



# *Mines and Metals Engineering GmbH*

Your partner for Iron & Steel Making

By: Hossein Aziztaemeh

# MME GmbH company

➤ registered in Düsseldorf, Germany since 1996

➤ engineering services for mining and metals

industries worldwide

**MME fields:**

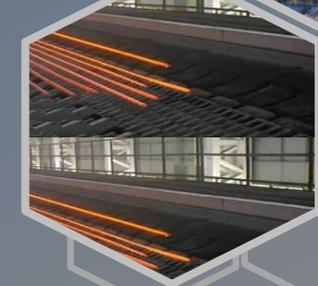
**Iron Mines Industries**

**Iron Making Industries  
– Direct Reduction**

**Steel Making Industries**

**Pelletizing plant**

**Rolling Mills**



## ***MME has a wide range of activities:***

- ***feasibility studies***
- ***engineering development and services***
- ***management for EPC project execution***
- ***start up and commissioning of plants***
- ***maintenance and spare parts management***
- ***systems and automation implementation***
- ***training and technical assistance services***



# PERED<sup>®</sup>

*Invented and patented in 2006*

BUNDESREPUBLIK DEUTSCHLAND

## URKUNDE

über die Erteilung des

## Patents

Nr. 10 2006 062 689

**IPC**

C21B 13/02 (2006.01)

**Bezeichnung**

Schachtofen für die direkte Reduktion von Eisenoxid

**Patentinhaber**

MINES and METALS Engineering GmbH (M.M.E.), 40474 Düsseldorf, DE

**Erfinder**

Najmossadat, Seyed Mohammed Reza, Teheran, IR

**Tag der Anmeldung**

21.12.2006

# PATENTED IN GERMANY

München, den 22.01.2009



Die Präsidentin des Deutschen Patent- und Markenamts

*Rudloff-Schäffer*

Rudloff-Schäffer



# PERED<sup>®</sup>

**LOWER**

**CAPITAL COST**

**WATER CONSUMPTION**

**MAINTENANCE COSTS**

**ENERGY CONSUMPTION**

**FLEXIBILITY**

**TO USE LUMP ORE UP TO 50%**

**END PRODUCT HDRI/CDRI/HBI**

**TO USE LOCAL MATERIAL**

# Where We Innovated

Shaft furnace

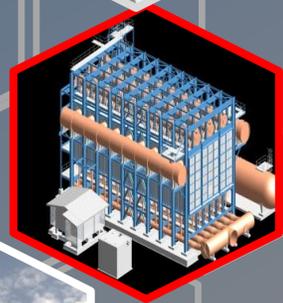
Compressors

Scrubbers

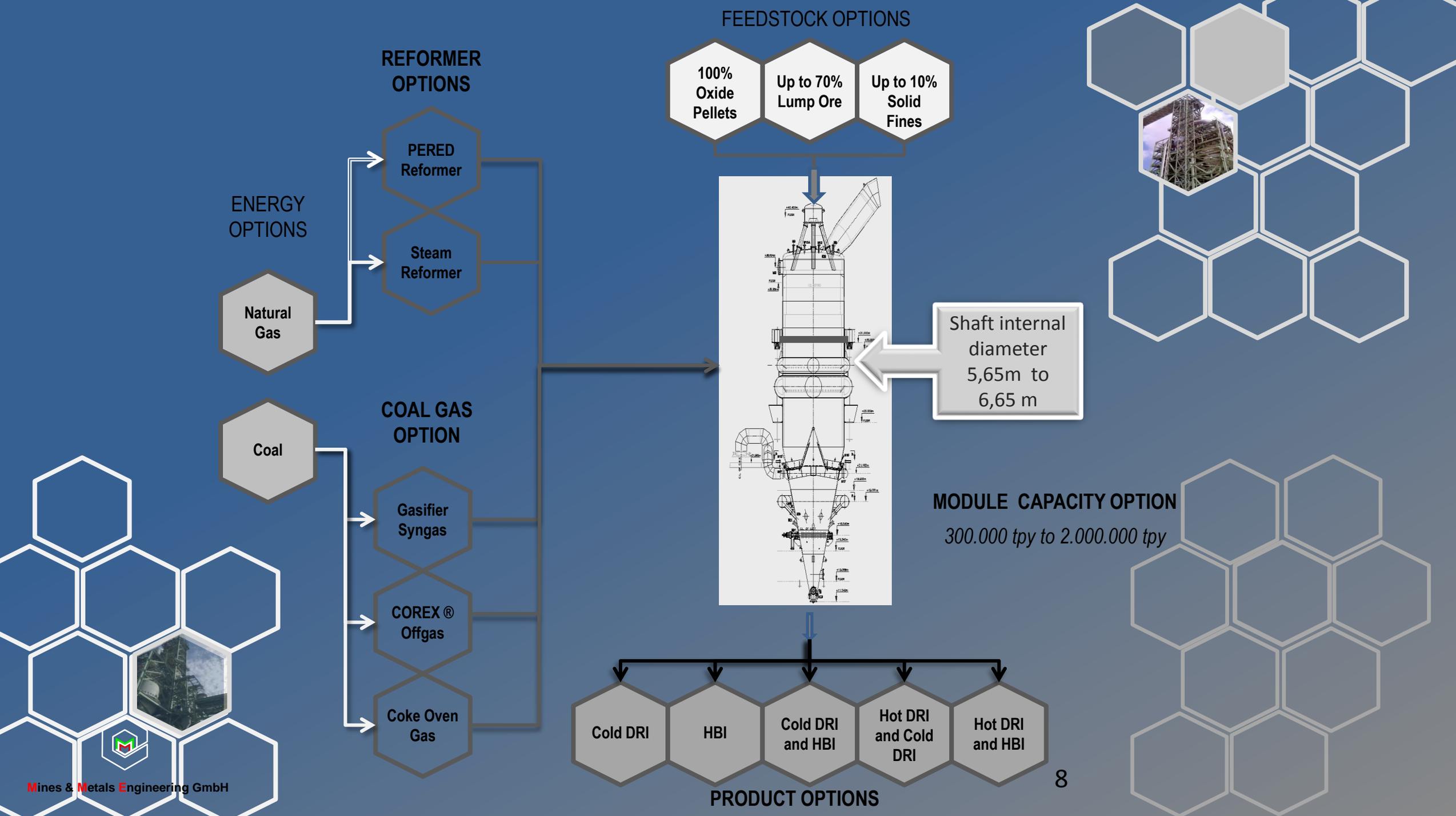
Reformer

Heat recovery

Refractory





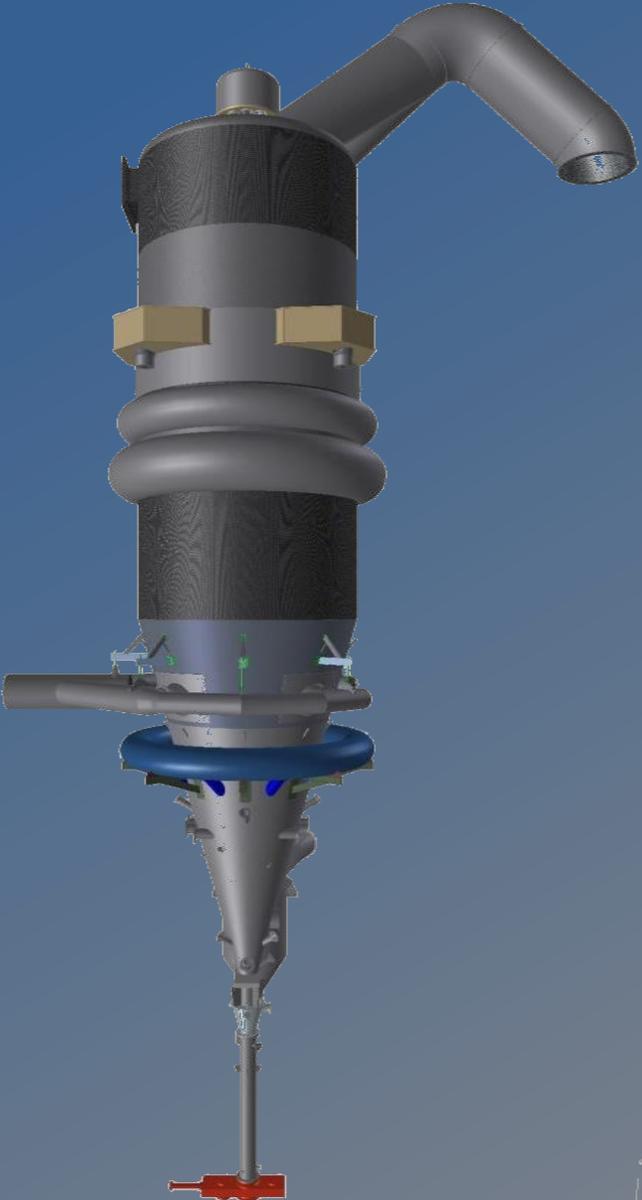


# SHAFT FURNACE

 *Top ( Reduction ) Zone*

 *Middle ( Transition ) Zone*

 *Lower ( Cooling ) Zone*



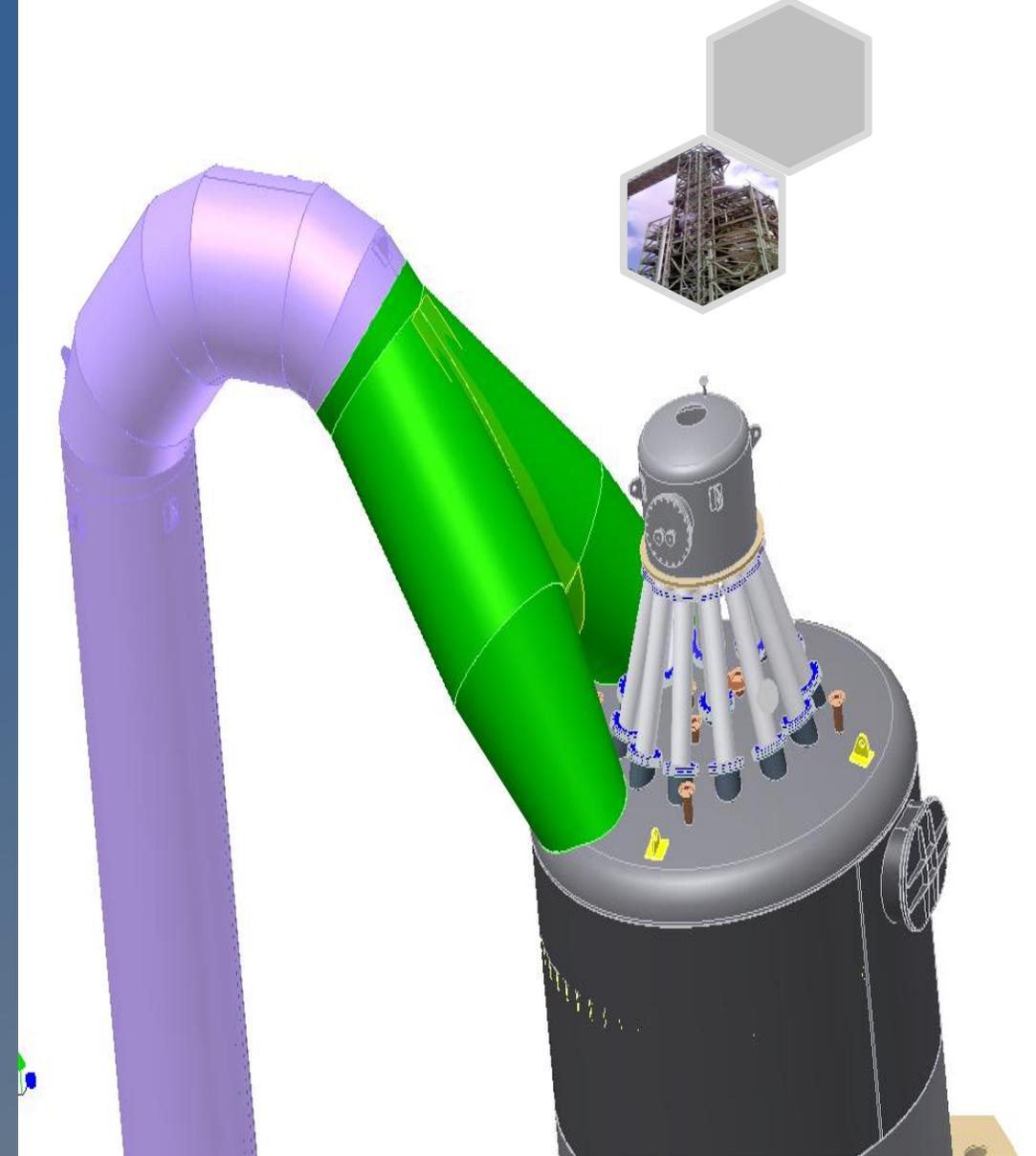
## Shaft Furnace    Top ( Reduction ) Zone

*Oxide feeding & distribution inside the furnace by special feed pipes.*

*Optimizing the ratio of height to diameter which improves utilization of the furnace.*

*Optimizing reduction reaction with:*

- ➔ *No equipment in the furnace reduction zone*
- ➔ *Reduces fines generation*
- ➔ *Improves material distribution inside the furnace*
- ➔ *Increase effective reduction volume*
- ➔ *Eliminates possible pollution due to gas leakage*
- ➔ *Capital cost reduction*
- ➔ *Maintenance cost reduction*

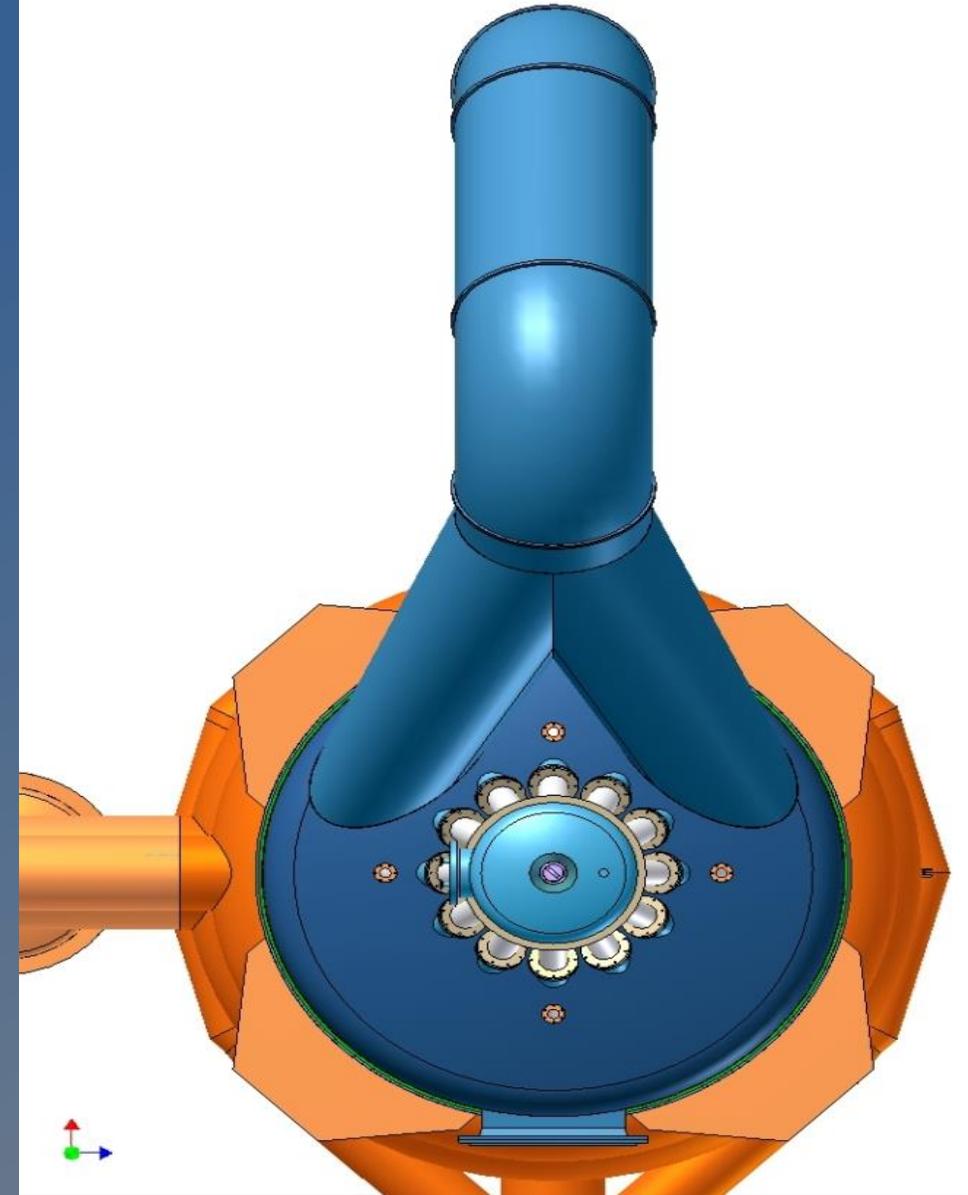


# Shaft Furnace

Top ( Reduction ) Zone

## *Design characteristics:*

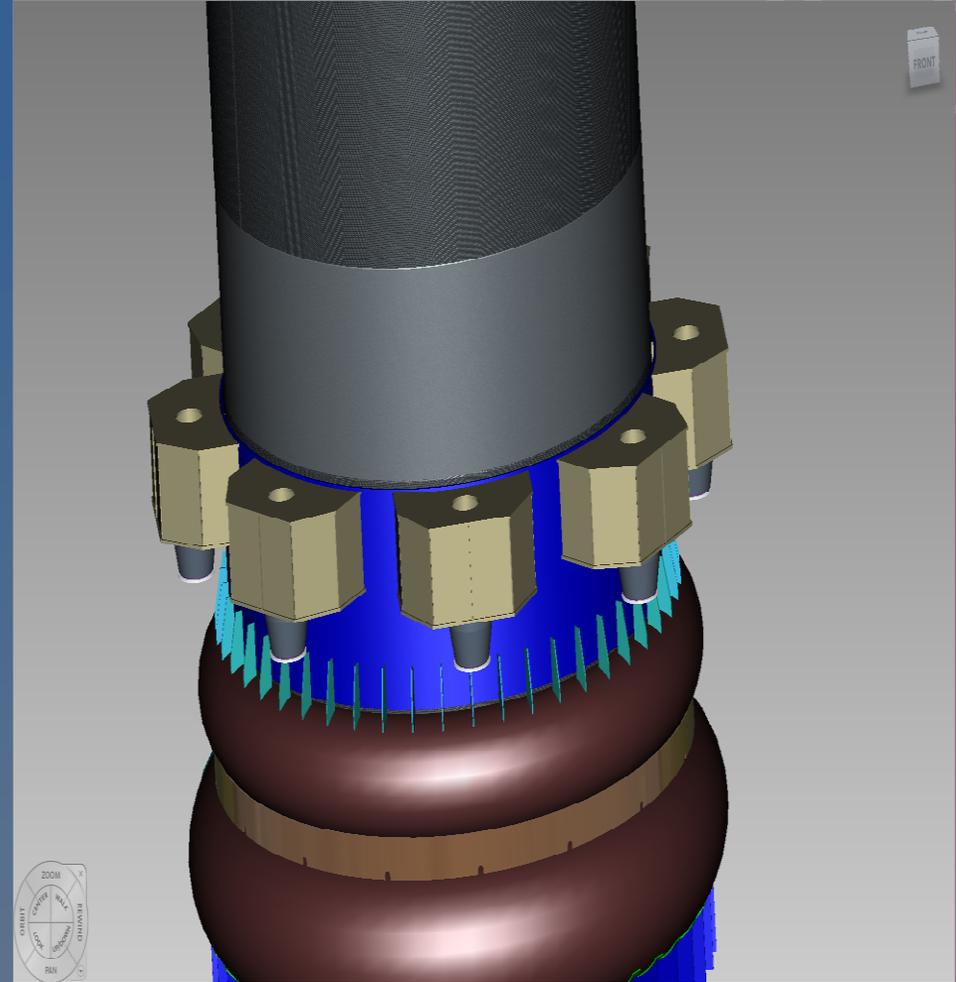
- ➔ *Dual top gas off take design*
- ➔ *uniform product quality*
- ➔ *improves the refractory life at top gas duct*
- ➔ *Optimise furnace size*
- ➔ *lower load on scrubbers*



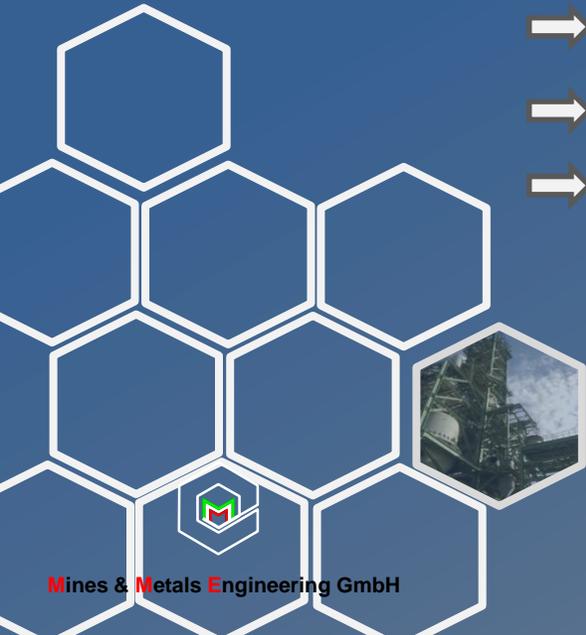
# Shaft Furnace

## *Reduction Zone Design characteristics:*

- ➔ *Dual reducing gas injection*
- ➔ *Flexibility to have different gas composition and temperature*
- ➔ *Better utilization of the bustle gas*
- ➔ *Improves distribution of gas in the furnace*
- ➔ *Improve productivity and quality*
- ➔ *Uniform bed temperature across the furnace*
- ➔ *Eliminate clustering possibility*
- ➔ *Flexibility to use lump ore*
- ➔ *Rectangular bustle ports design*
- ➔ *Tapered refractory construction*



*Bustle Port arrangement  
Specially designed ports*



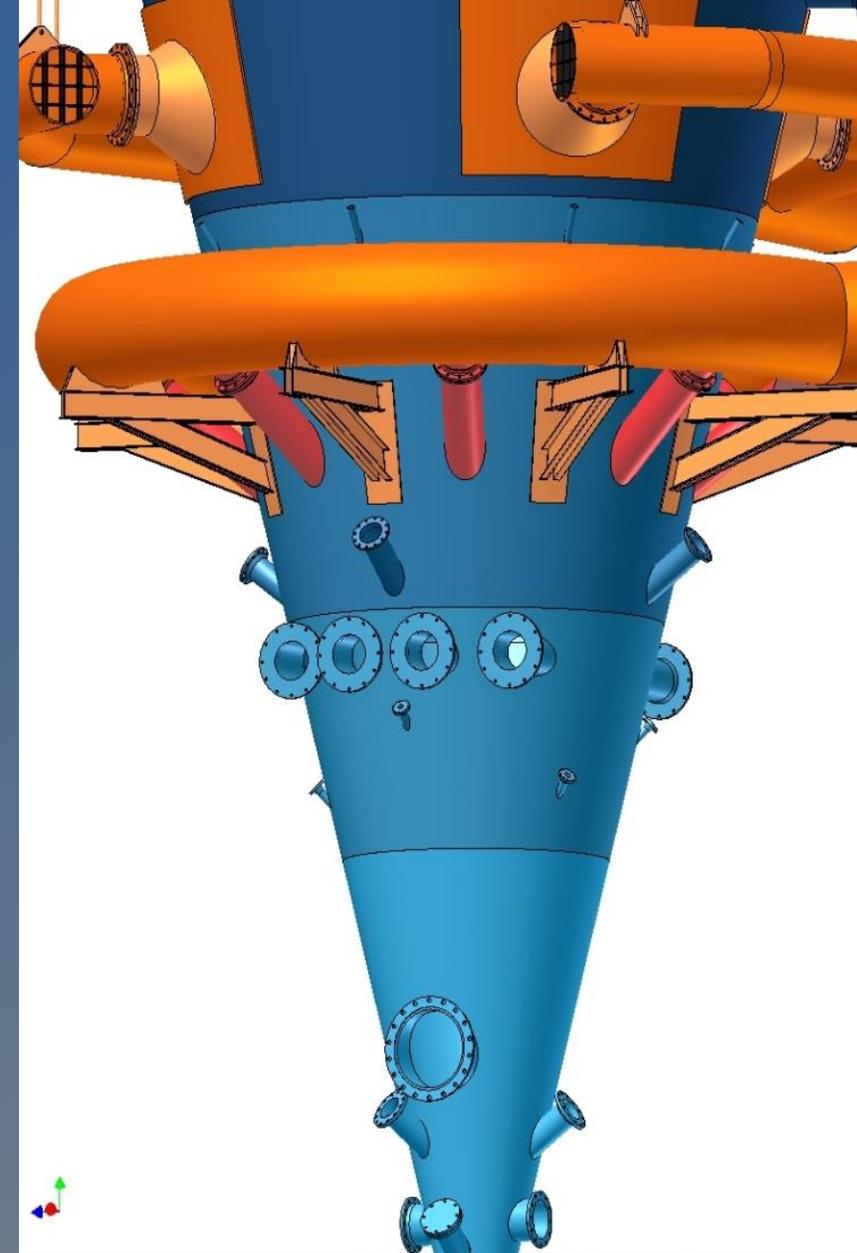
## Lower Shaft Furnace      Cooling zone

### *Design characteristics:*

- ➔ *360 degree rotating burden feeders*
- ➔ *Better and uniform performance*
- ➔ *Feeding burden with 4 independently controlled rotating shafts*
- ➔ *No water jacketing as it is in the cold zone*
- ➔ *No clustering*

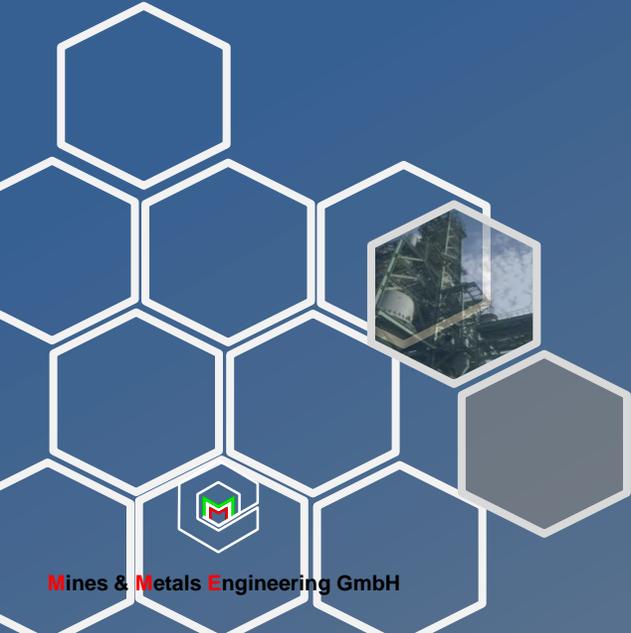
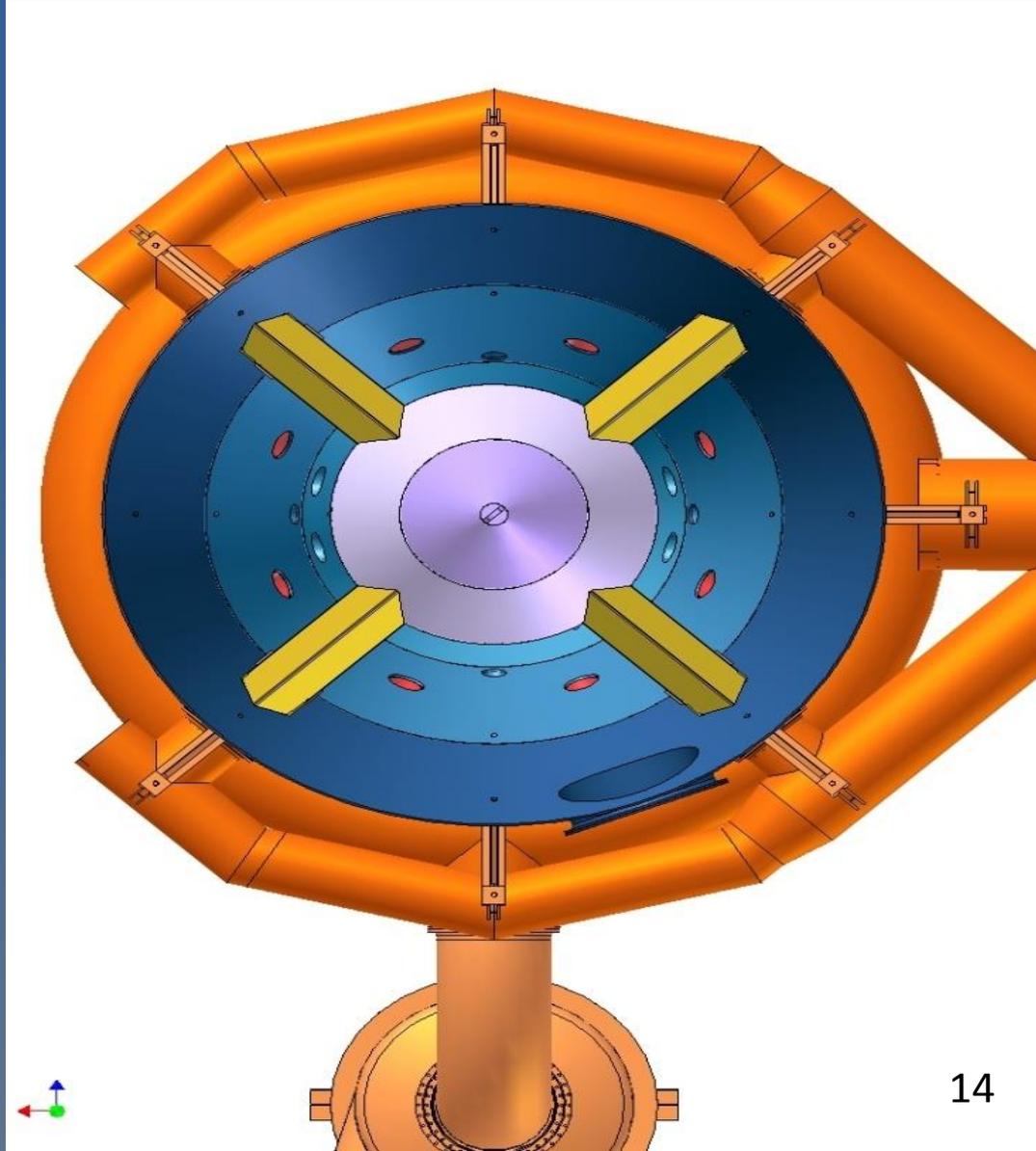
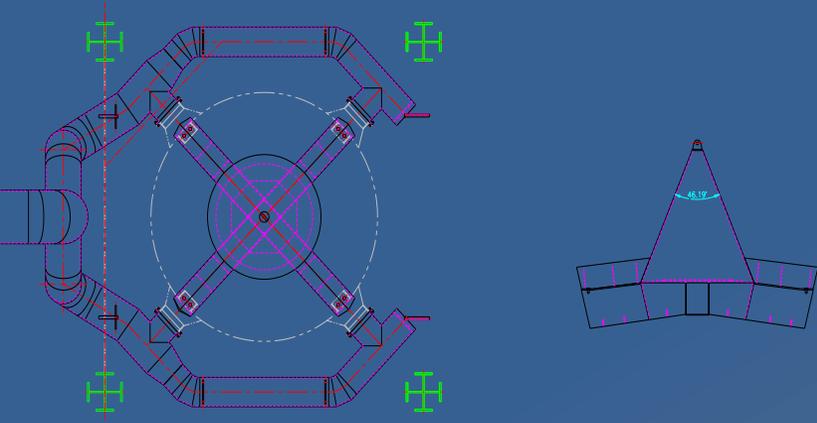
### Cooling gas Offtake and China hat

- ➔ *Injection of cooling gas to cone from outside header*
- ➔ *Uniform hot cooling gas collection by ' + ' shaped Offtake*
- ➔ *No refractory in the header*



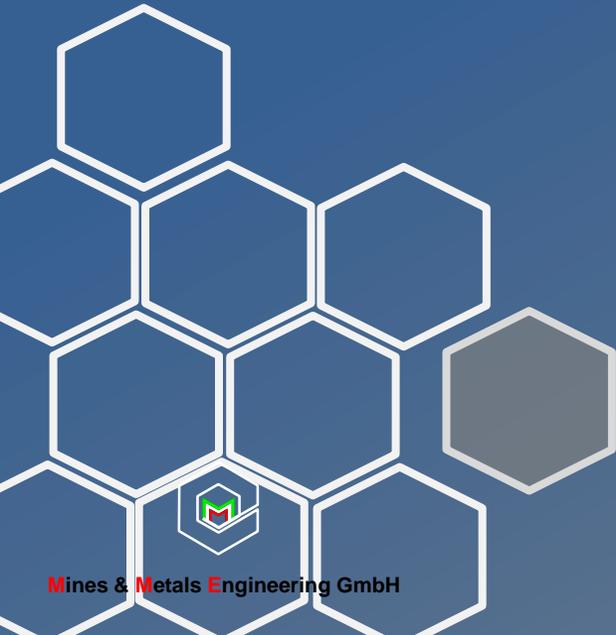
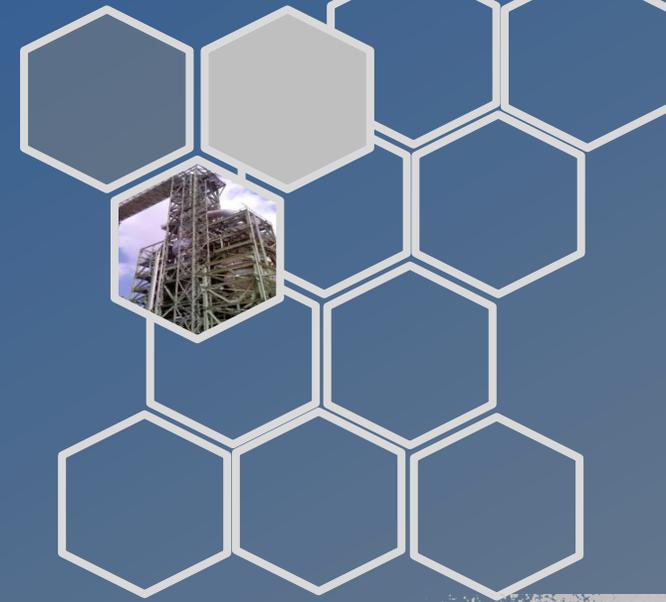
# Shaft Furnace

## Cooling Gas Off Take Arrangement



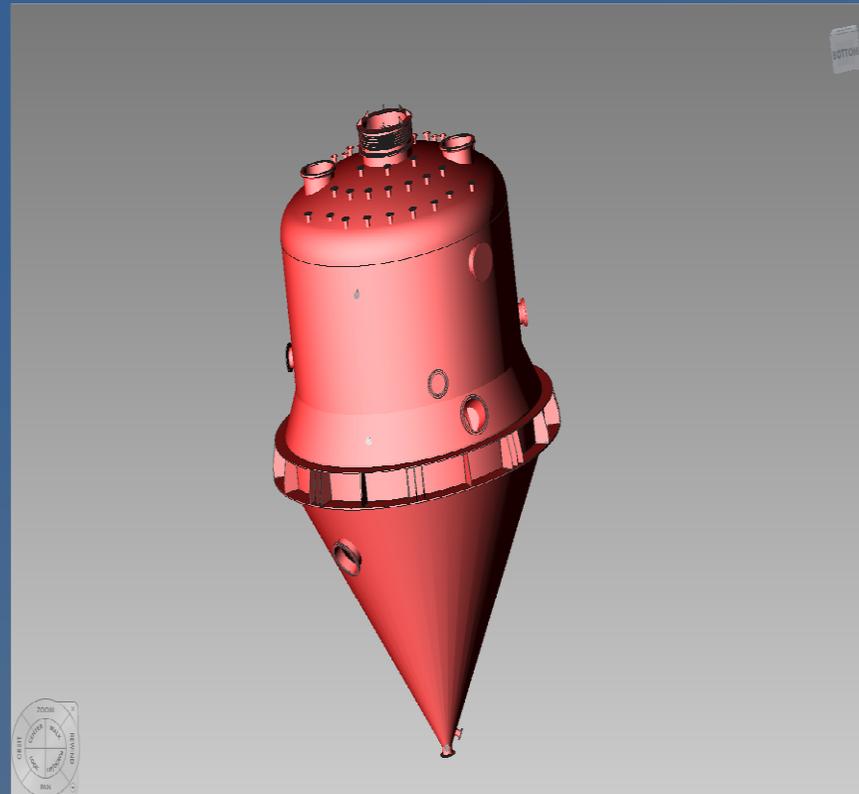
# REFORMER

- *Increased reformed gas volume per tube*
- *Usage of Super Active PERFORMEX Catalysts*
- *Safe Reformer operation with High H<sub>2</sub>/CO Ratio*

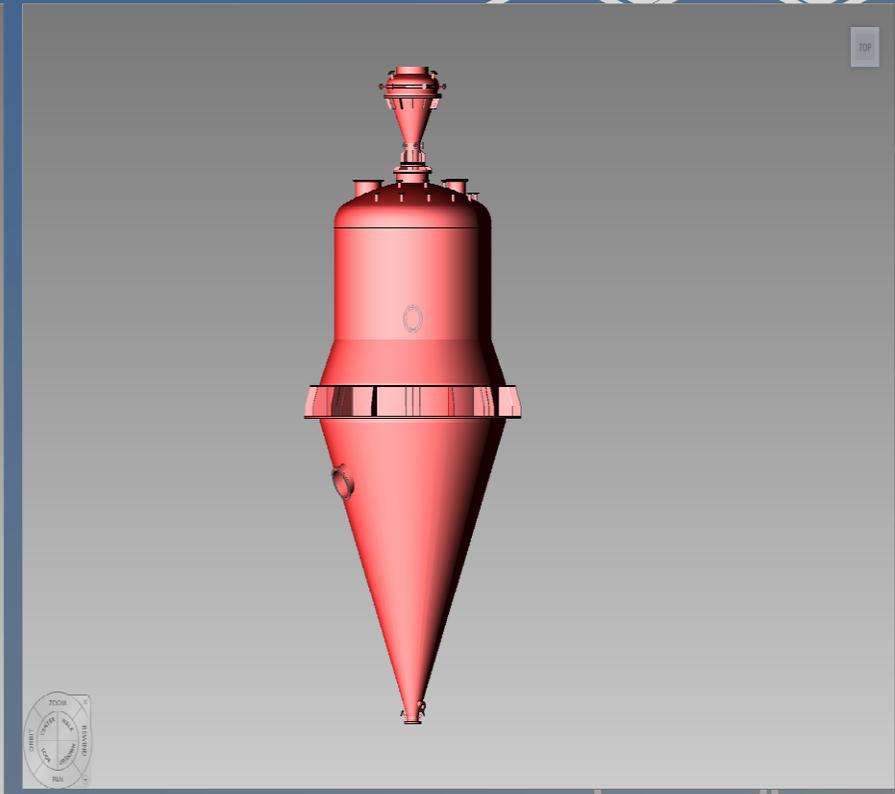


# Top Gas Scrubber & Cooling Gas Scrubber

- *Remove the fines with high efficiency*
- *Improves the Life of Ducts, Refractory & Compressors*



**TOP GAS  
SCRUBBER**

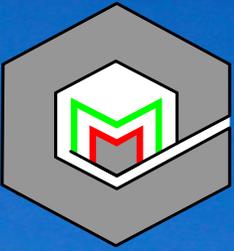


**COOLING GAS  
SCRUBBER**

# Compressors

- *Operation with higher pressure by proven system*
- *Reduce power consumption.*



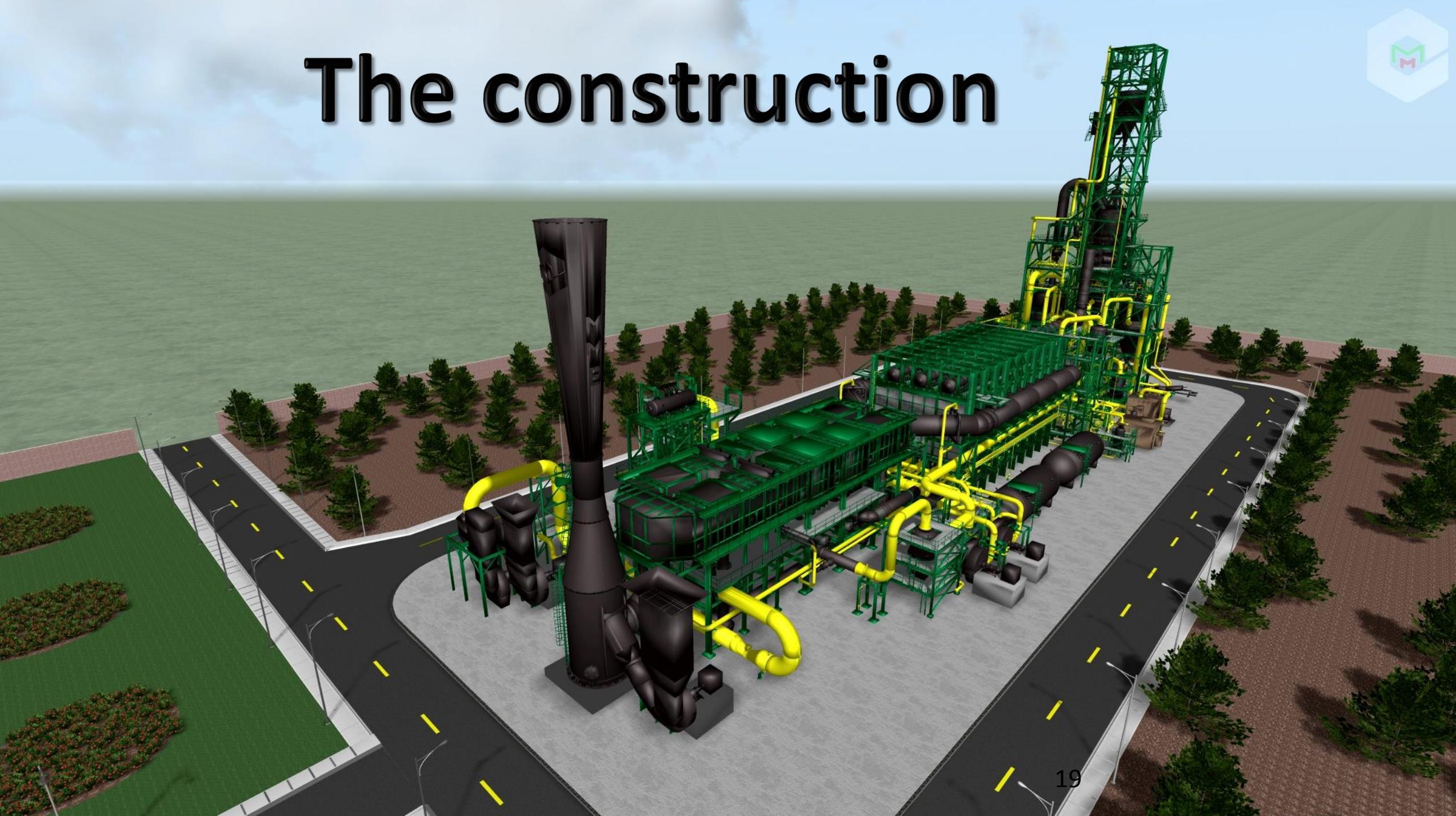


## *PERED<sup>®</sup> technology brings the following advantages*

- *Lower capital investment*
- *Lower energy & operation costs*
- *Lower environment pollution*
- *Jumbo module for more than 1 MTPY*
- *Option for hot DRI / HBI / HDRI and combinations*



# The construction





# Reduction Furnace



# Reformer & Heat Recovery



# Gas Compressors





Rotating Burder Feeder

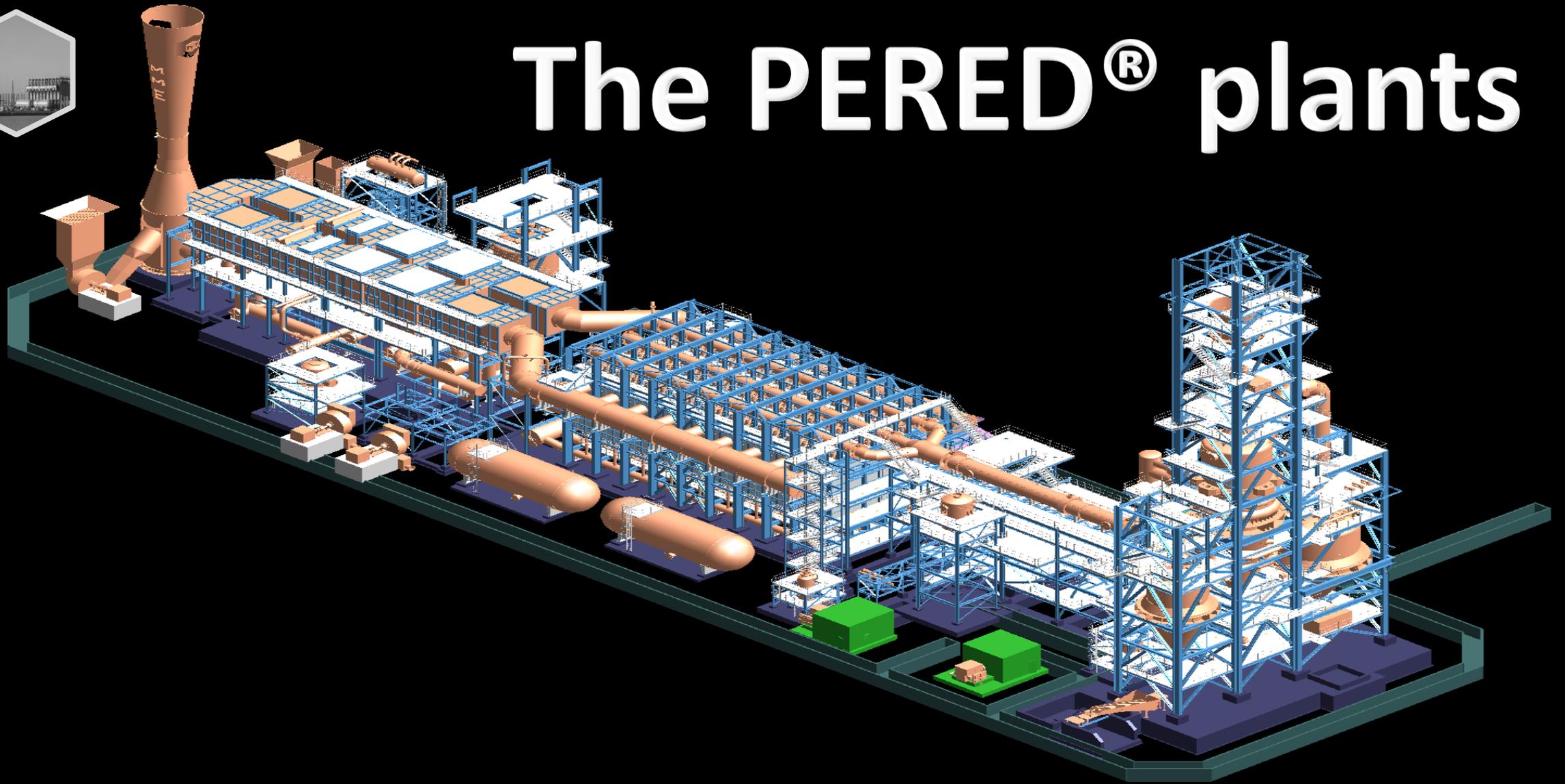


Reduction Furnace





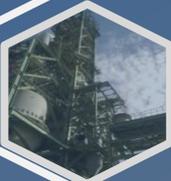
# The PERED<sup>®</sup> plants



# THE PERED® DRI PROJECTS



Projects	Capacity	
SHADEGAN PERED®	(0.8 MTPY) Turn Key	In Operation
MIYANEH PERED®	(0.8 MTPY) Engineering & Equipment Supply	In Operation
NEYIRIZ PERED®	(0.8 MTPY) Engineering & Equipment Supply	In Operation
BAFT PERED®	(0.8 MTPY) Turn Key	Under Construction
CSTM PERED®, With Syn Gas From Coke Oven– P.R. of CHINA	(0.3 MTPY) Engineering & Equipment Supply	Under Construction



# THE PERED<sup>®</sup> DRI PROJECTS

## SHADEGAN STEEL COMPLEX PERED<sup>®</sup> (0.8 MTPY)

Commissioned on 21<sup>st</sup> June 2017

Production until June 2018 > 500,000 MT

Maximum rate achieved so far 105 T/H

Met. 92 to 95%. Carbon 1.5-3.0 %

NG Consumption at rated capacity 2.45 Gcal/Ton

Power Consumption at rated capacity 105 kWh/Ton

Water Consumption at rated capacity 1.0 m<sup>3</sup>/Ton



# THE PERED<sup>®</sup> DRI PROJECTS

## MIYANEH STEEL COMPLEX PERED<sup>®</sup> (0.8 MTPY)

Commissioned on 05<sup>th</sup> September 2017

Production until May 2018 > 500,000 MT

Maximum rate achieved so far 108 T/H

Met. 92 to 95%. Carbon 1.5-2.0 %

NG Consumption at rated capacity 2.45 Gcal/Ton

Power Consumption at rated capacity 105 kWh/Ton

Water Consumption at rated capacity 0.85 m<sup>3</sup>/Ton



# THE PERED<sup>®</sup> DRI PROJECTS

## NEIRIZ STEEL COMPLEX PERED<sup>®</sup> (0.8 MTPY)

Commissioned on 24<sup>th</sup> January 2018

Production until May 2018 > 275,000 MT

Maximum rate achieved so far 100 T/H

Metn 92 to 95%. Carbon 1.5-2.0 %

NG Consumption 2.45 Gcal/Ton

Power Consumption 105 kWh/Ton

Water Consumption 0.9 m<sup>3</sup>/Ton



# *Positive observations during first commissioning of PERED® DRI Plants in coherence with Technology Features*

- *Met. as high as 95% during the first startup in less than 24hrs.*
- *No cluster during first start up*
- *Very less percentage of fines on the product*
- *Uniform Temperature profile across reduction zone*
- *Quick start up after a lay over*
- *Improved operation cycle of scrubber packings*



# LOOKING TO THE FUTURE

JUMBO MODULE DRI

HOT CHARGING OF DRI TO STEEL MAKING

HOT DRI TRANSPORT

BRIQUETTING OF COLD DRI



*we have the technology for  
today and tomorrow*

**M**ines and **M**etals **E**ngineering GmbH

**MME**

*The right partner for your next project*

