



THE SCARABAEUS®

Contribution of processing technology to achieve climate targets in the
steel industry.

Dr.-Ing. Jan Lampke
10.06.2021

HAVER ENGINEERING GmbH

Associated-Institute of TU Bergakademie Freiberg



Processing



Storage



Mixing



Filling



Package & Load



Palletizing



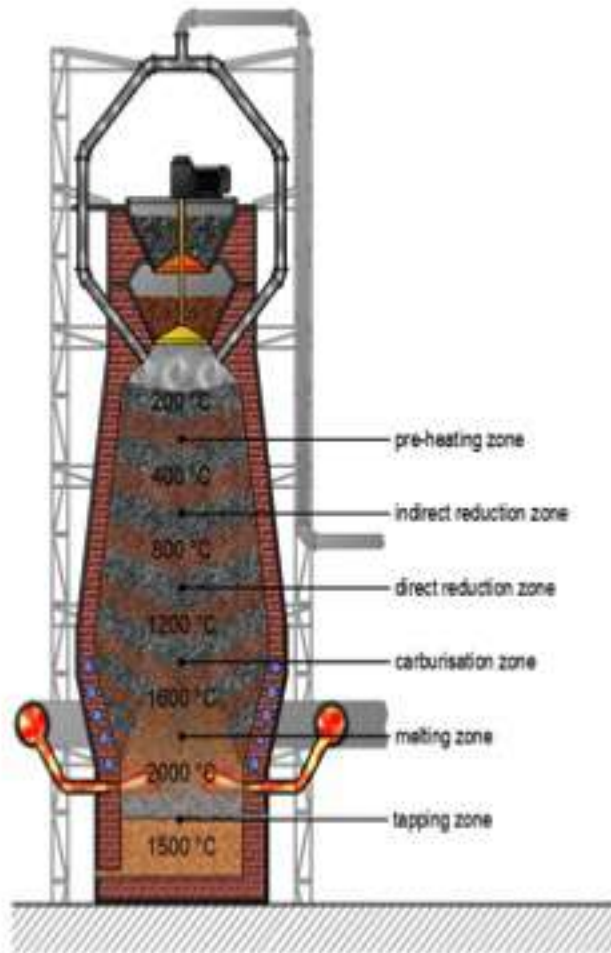
- 1 Problem
- 2 Solution approach
- 3 Process description
- 4 Product evaluation
- 5 Summary



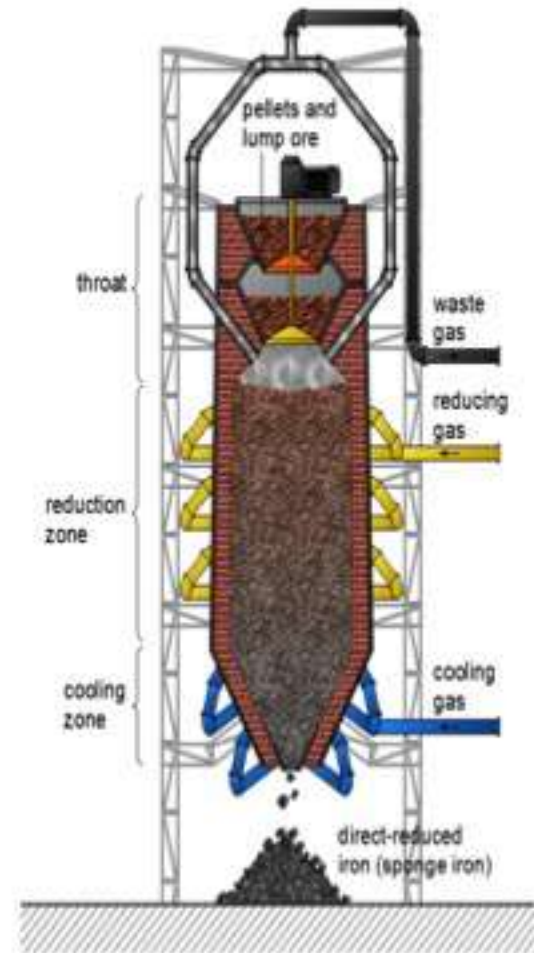


Metallurgical background

Blast furnace process

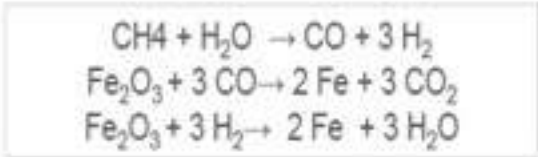
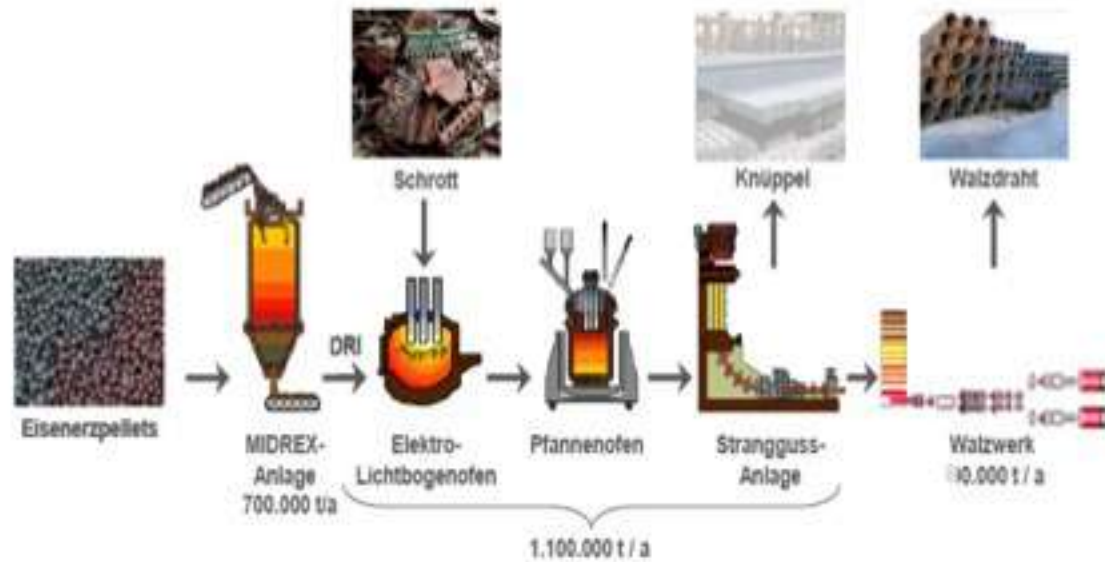


Direct reduced iron (DRI) process

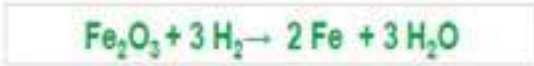




Vom Erz zum Stahl: DRI-Elektrolichtbogen Route, Beispiel ArcelorMittal Hamburg

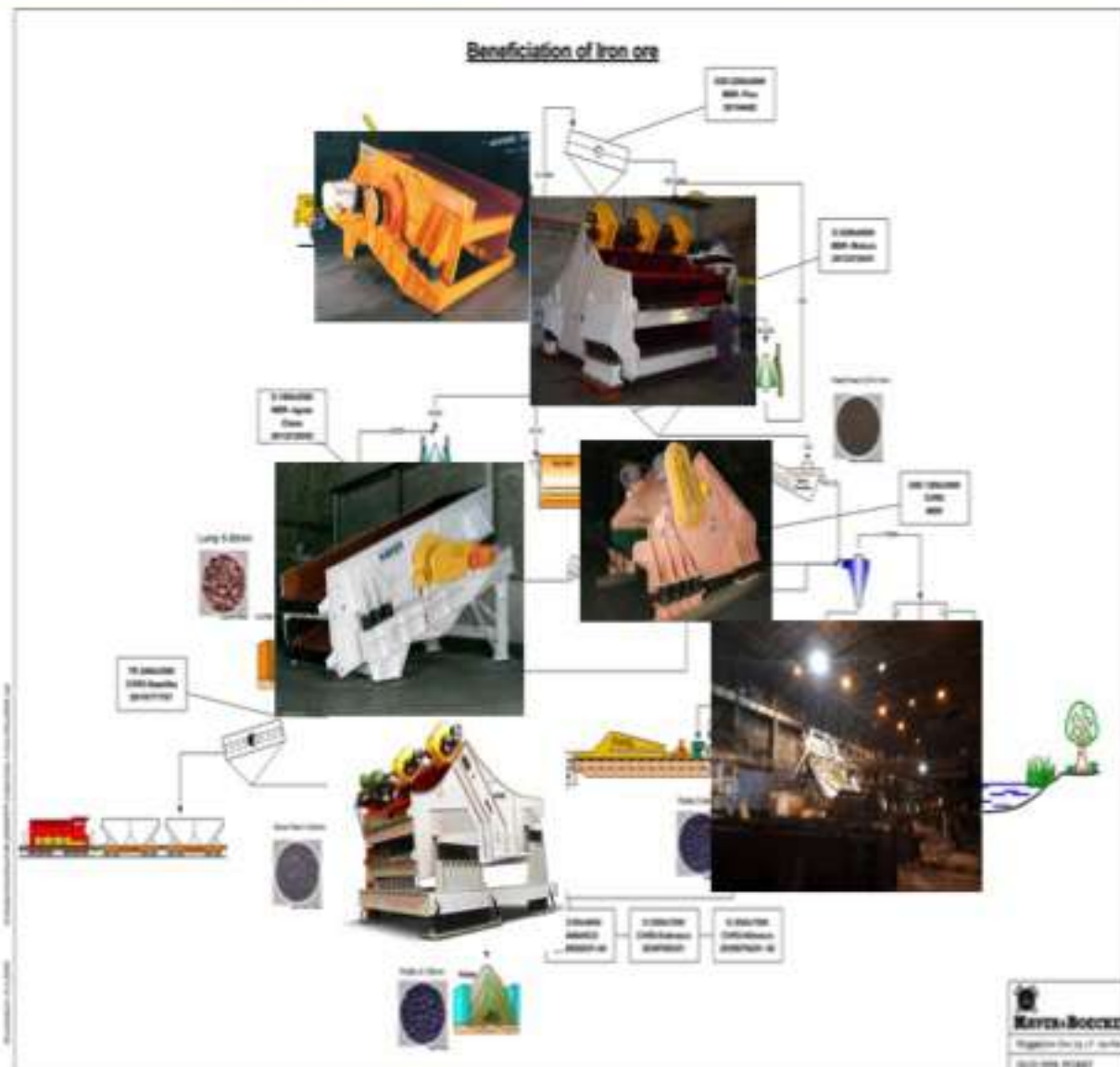


ODER



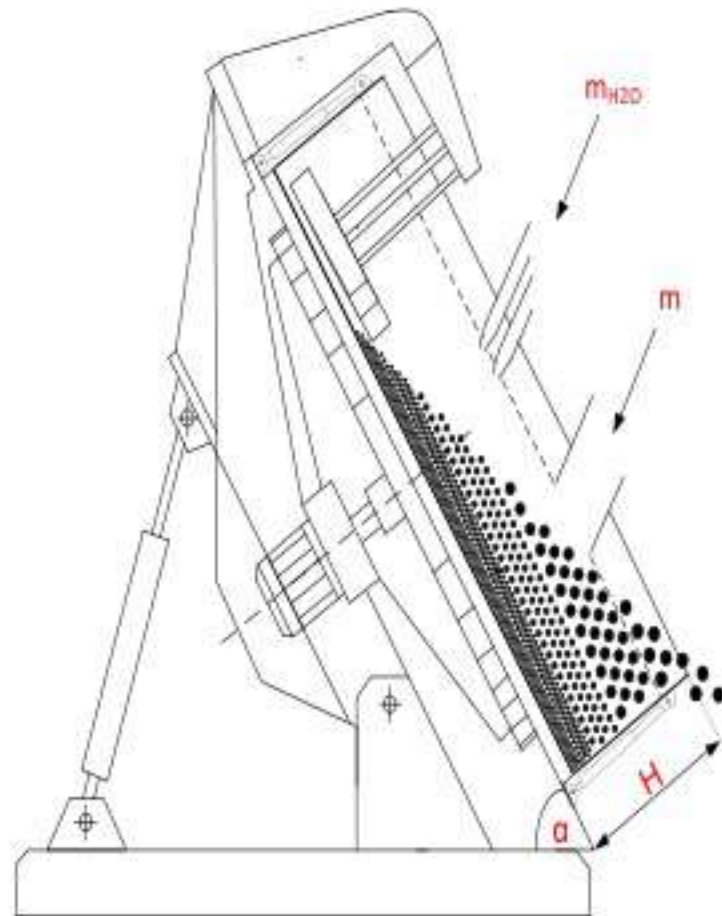
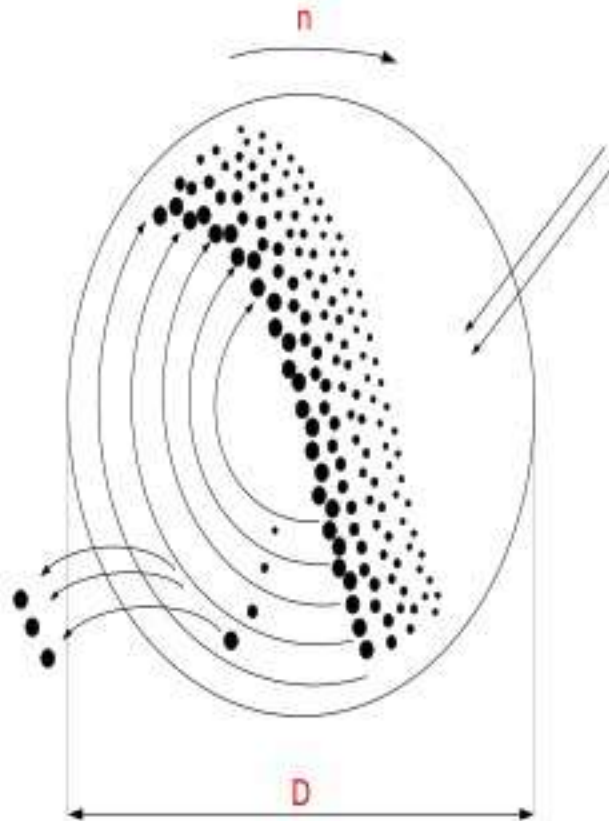


General Iron Ore Beneficiation Process



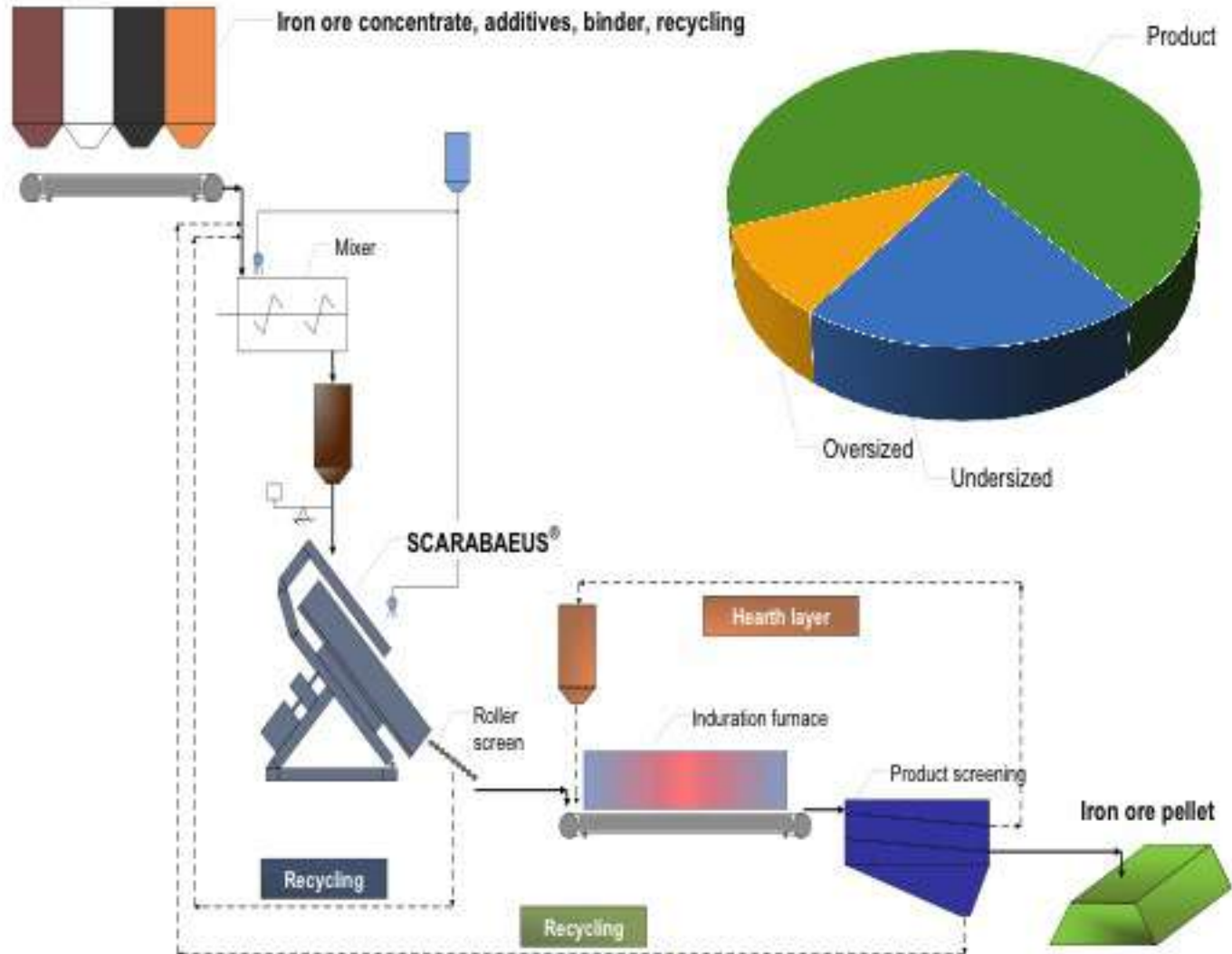


Basics of Pelletizing



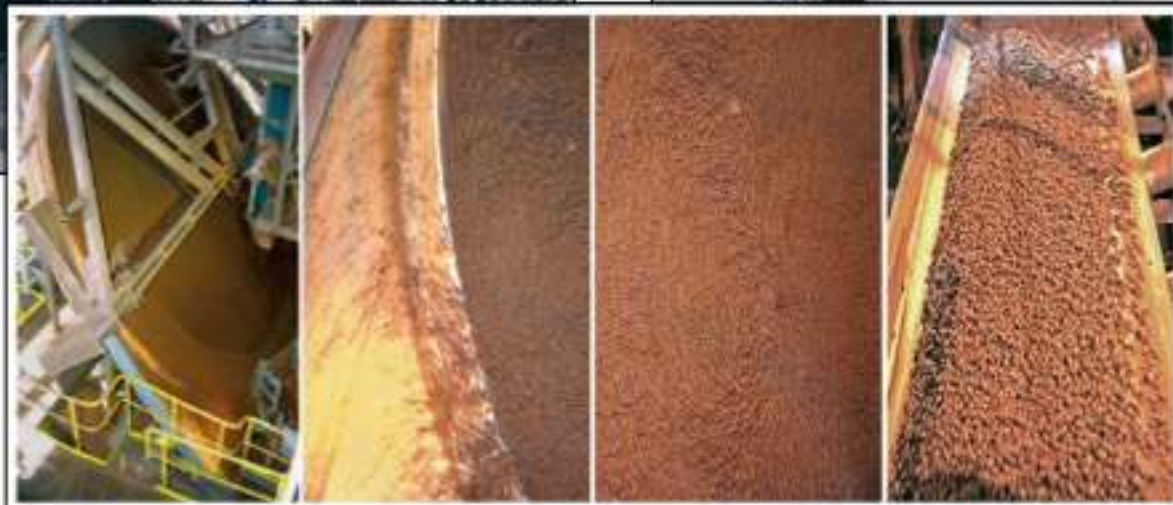


Iron ore pelletizing process





Experience in Pelletizing of Iron Ores





Experience in Pelletizing of Iron Ores

Diameter:	7500 mm
Rim height:	400 ... 900 mm
Total mass:	45 ... 55 t
Capacity:	approx. 150 t /h
Product:	approx. 70 %
Recycling:	approx. 30 %
Inclination:	40 ... 65 °
Rotational speed:	1 ... 10 rpm
Installed Power:	185 ... 255 kW





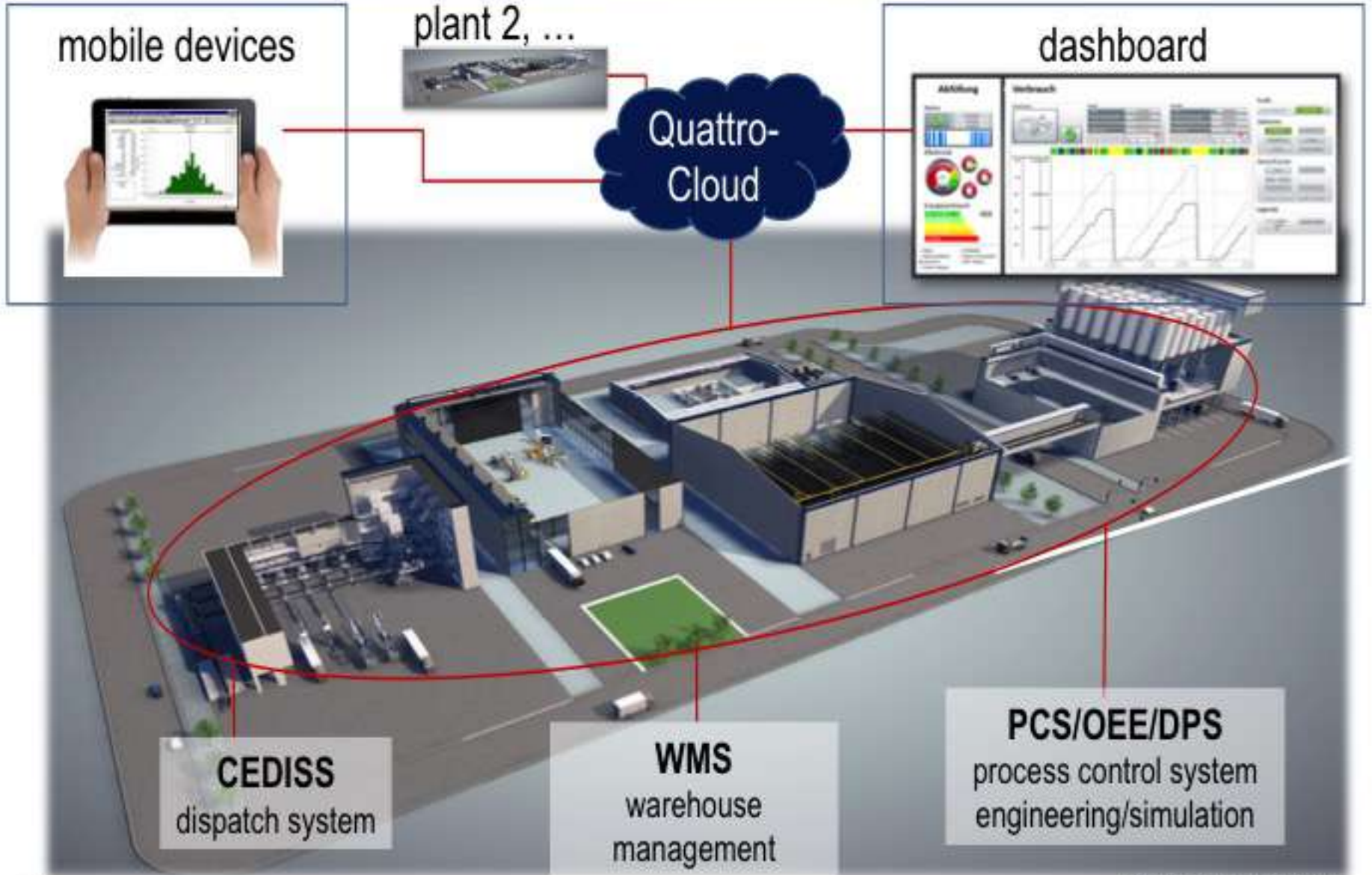
Experience in Pelletizing of Iron Ores

Diameter:	3600 mm
Length:	11000 mm
Total mass:	35 ... 60 t
Capacity:	approx. 400 t /h
Product:	approx. 25 %
Recycling:	approx. 75 %
Inclination:	0 ... 10 °
Rotational speed:	1 ... 15 rpm
Installed Power:	120 ... 250 kW





HAVER AUTOMATION





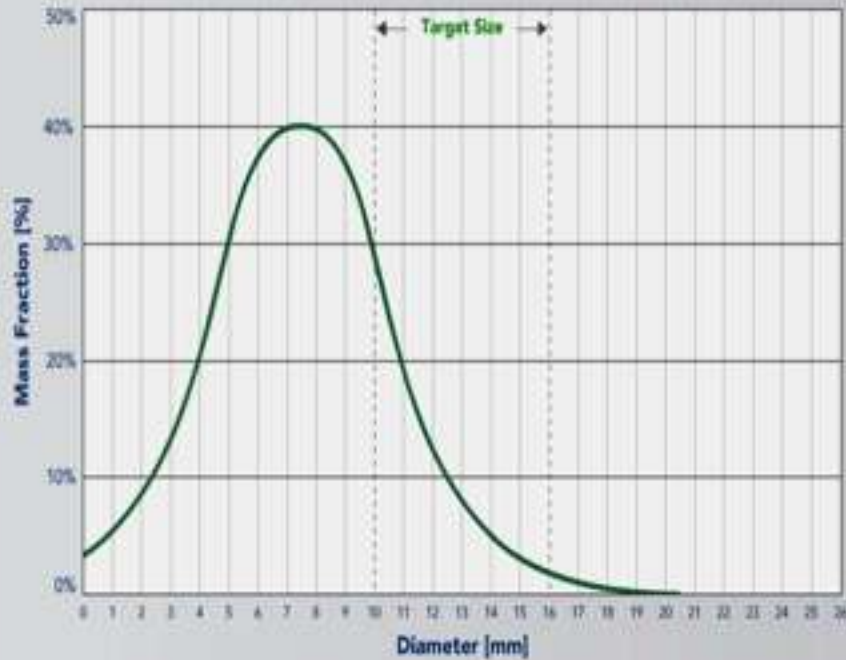
The SCARABAEUS® 7500

EFFICIENT PRODUCTION OF IRON ORE PELLETS





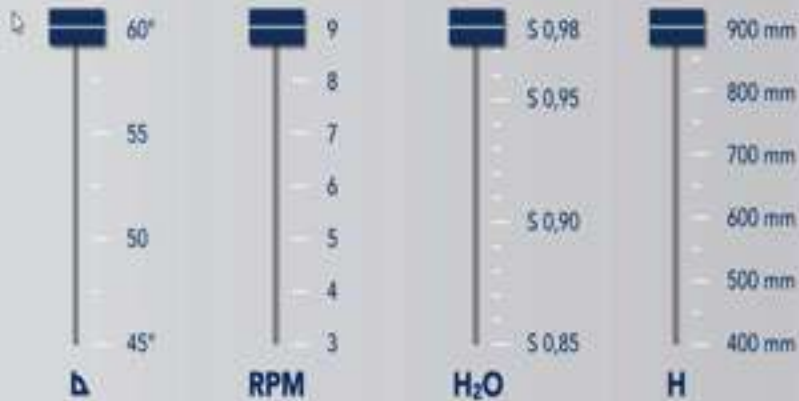
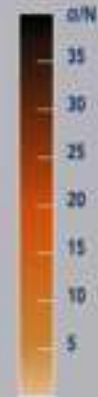
The SCARABAEUS® 7500



HAVER & BOECKER



7,65 mm





Benefit 1: Improved product quality

- The Scarabaeus® process creates higher quality pellets, which can be sold at better prices due to significantly tighter pellet size distribution and a higher iron ore content.
- The Scarabaeus® pelletizing disc gives the operators a full range of influencing parameters by the machine itself.
- Desired pellet quality could be achieved by changes of machine parameters, no longer only by addition of more and more binders and additives.





Benefit 2: Increased product output

- The Scarabaeus® process generates higher tonnages by minimizing the material return rates and avoids double processing of over- or undersized pellets due to automatic machine parameter adjustments, which can also adapt to varying material property fluctuations in the feed material.
- The Scarabaeus® pelletizing disc creates possibilities to react quickly to material fluctuations in the feed material by self-adjustment of rotational speed, side wall height, inclination, capacity and water addition.
- The outcome is an increased product output by reduced over- and undersized pellets.
 - standard BF-Pellet production: increase of the production rate by more than 30 % is possible
 - standard DR-Pellet production: increase of the production rate by up to 50 % is possible





Benefit 3: Reduced CO₂ emissions

- The Scarabaeus® process creates pellets so high in quality that they can be utilized for the direct reduction process. This in return can create enormous CO₂ emission savings, thus minimizing the mine's impact on the environment.
- The Scarabaeus® pelletizing disc and the Scarabaeus® process control are the tools to produce a tight pellet size distribution.
 - The specifications of iron ore pelletizing are no longer any more only 9 to 16 mm.
 - With these tools, even specifications of 10 to 14 mm possible.



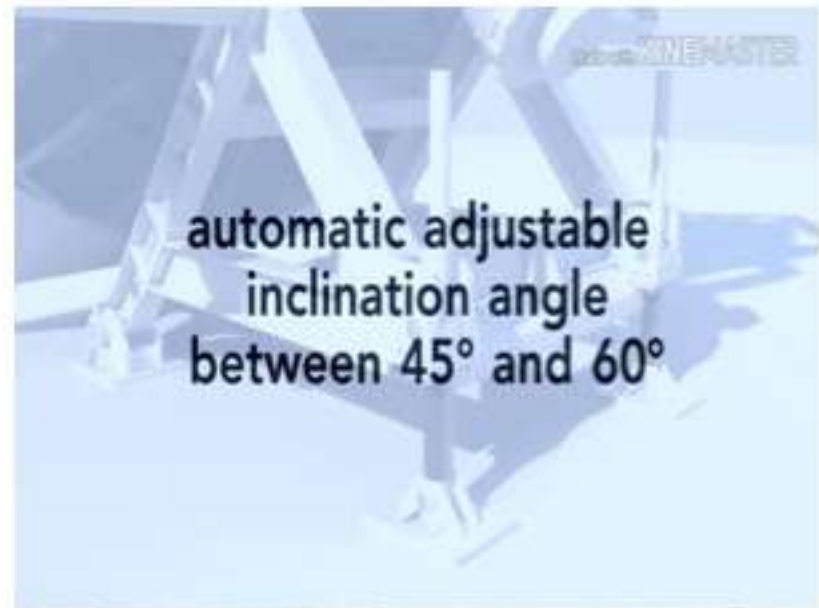


The SCARABAEUS® Pelletizing Disc

- Stepless rotary speed adjustment during operation
- Automatic inclination adjustment during operation
- Automatic adjustment of the sidewall height

The SCARABAEUS® Pelletizing Process

- Completely automated inline analysis system
- Measuring of pellet size distribution of unconsolidated material on the conveyor belt
- Real time measurement without disrupting the production
- Continuous target/actual comparison of key performance indicators based on Expert system
- Automatic readjustment of process parameters



Commissioning and Optimization





Commissioning and Optimization

Pellet quality – request by customer

- 6 mm	$\leq 20\%$
10 - 13,1 mm	$\geq 60\%$
10 - 14,7 mm	$\geq 70\%$
+16 mm	$\leq 10\%$





Industrie 4.0: Was steckt eigentlich dahinter?

Es gibt keine klare Definition am Markt, wichtige Bestandteile sind:

- Nicht der Computer ist die zentrale Technologie, sondern das Internet
- Vernetzung über Unternehmens- oder Ländergrenzen hinweg
- Das Internet der Dinge, Maschine-zu-Maschine-Kommunikation und Produktionsstätten, die immer intelligenter werden

„Die vierte industrielle Revolution“ hat begonnen...





Industrie 4.0: Was steckt eigentlich dahinter?

...wie hat HAVER & BOECKER diesen Auftrag verstanden?

„Indem wir Datentransparenz in dem Aufbereitungsprozess unserer Kunden durch die Vernetzung der Maschine mit dem Internet of Things sichern, schaffen wir nicht nur die intelligente Maschine, sondern machen den Betreiber zu dem Dirigenten seiner eigenen Wertschöpfung.“ (Herr Johann Soder)



QUAT²RO Remote Service - Schlüsselfunktionen





Was ist die Zukunft der Aufbereitung 4.0?

Maschinenzustände sind immer in Echtzeit verfügbar

Abweichungen werden frühestmöglich erkannt und automatisch mitgeteilt

Die Wartung und der Service wandelt sich von reaktivem Vorgehen in Maßnahmen, die durch automatische Analysen der vernetzten Datenquellen, gesteuert werden.

Zusätzlich werden die gleichen Daten zur selbstregelnden Anlagen genutzt werden.





Prozess-Know-How – erprobte Erfahrung – in Labor und Produktion!



Machbarkeitsstudie



Pilotstudie



Prozessskalierung

- Entwicklung und Optimierung von Prozessen, Maschinen und Anlagen
- Betrachtung des gesamten Pelletierprozesses
 - Rohmaterialvorbereitung, Binder und Additive
 - Metallurgische Analyse
- Maßgeschneiderte Prozesse als Grundlage für einen energie- und ressourcenschonenden Produktionsprozess!
- Transformation Ihrer technischen Anforderung zum wirtschaftlichem Vorteil.



5004 HAV

HAVER & BOECKER NIAGARA 1000

HAVER
NIAGARA



Contact us!

www.haverniagara.com

HAYER ENGINEERING GmbH

Associated Institute of TU Bergakademie Freiberg

Halsbrücker Str. 34

09599 Freiberg

www.haverengineering.de

Tel. 0049 3731 419700

