

# METCOKE

November 13-15, 2012  
Pittsburgh, PA, USA

## INCREASE ON PRODUCTIVITY BY INTEGRATED SOLUTIONS FROM THE VIEW OF A MACHINE SUPPLIER

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November 15, 2012

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# Incentive



Being in business for 140 years, SCHALKE permanently encounters:

All customer call for maximizing coke productivity in spite of

- low budgets  
(new sites) or
- aging equipment and coal feed changes in case  
(existing site).

Schalke's approach to meet these requirements is to make use of intelligent and integrated machine design.

**Please follow SCHALKE'S answer....**

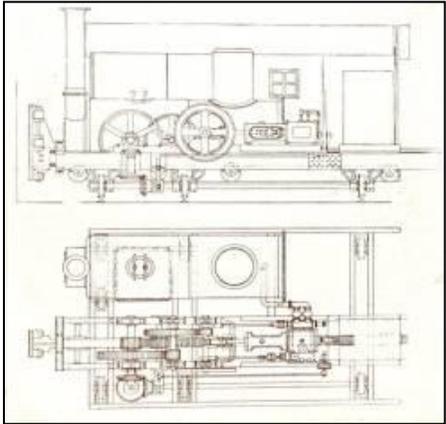
## Introductory part

- Brief company overview

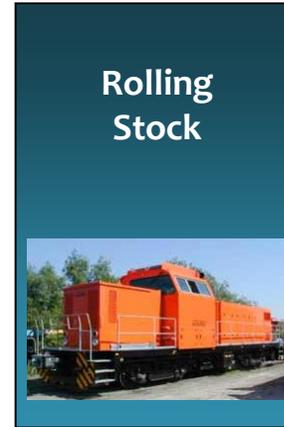
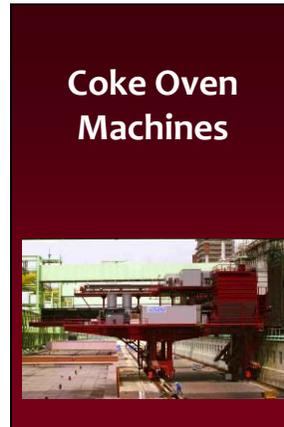
## Technical part

- Nature of aging
- Preconditions and tolerances
- SCHALKE's answers on
  - mechanics
  - process
  - positioning
- Summary

# What is SCHALKE?



- located in Rhein-Ruhr-Area, former German coal and steel industry
- Manufacturing Company - 140 year anniversary in 2012
  - First steam driven Pusher Machine in 1896
- SCHALKE products:



- standard and custom-tailored solutions

**Long-term tradition in coke business!**

# What is Schalke?

**schalke**

**Eickhoff**

**Eickhoff Group**

- g Stock
- Oven Machines
- ry Products
- ground Mining
- g Technology
- anical Components

**HQ** headquarter  
 ◎ subsidiary  
 ☆ representative

**schalke**

**Eickhoff**

There are contacts all over the world.

# What do we do?

## *individual solutions*

- consulting, studies, process analysis,
- project management, procurement
- basic & detail engineering, fabrication,
- erection, commissioning, after-sales



- charging, pushing, transferring,
- emission-treating, quenching,
- maintenance & changing stations

## *TURNKEY projects*

**Anything you need to run coke ovens!**

# Where do we do?



Approx. 300 machines and 80 revamps referenced since 1980

# Current SCHALKE orders

 ThyssenKrupp UHDE



 HYUNDAI  
STEEL

Dangjin, Korea

Phase 3:

- 7.63m Battery
- 3 Sets of Machines
- Completion 12/2013

 PAUL WURTH



 KRAKATAU posco

Cilegon, Indonesia

- 7.63m Battery
- 3 Sets of Machines
- Completion 11/2013

 PAUL WURTH



 BHUSHAN  
Enhancing  
The World Of  
Steel

Angul, India

- 7.6m Battery
- 2 Sets of Machines
- Completion 09/2013

 PAUL WURTH



 CSP  
Companhia Siderúrgica do Pecém

Pecem, Brazil

- 7,63m Battery
- 2 Sets of Machines
- Completion 01/2015

# What do the machines do?

## customer's requirements

- no downtime
- best productivity
- no wear or maintenance
- negligible investment
- service for decades



*Sorry people,  
get real*

## today's accomplishments

- quick, accurate and safe motion
- endurance of heat, cold, dirt, dust, fire, corrosion
- accurate and repeatable handling
- tight sealings of doors and openings
- kiln identification
- remote control to manless operation
- collision control, smooth integration

**machine features range on high level!**

# What is the challenge?

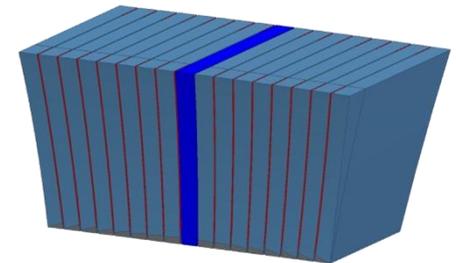


## Ravages of time

- design is fine / site erection gives special touch
- aging behavior of battery and machines are different.
  - thermal load cycles on battery
  - mechanical load on machines

lead to worn-out equipment and constantly growing batteries.

- Batteries grow in height for 100 mm
- oven doors tilt towards machines
- oven doors incline sideways
- charging holes drift apart
- fittings and guides wear out



**machines have to overcome positioning challenge.**

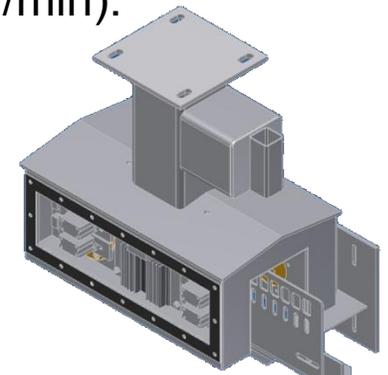
# SCHALKE's answer: positioning system

- SCHALKE'S system is used for positioning coke oven machines and similar rail-bound vehicles.
- The rough design and the special fibre optic technique enables nearly maintenance-free use.

## 600 positioning tasks per day

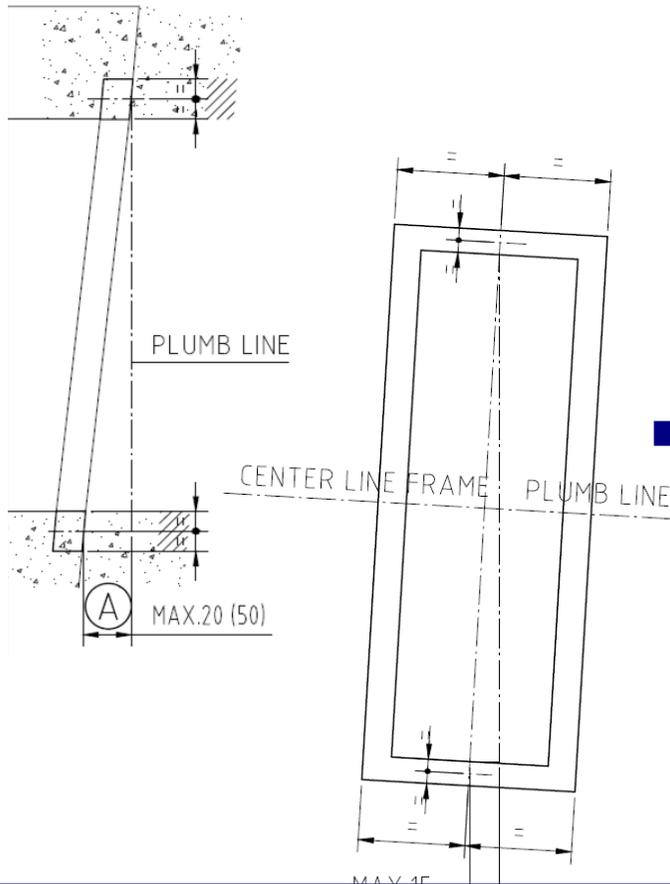
The main characteristics of the system are:

- Travel speeds up to 400 m/min (1300"/min).
- Independent from travel direction
- Simultaneous oven number detection
- Positioning accuracy  $\pm 5$  mm.



**Accurate and quick positioning is key to smooth operation!**

# SCHALKE's answer: mechanics



## ■ design example:

door opening system with jaw and anchor

- positioning system                    +/- 5 mm                    (~3/16")
- movement of arm                    + 3-4 m                    (10-12')
- head weight                            6-11 tons
- positioning tolerance               +/- 10 mm                (+/- 3/8")

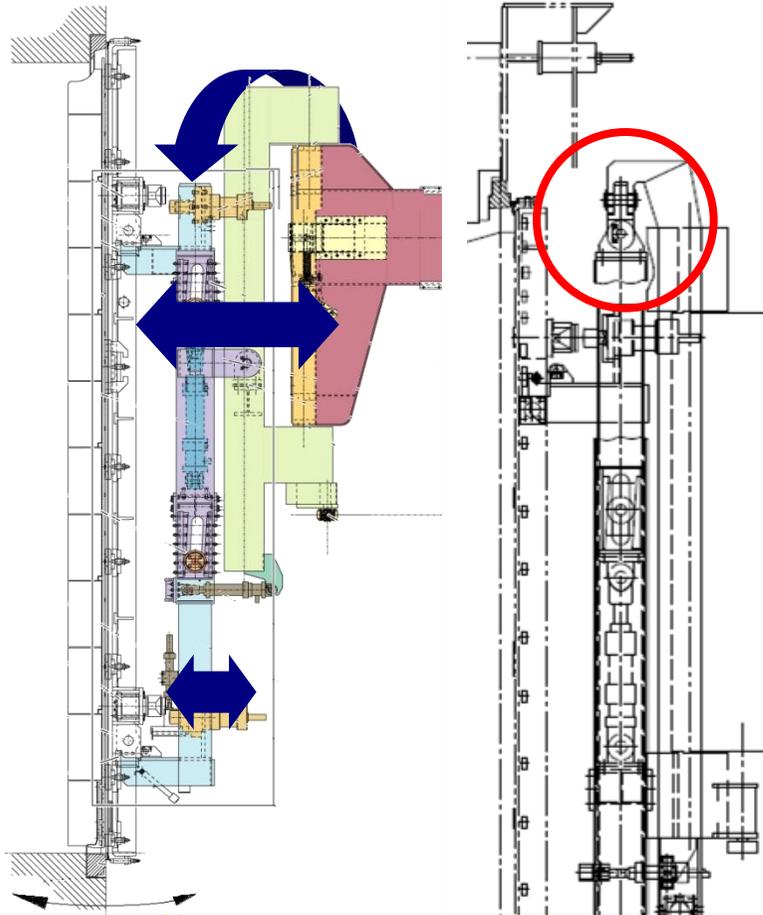
## ■ additional technical packages

- |                          |               | standard | & | upgrade      |
|--------------------------|---------------|----------|---|--------------|
| - tolerances             |               |          |   |              |
| - door inclination       | 20 mm (6/8")  | ...      |   | 100 mm (4")  |
| - oven frame tilting     | 15 mm (9/16") | ...      |   | 80 mm (3")   |
| - charging holes offset: | 40 mm (12/8") | ...      |   | 200 mm+ (8") |

***schalke***

**Little extra technical effort leads to flexibility and operability.**

# SCHALKE's answer: mechanics realized



## BlueScope Steel, Port Kembla Steelworks, Australia



- 5 batteries, 331 ovens, 1960-1987
- In 1998 SCHALKE supplied 3 coke transfer cars on battery 3/4/5 (25-30 years old, 5 m)
- environmental incentives, but subject to operability
- tolerances critical, solution: gimbal mounting

## SSAB Tunplat, Luleå, Sweden



- 1 battery, 54 ovens, 1975
- In 2001 SCHALKE supplied 1 coke transfer car (battery 26 years old)

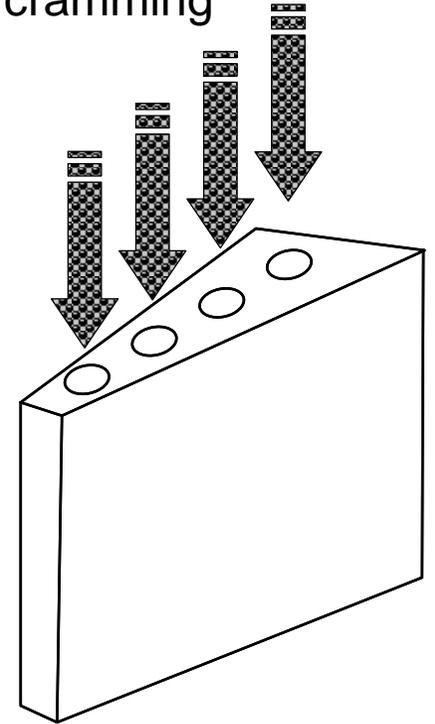
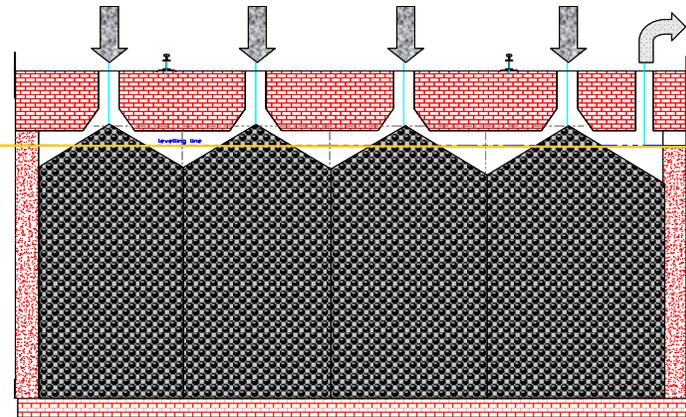
**In 2011 batteries still in service and machines running!**

# Schalke's answer: process



## How does improved charging work?

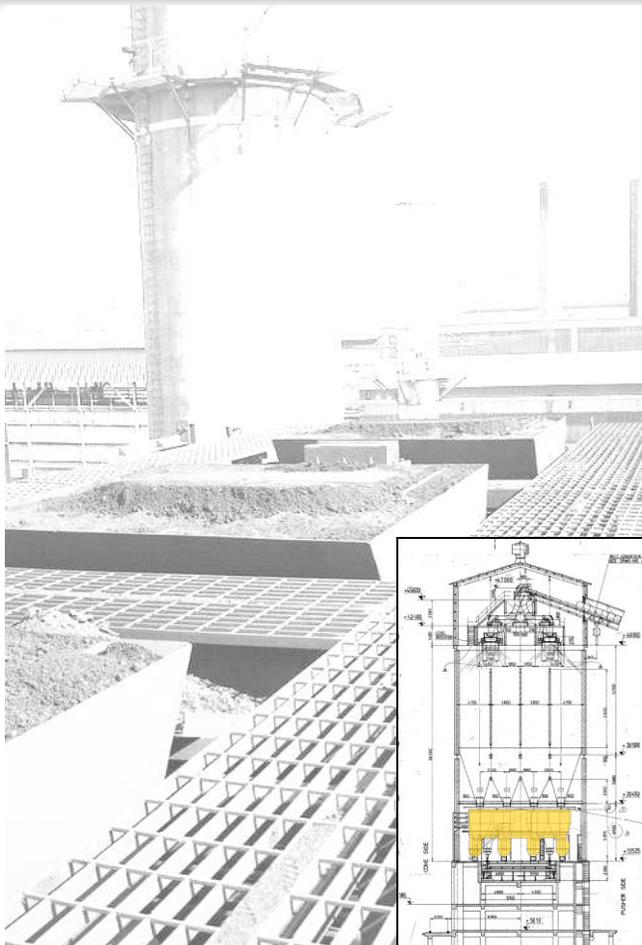
- objective: maximize input coal without cramming
  - prism-like oven geometry
  - simultaneous charging
  - minimize levelling coal
  - maintain emission seal



- manual service device aids adjustments

Process tuning at its simplest.

# Schalke's answer: process realized



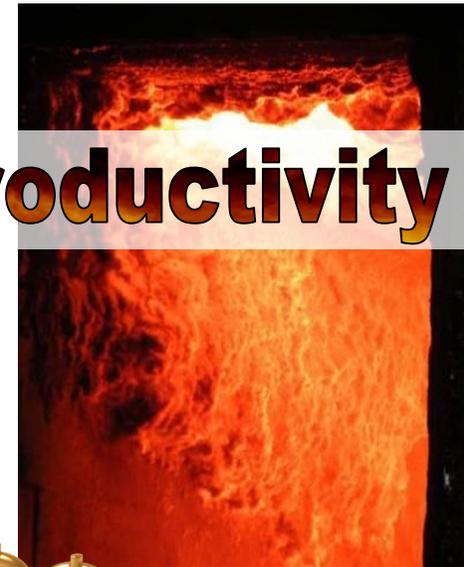
## SOUTH AMERICAN customer, 6 m battery

- objective: site survey & improved charging in 2012
- no mechanical changes
- key: intelligent settings with respect to aging battery and coal mix

■ success: **4% gain in productivity**

1% of 1 Mio. t coke/a x 300 USD/t =  
3 Mio. USD/a

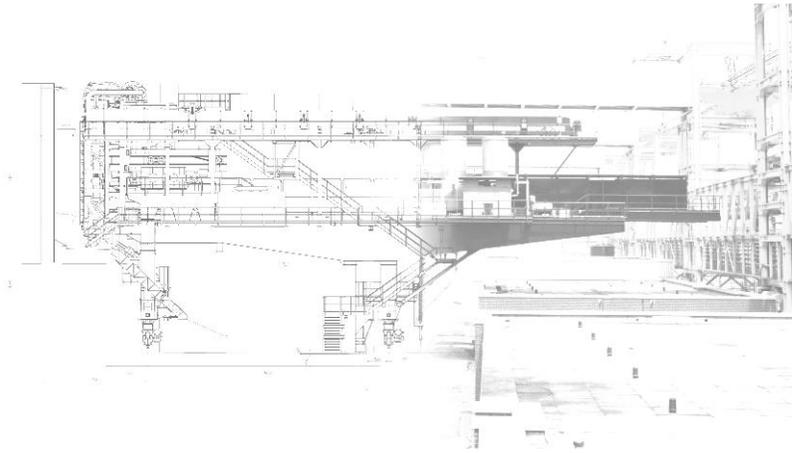
- secondary success:  
less graphite formation



Process tuning is pure cash!



# Summary



- brief introduction of SCHALKE:  
who we are, what we do, whom we deal with
- great challenges to fair battery operation:
  - aging equipment and
  - coal feed mixes
- examples on SCHALKE'S answers taking up the challenges:
  - automation, mechanics, process
- “An Increase on productivity is not always a gigantic investment, but sometimes a small integrated solution, that pays off in no time.”

.... just a view of a machine supplier ....