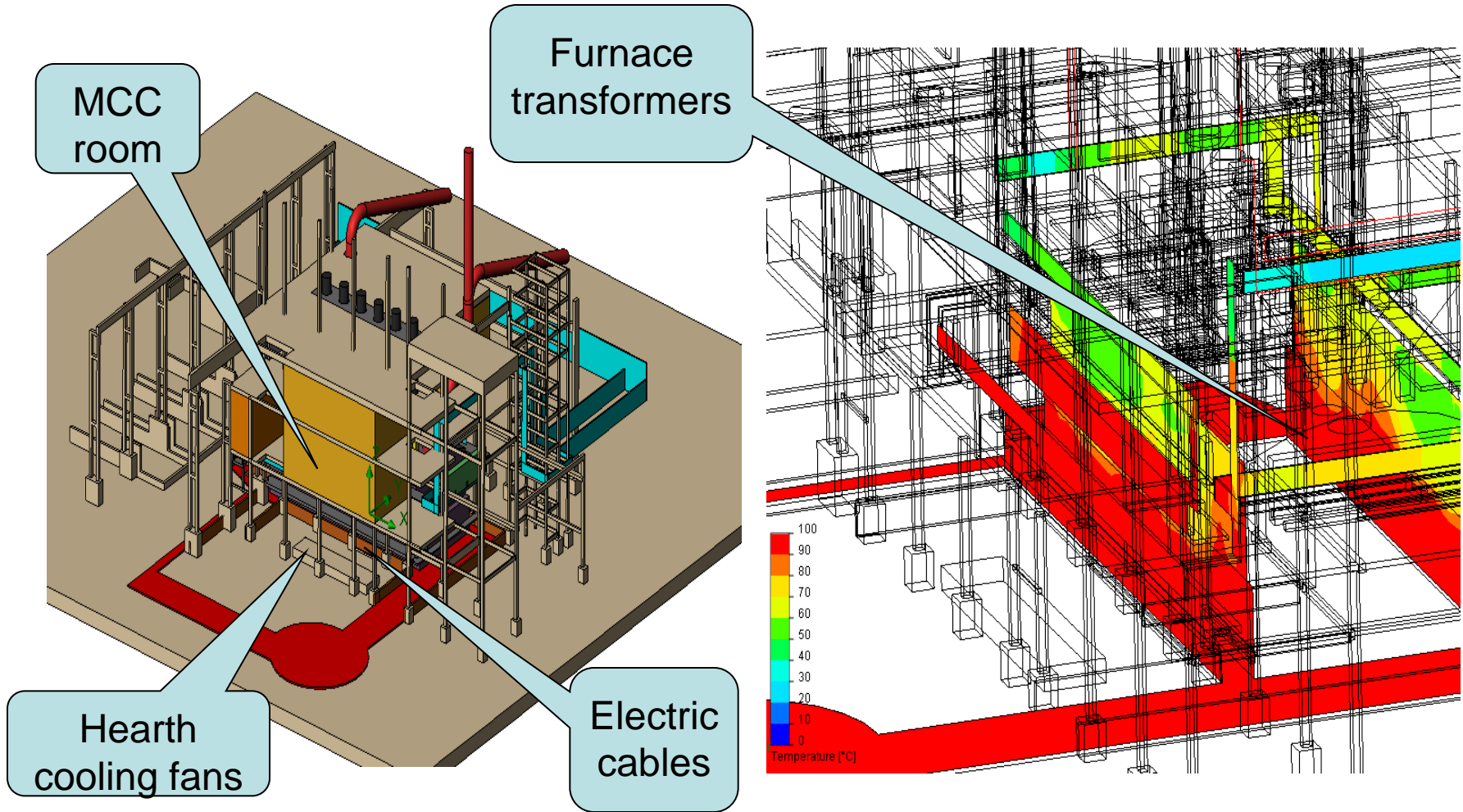


Furnace run-out Case Study



Furnace run-out

Case Study: CFD M1



2009

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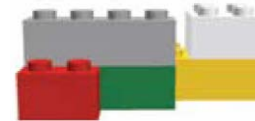
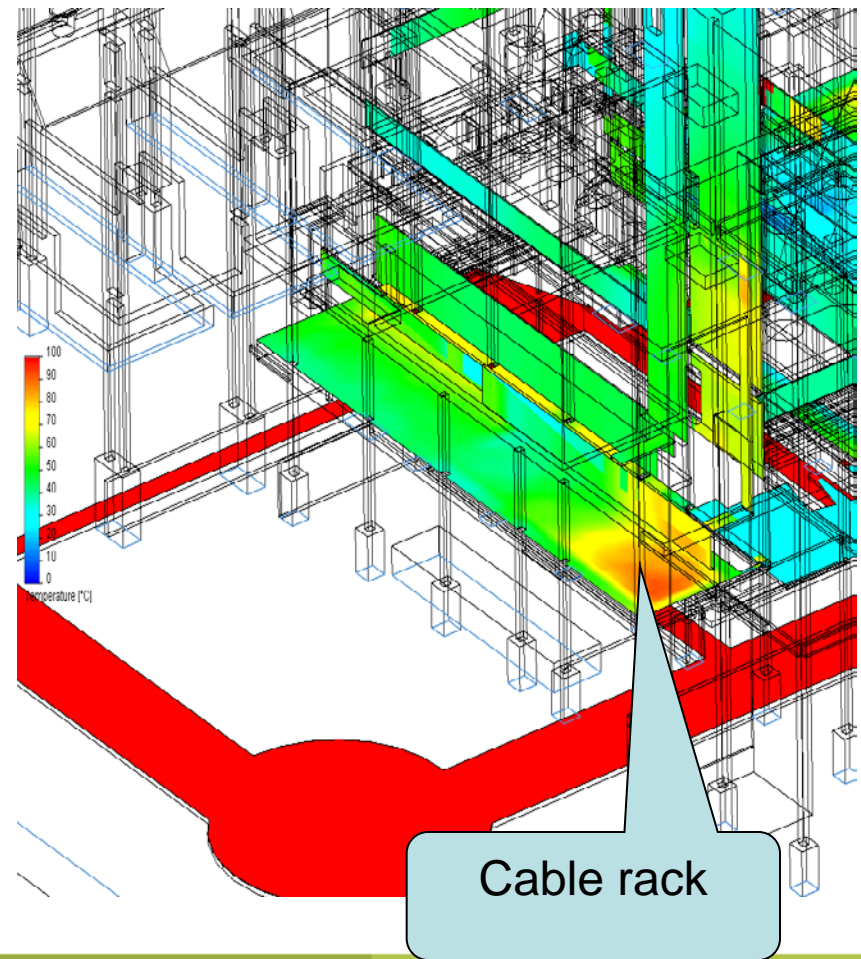
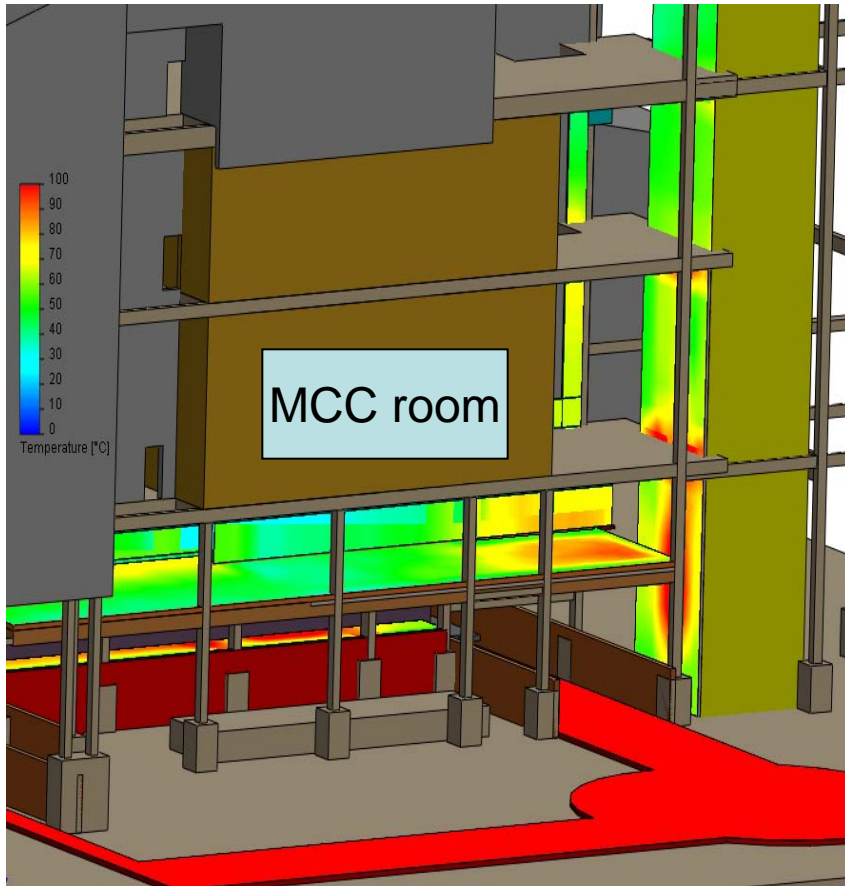
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Furnace run-out

Case Study: CFD M8



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Improvement plan

Scope of work:

- Extension of the bund wall around the ground floor level
- Erection of fire resistant floor on the copper cooler level
- Sealing gaps/openings
- Fire proofing of exposed steel structures
- Improvement of Emergency escape routes
 - Horizontal rather than vertical escape



Improvement plan

Scope of work:



Improvement plan

Project benefits:

- Health and safety
 - Improved emergency escape (horizontal vs. vertical escape)
 - Minimised exposure to fumes
 - Reduced number of contractors on site for repairs
- Equipment
 - Shielded/ protected from thermal energies
- Production
 - Reduced downtime



Improvement plan

Project benefits:

Run-out	Maintenance Downtime	Average hearth temperature prior start-up	Ramp up duration to 30MW
Feb 2008	29 days	200 deg	26 days
Nov 2008	17 days	230 deg	24 days
Future	10 days	350 deg	15 days



Improvement plan

Project benefits:

- Future downtime improvement

Number of days = Feb 2008 – Future
= 30

Matte saving = tons/day X %matte fall x days saved
= 2000 X 0.15 X 30
= 9000 tons

Platinum ounces = oz/ton matte X Matte tons
= 13.3 X 9000
= 120 000 oz



Questions

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