

# Economics and Efficiency in Sand Reclamation

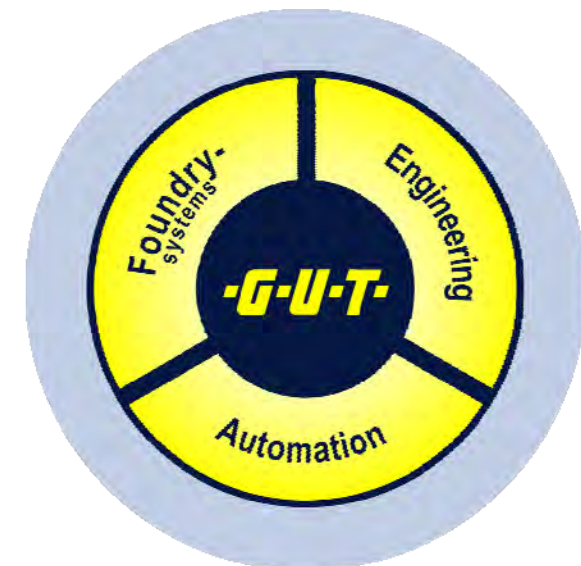


MCTS Colloquium  
09.2015

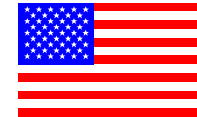
Dr. Hartmut Polzin – TU Freiberg  
Jens Müller-Späth – G U T



- **about G U T**
- Nobake Sand Reclamation in general
- Plant Capacity Design - less can be more
- Sand Transportation – proper Plant Engineering required
- Automatisisation and Energy Saving – „low hanging fruits“
- Chromite Separation – good example on cost savings



... our name is our program



G = **Giesserei** = Foundry

U = **Umwelt** = Environment

T = **Technik** = Technology



... certified quality according DIN EN ISO 9001:2008

Our topic: foundry sand



Consulting, Engineering, Equipment and  
Service for No-Bake Foundries

# Engineered solution – fit to purpose



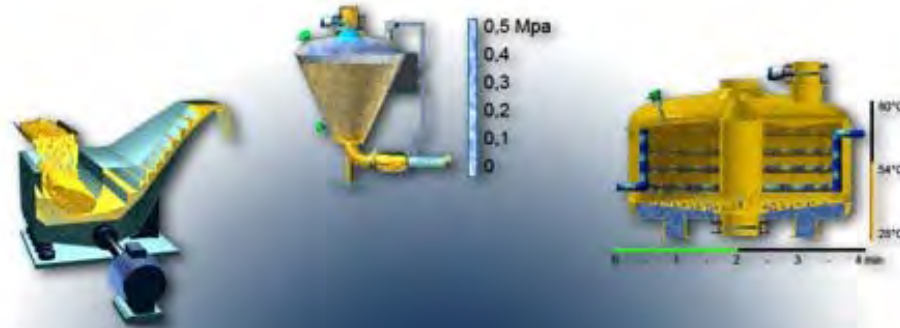
G U T... from consulting and engineering to a turn-key plant ... we design your success



## Pneumatic Sand and Dust Conveyors

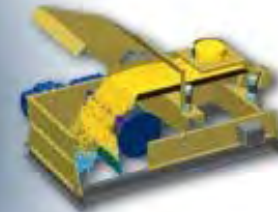
Vibratory

Lump crushers



Sand cooler – heater - classifiers

Shake-out Devices



Sand Separation Plants (Chromite out of Silica)

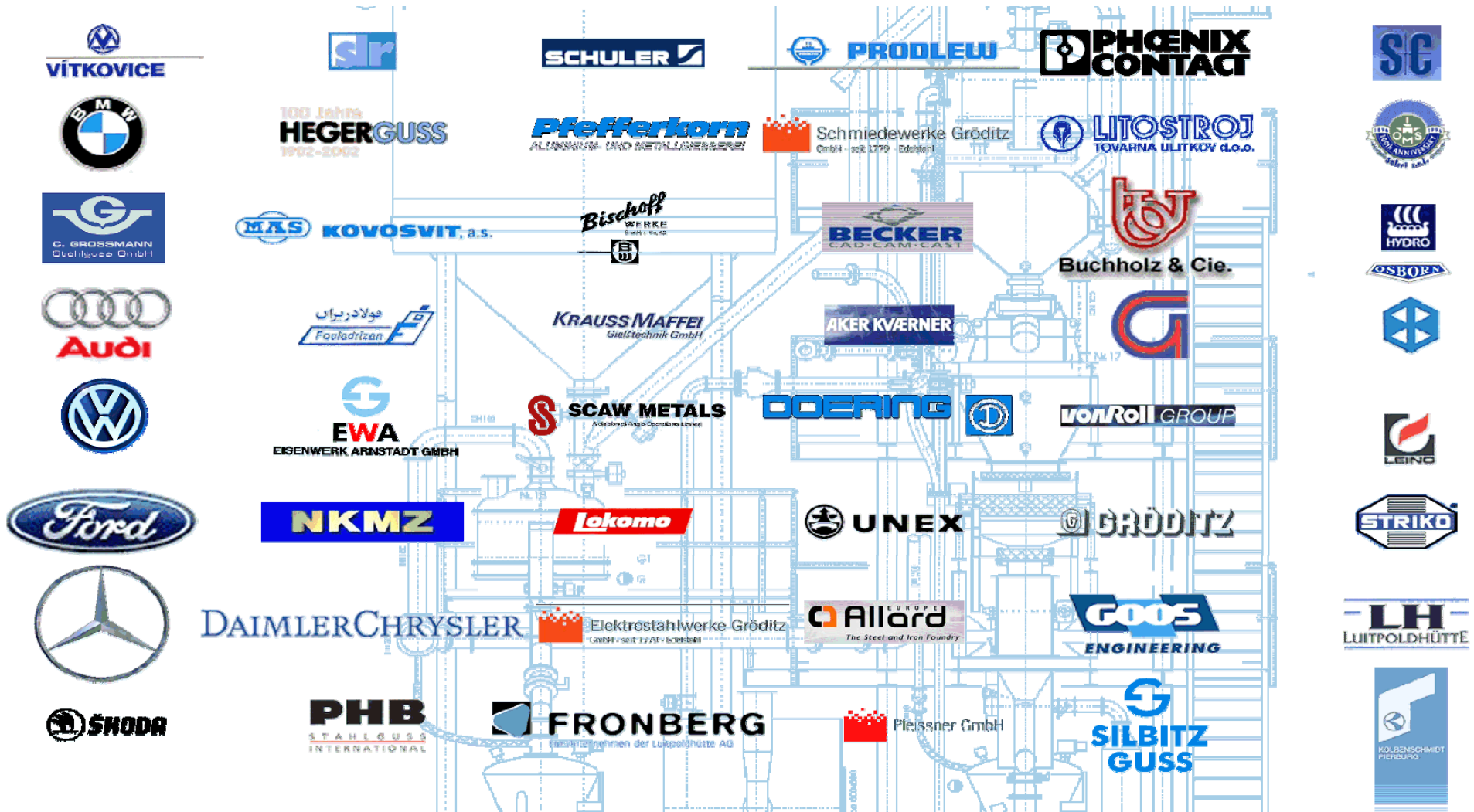
Sand Reclamation (mechanical, pneumatical)



Nobake Moulding Lines

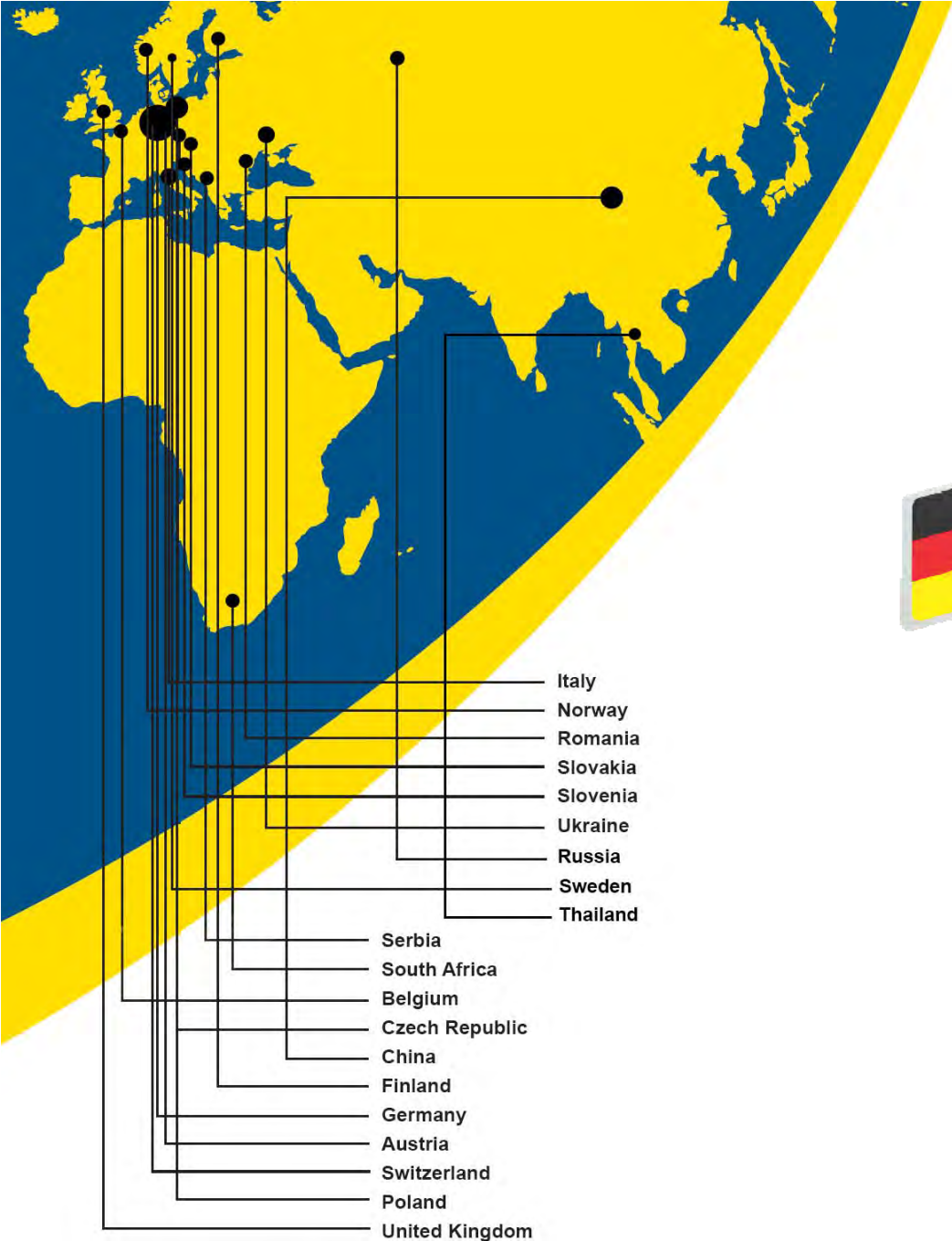


Extract from reference list ... more than 100 plants



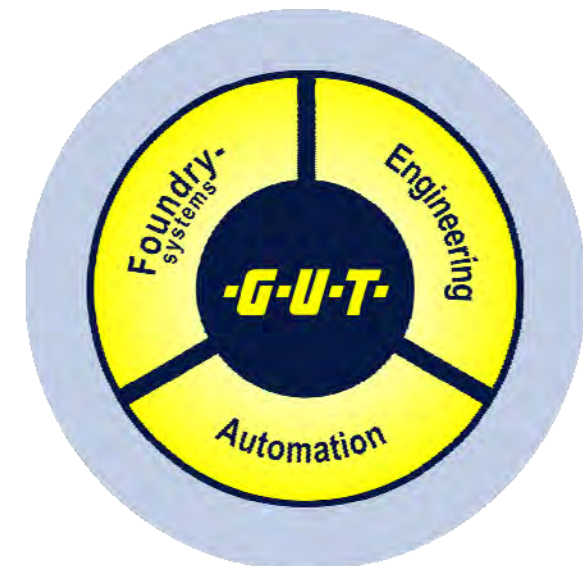
... and many other valued customers

# Our location in Germany and our plants worldwide





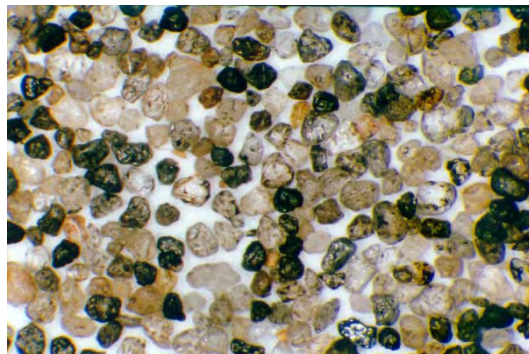
- about G U T
- Nobake Sand Reclamation in general
- Plant Capacity Design - less can be more
- Sand Transportation – proper Plant Engineering required
- Automatisisation and Energy Saving – „low hanging fruits“
- Chromite Separation – good example on cost savings



# Quality parameters of reclaimed foundry sand

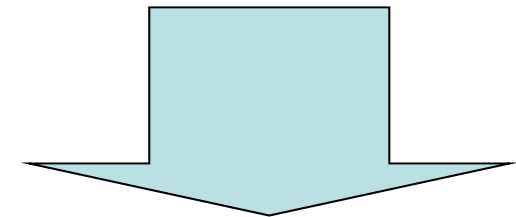


- low dust content
- constant sand temperature
- preferably only sand – no others
- always similar grain size distribution
- L.O.I. constant and preferably low
- similar surface structure of sand grains



**constant  
sand quality**

- reproducible  
processes



- high quality  
moulds and cores

# Reclamation technologies

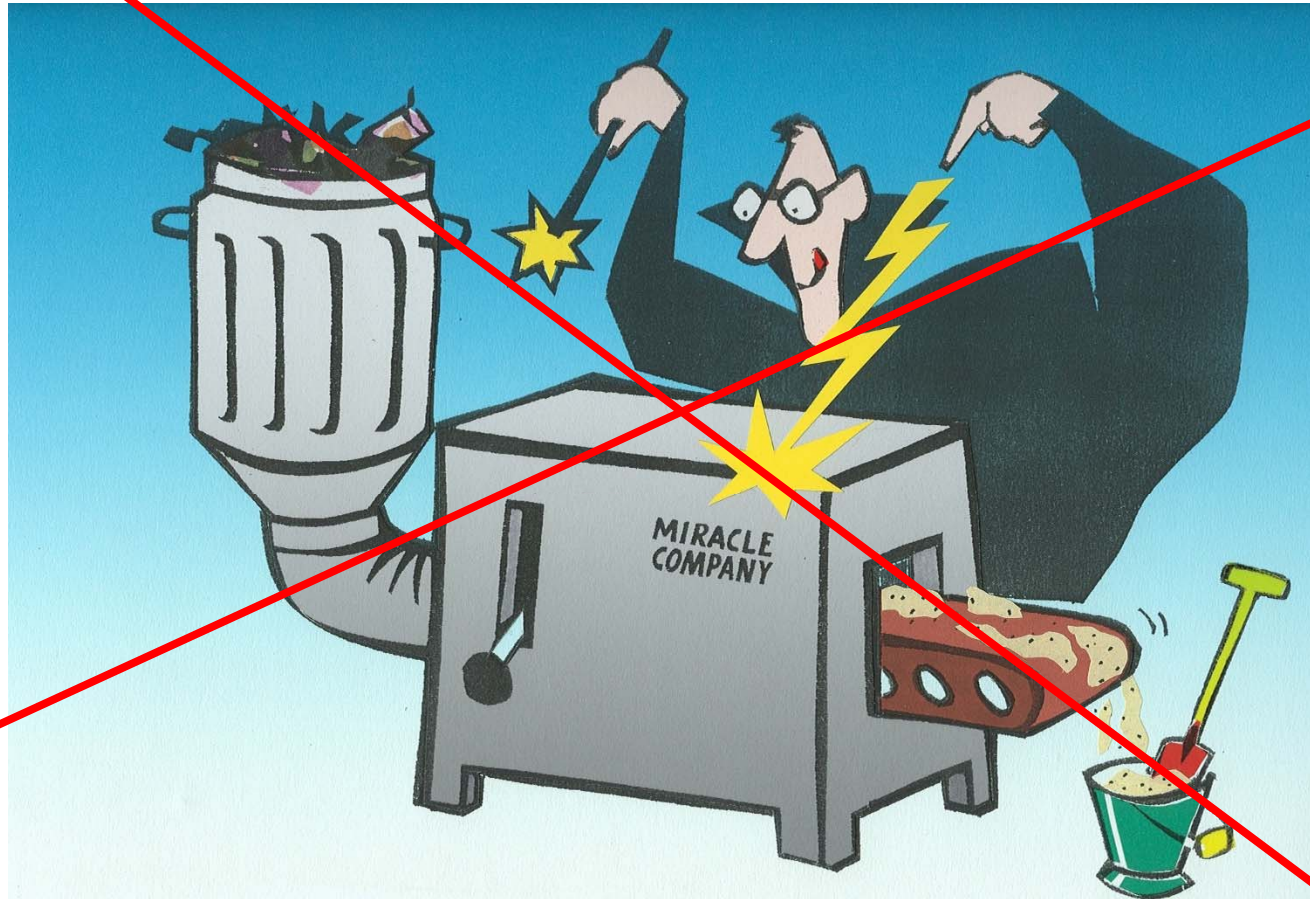


„reclaim only as much as necessary – not as much as possible!“

↙  
= L.O.I. reduction made from machines

	standard sand recovery	pneumatical reclamation	secondary attrition	thermal reclamation
L.O.I	0	+	++	++
loss of sand	++	0	-	++
investment	+++	+	0	--
sand costs	+++	+	0	--

# Miracle sand reclamation system ...

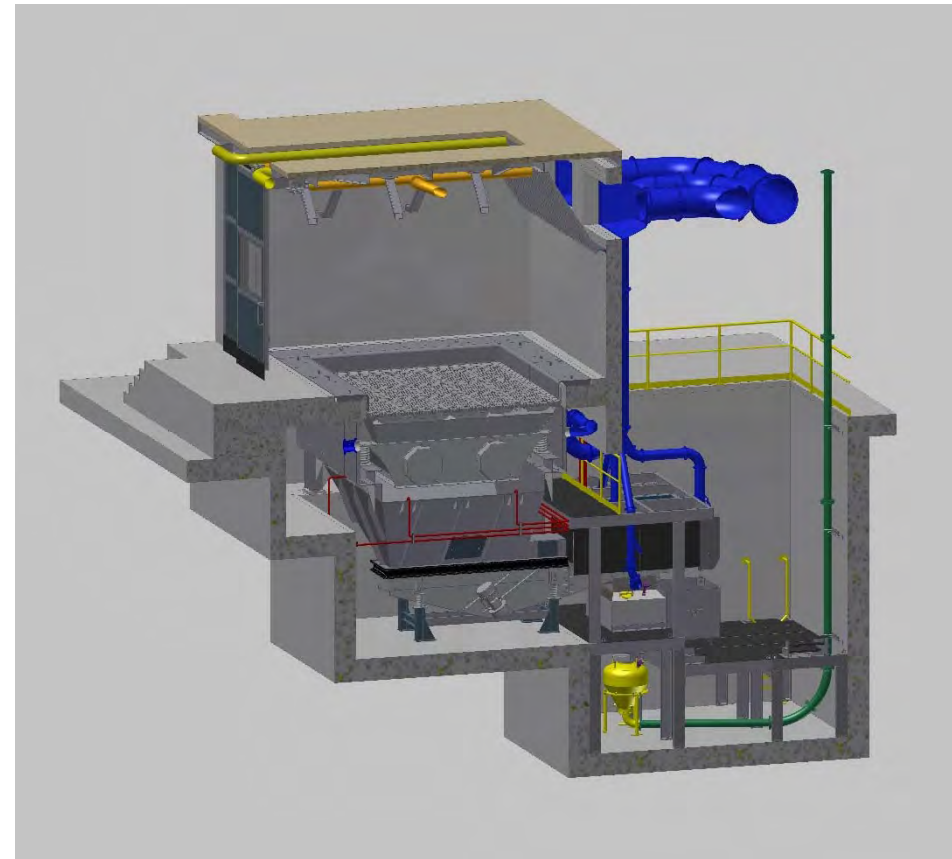
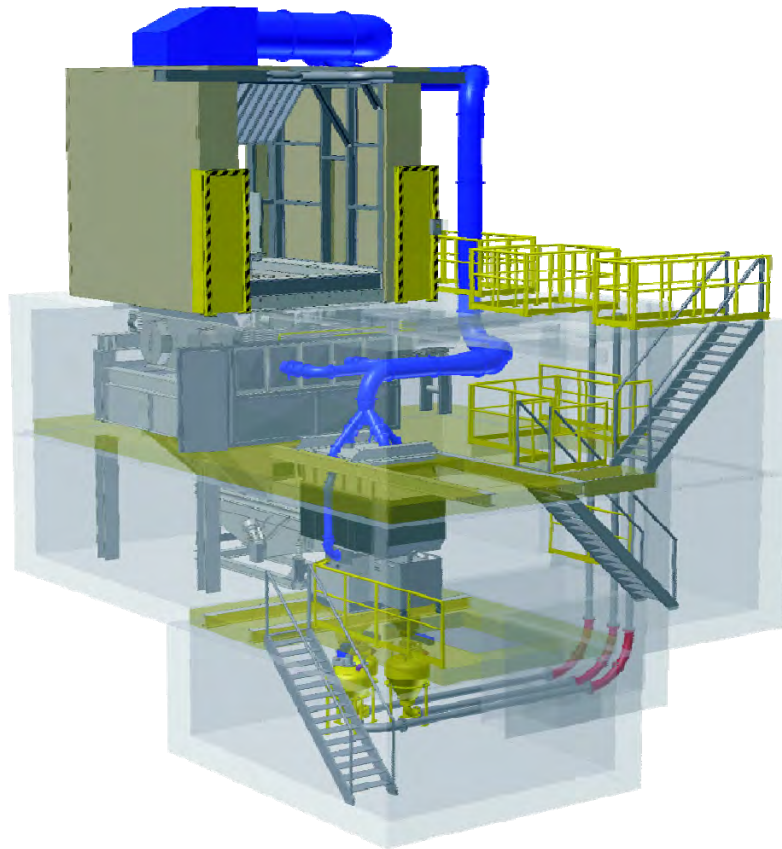


origin:

**GEMCO**<sup>®</sup>  
CAST METAL TECHNOLOGY

➤ ... sorry – we donnot have – but good systems for various applications

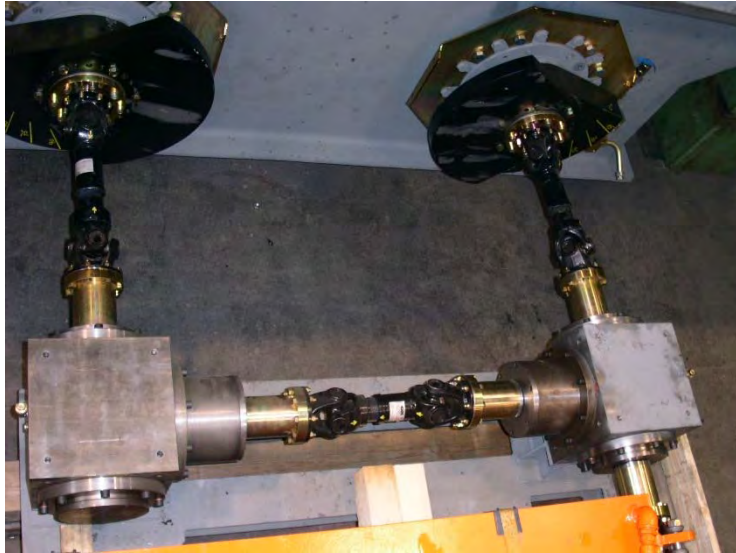
# Shake out – 3 D Engineering



# Shake out with sound isolating cabin



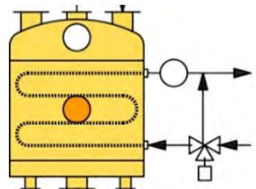
# Shake out



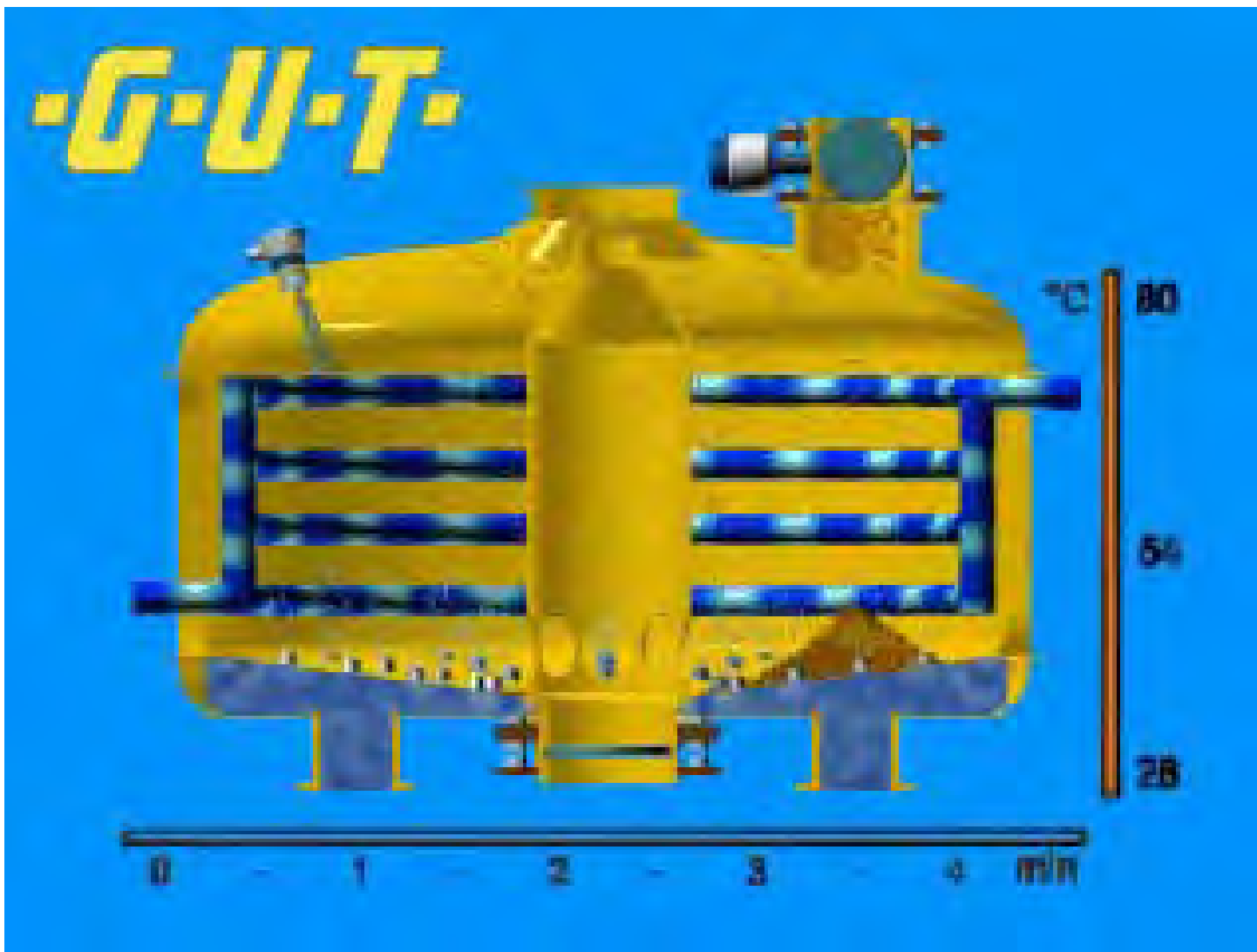
... in case shake out grid is to small !!!

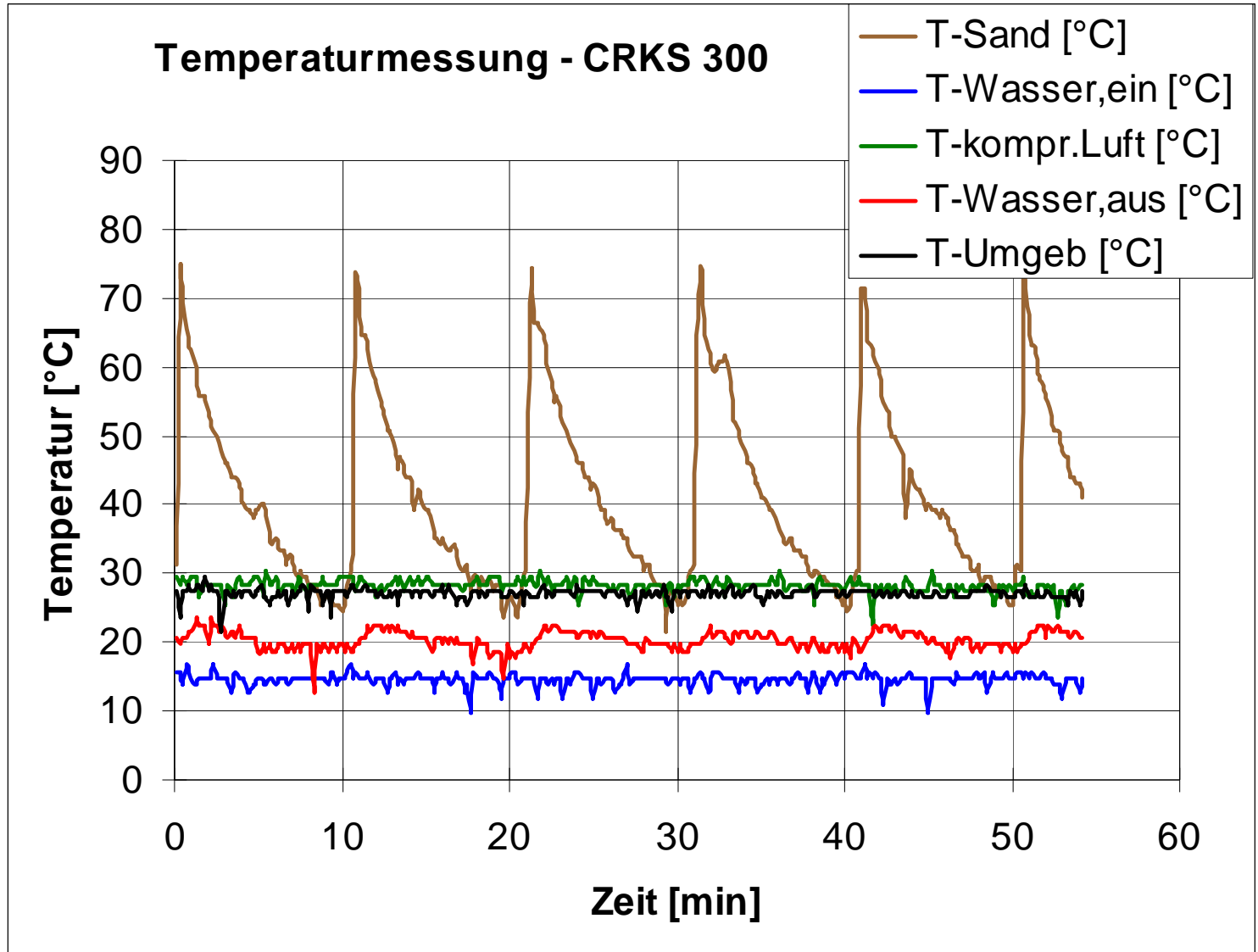






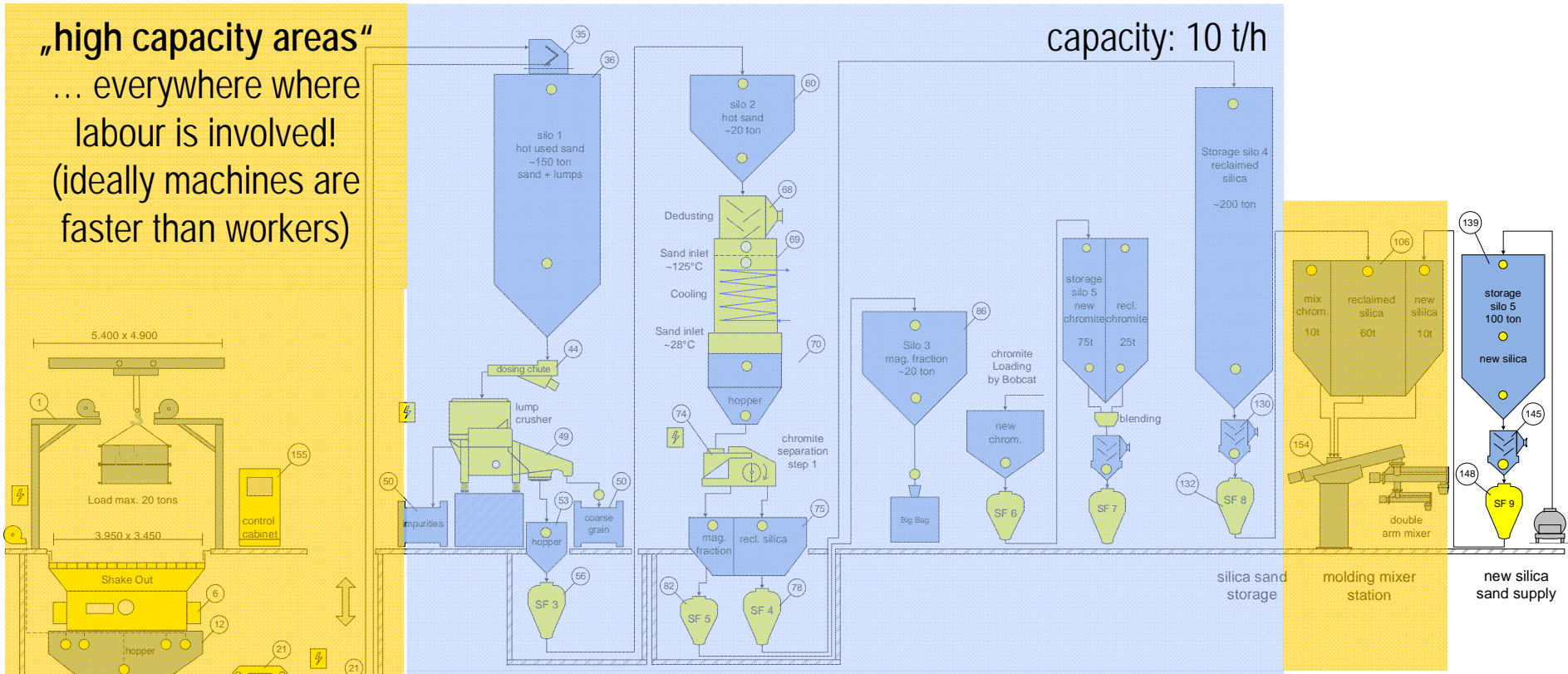
CRKS: function





# Sandbehandlungsstationen. Entstauben, kühlen oder erwärmen.





„high capacity areas“  
 ... everywhere where  
 labour is involved!  
 (ideally machines are  
 faster than workers)

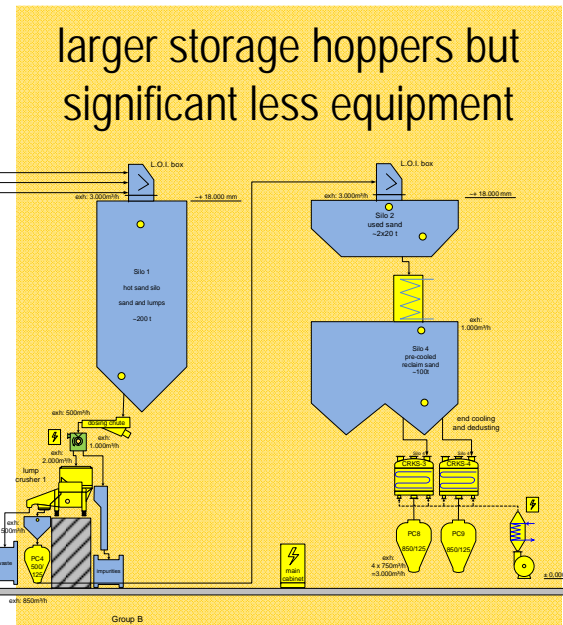
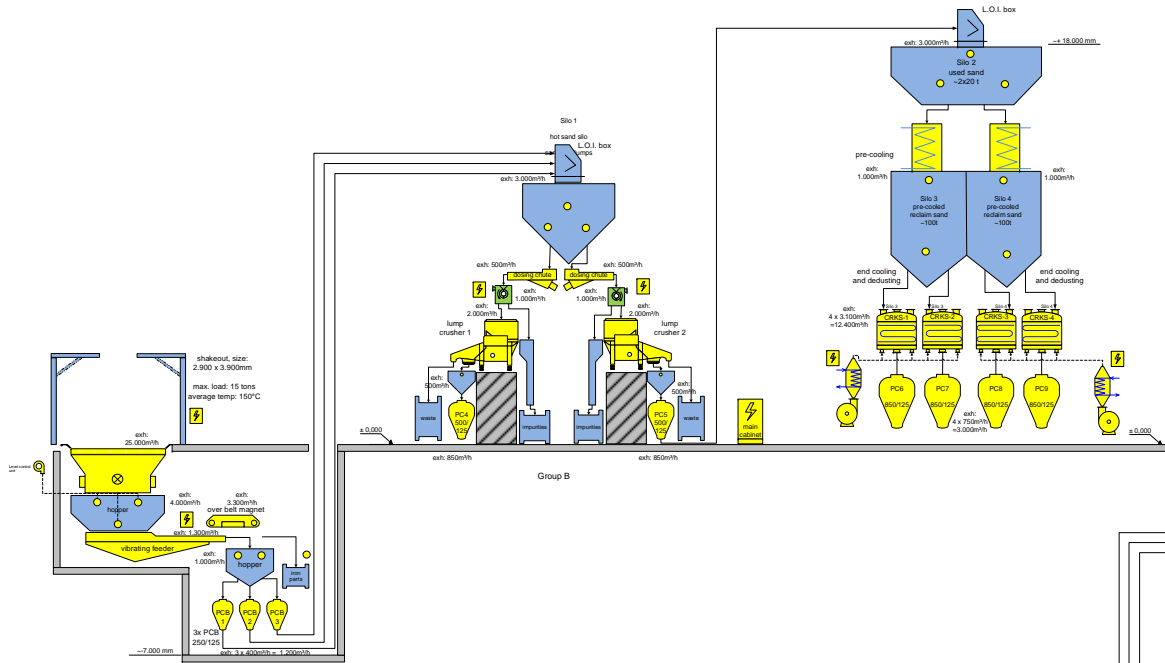
capacity: 10 t/h

capacity: 30 t/h

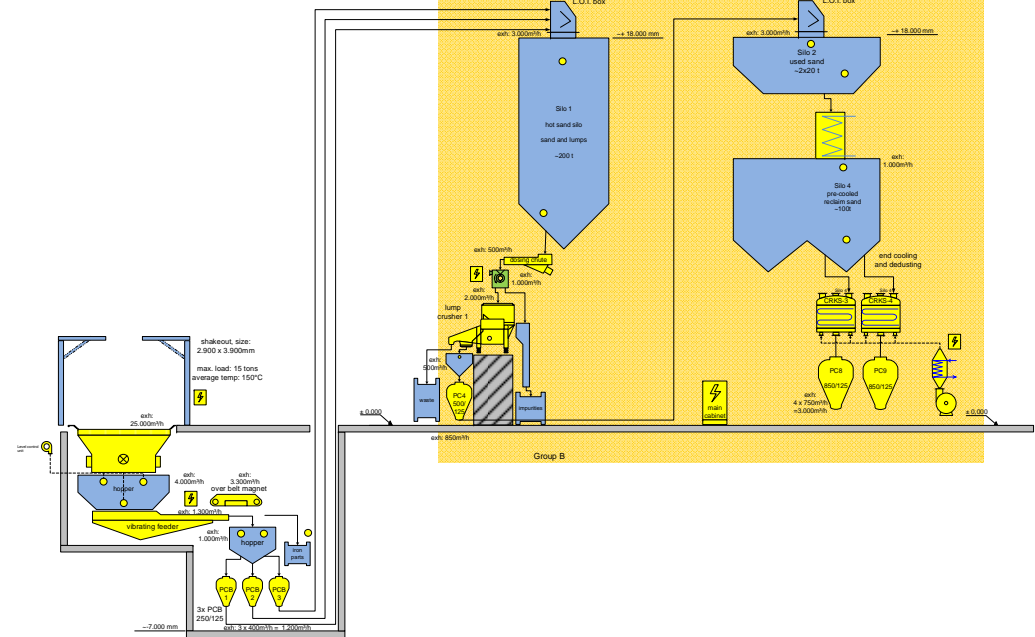
„lower capacity areas“

- machines runs 24 hours in „automatic mode“
- less capacity, but storage hoppers required to balance different requirements during a working day
- lower investment costs
- lower energy consumption

# Plant Capacity Design



- Potential savings on:
- Investment costs
  - Filter plant capacity
  - Water re-cooling plant capacity
  - Air compressor capacity



... saves investment costs  
(less or smaller sand reclamation machinery)

... saves running/operating cost, because of

- lower energy consumption
- less Maintenance costs

## Examples:

- filter plant for 40.000 m<sup>3</sup>/h instead of 60.000 m<sup>3</sup>/h
- Water Recooling Plant „only half size“ if it can operate 24 instead of 12 hours

- usually nobake foundries use a huge amount of sand for moulds and cores (in average 4-5 times more than their net casting production, 1 ton casting needs 4-5 tons of sand)
- usually sand needs to be conveyed several times in between shake out and mixers (from shake out to lump crusher, from lump crusher to cooler , ...)
- Sand transport costs are a considerably portion of total cost for sand reclamation
- Share on energy cost per ton of reclaimed sand is usually higher than amortisation

Foundry layout / Sand reclamation plant layout influences both, economy and efficiency ... „Engineering“ matters a lot !

# Sand reclamation plant with chromite separator

**-G-U-T-**  
Giesserei Umwelt Technik GmbH





# Sand reclamation and moulding area



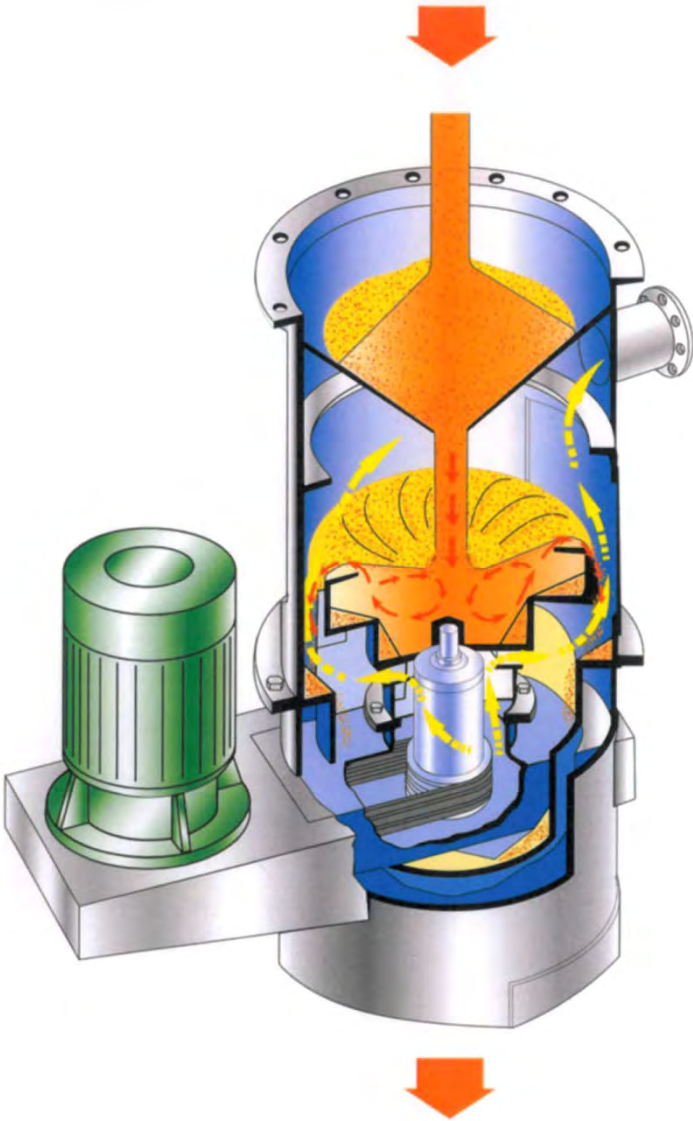
## Secondary Attrition Units ...

---



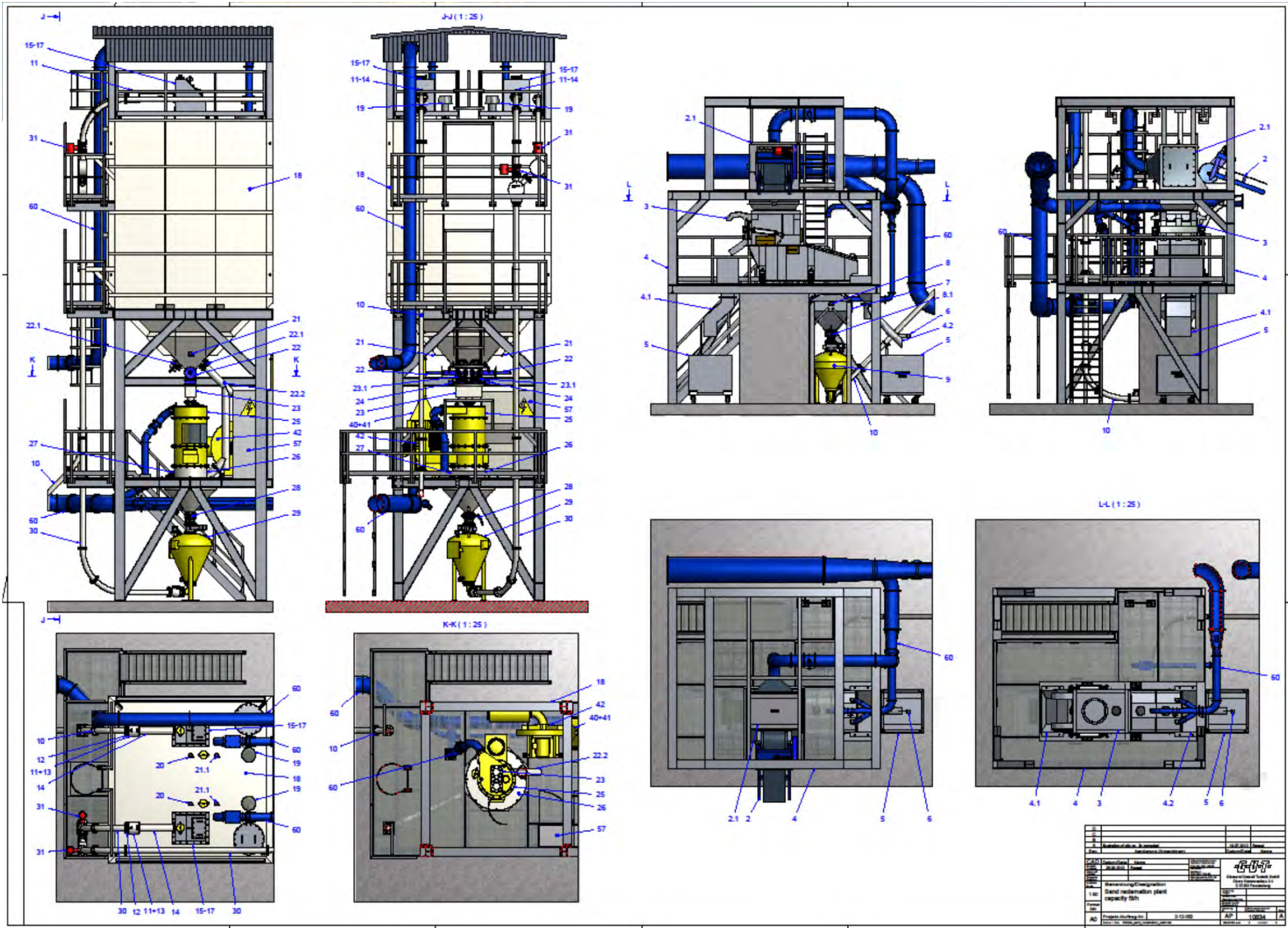
- are mostly missing in South African Foundries (and also in Germany)
- increase quality of reclaimed sand
- are much cheaper on investment and running costs than thermal reclamation
- needs minimum space
- needs only very little energy

# Rotary reclaimer - FKR (Firma Klein)



# FKR – Rotary Sand Reclaimer





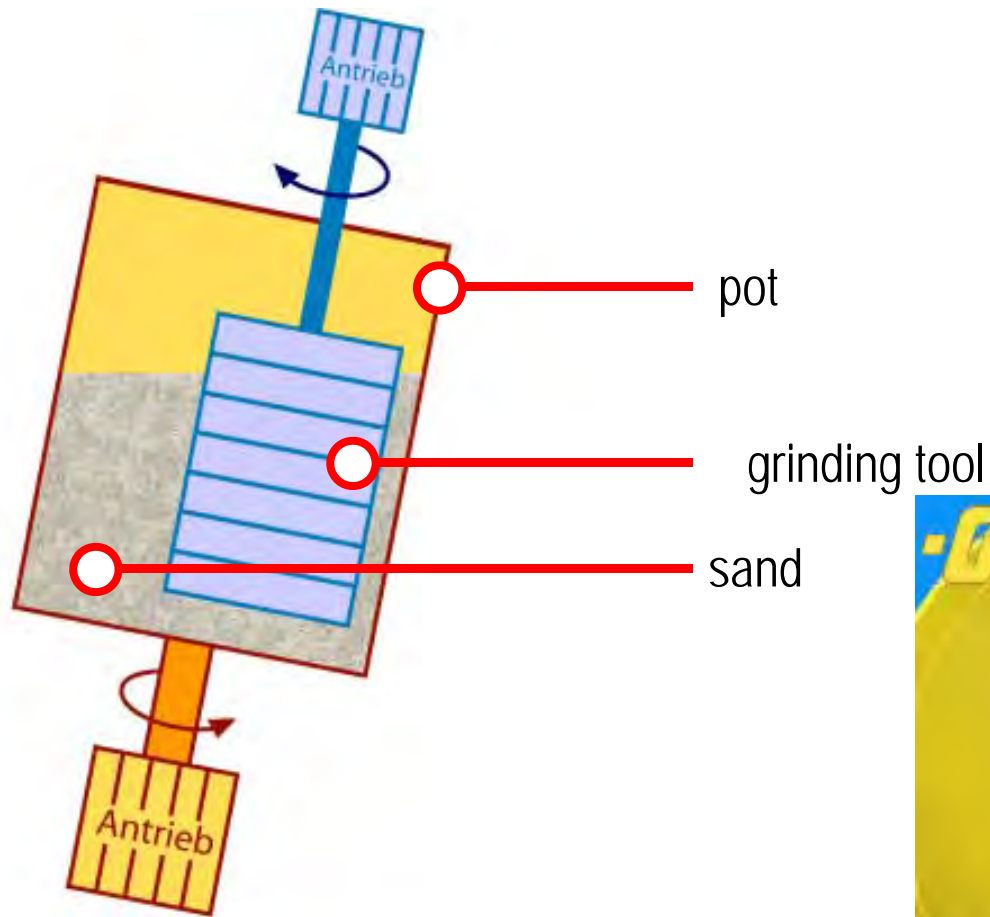
1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36
37	38	39	40	41	42
43	44	45	46	47	48
49	50	51	52	53	54
55	56	57	58	59	60

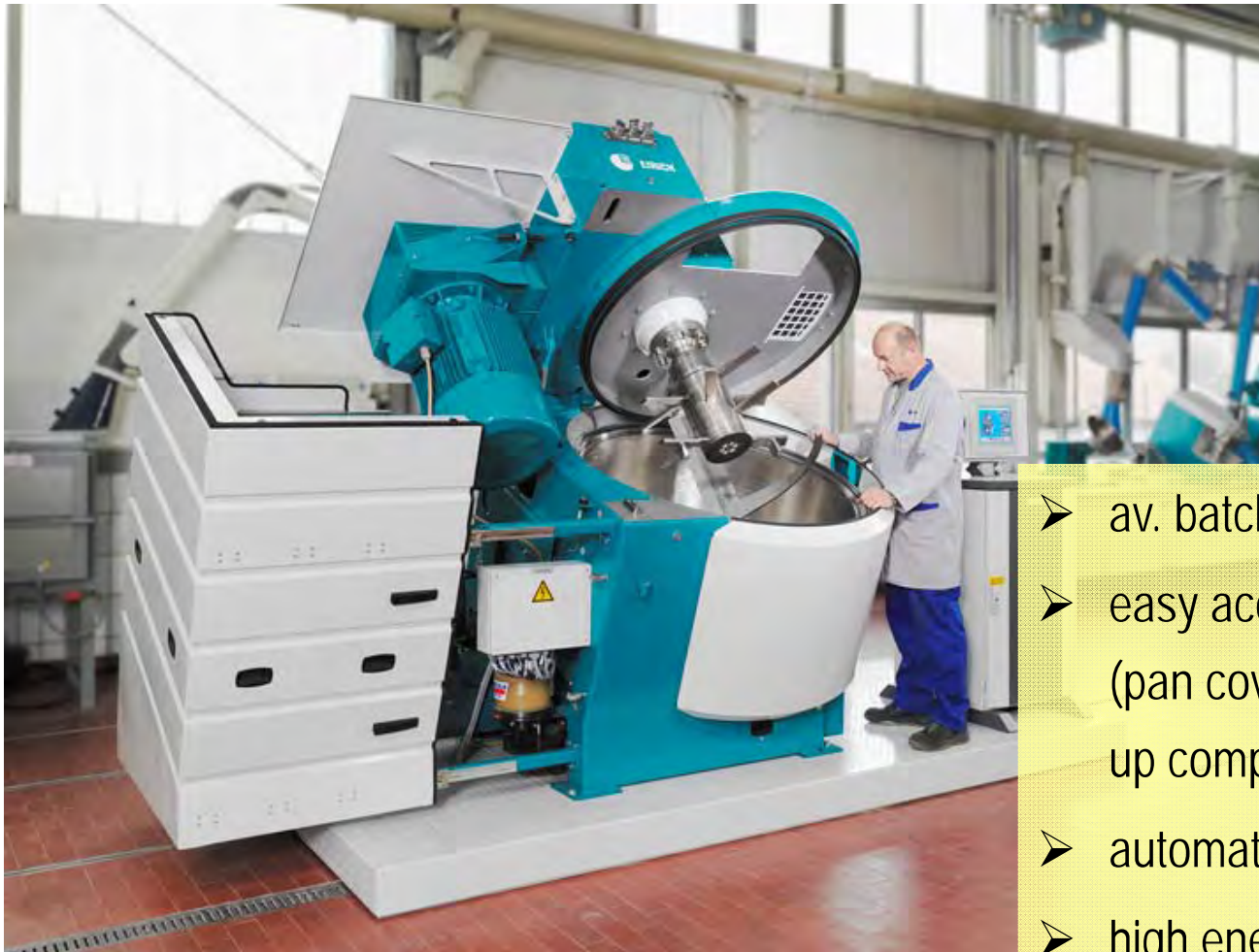
Project Name	Project No.	Scale	Revision
Client	Contract No.	Author	Checked
Design	Drawn	Approved	Date
Description		Date	
<p>Water/Wasserreinigung  Sand reclamation plant  capacity 50t/h</p>			
Project Manager	2-12-00	AP	1/0034



# Grinding reclaimer: function

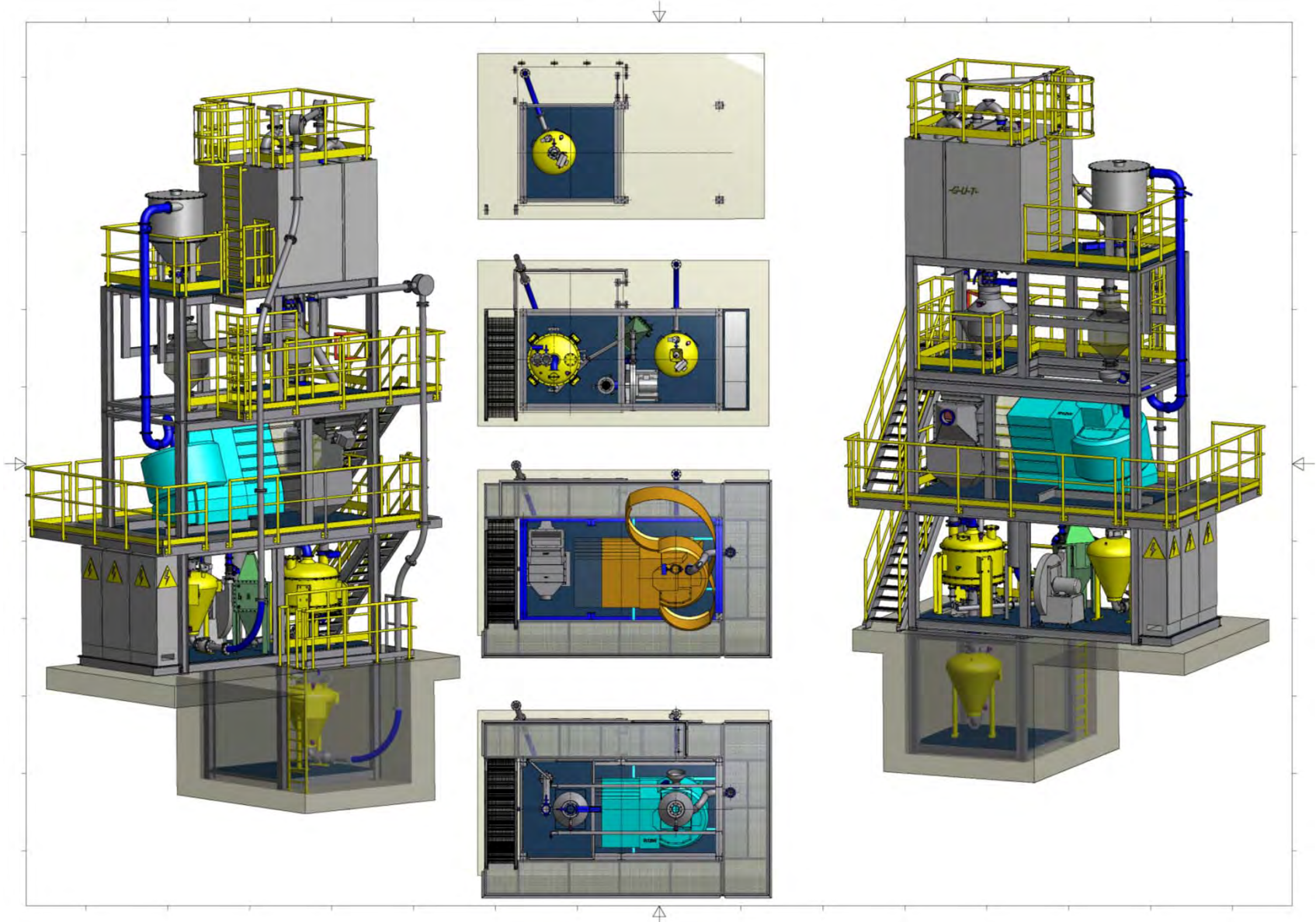


# New generation basic machine – Eirich R12W



- av. batch size: 420 kg
- easy accessibility  
(pan cover and tool can be tipped up completely)
- automatic central lubrication
- high energy input into the mix

# Single line setup – capacity: up to 3 t/h





# Mechanical intensive reclamation – Alpha Set Input Sand

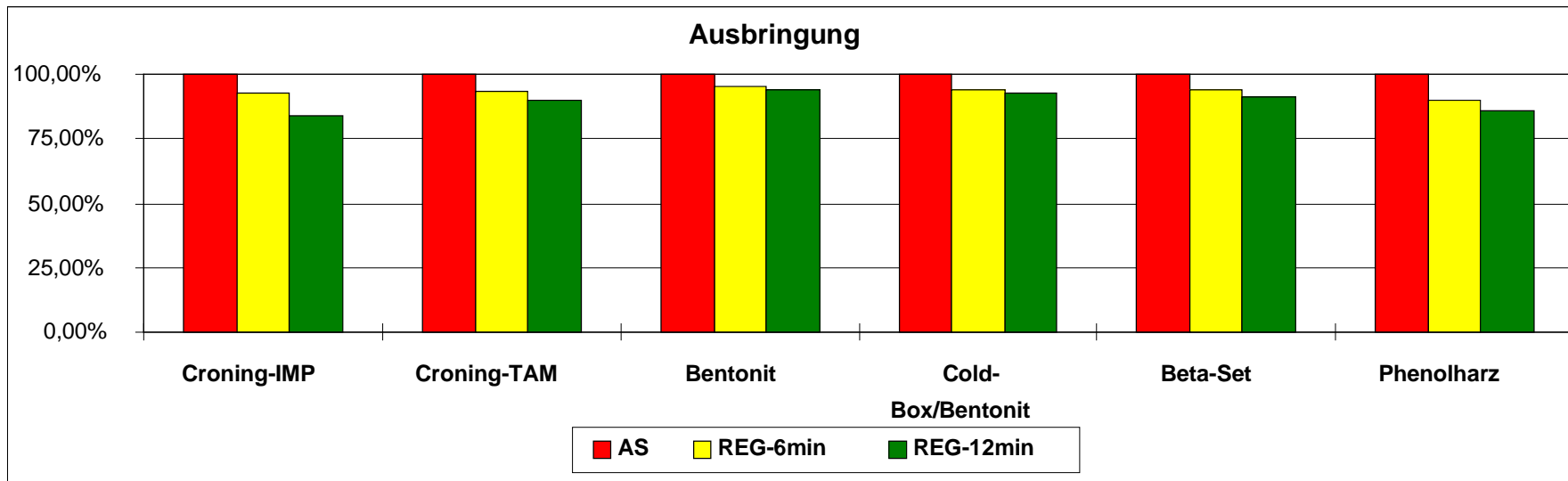
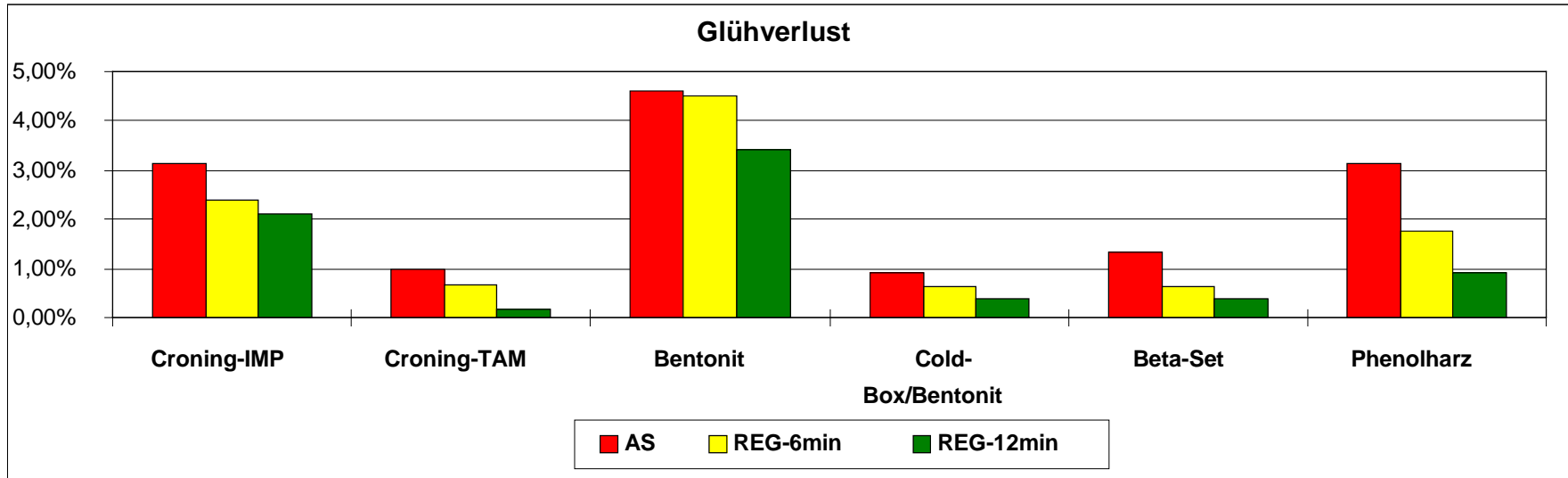


# Mechanical intensive reclamation – Alpha Set Sand



Reclaimed sand – 10 min

# Results – grinding reclaimer





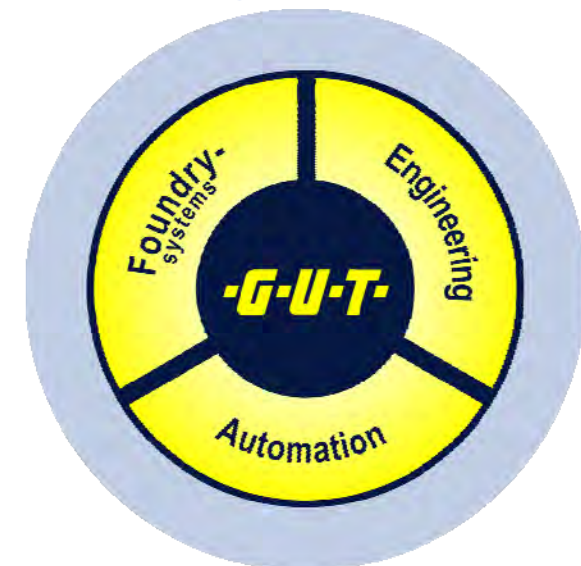
... on new cars automatic „start-stop“ of the engine has become a standard feature

... what about Sand Reclamation systems in Foundries?

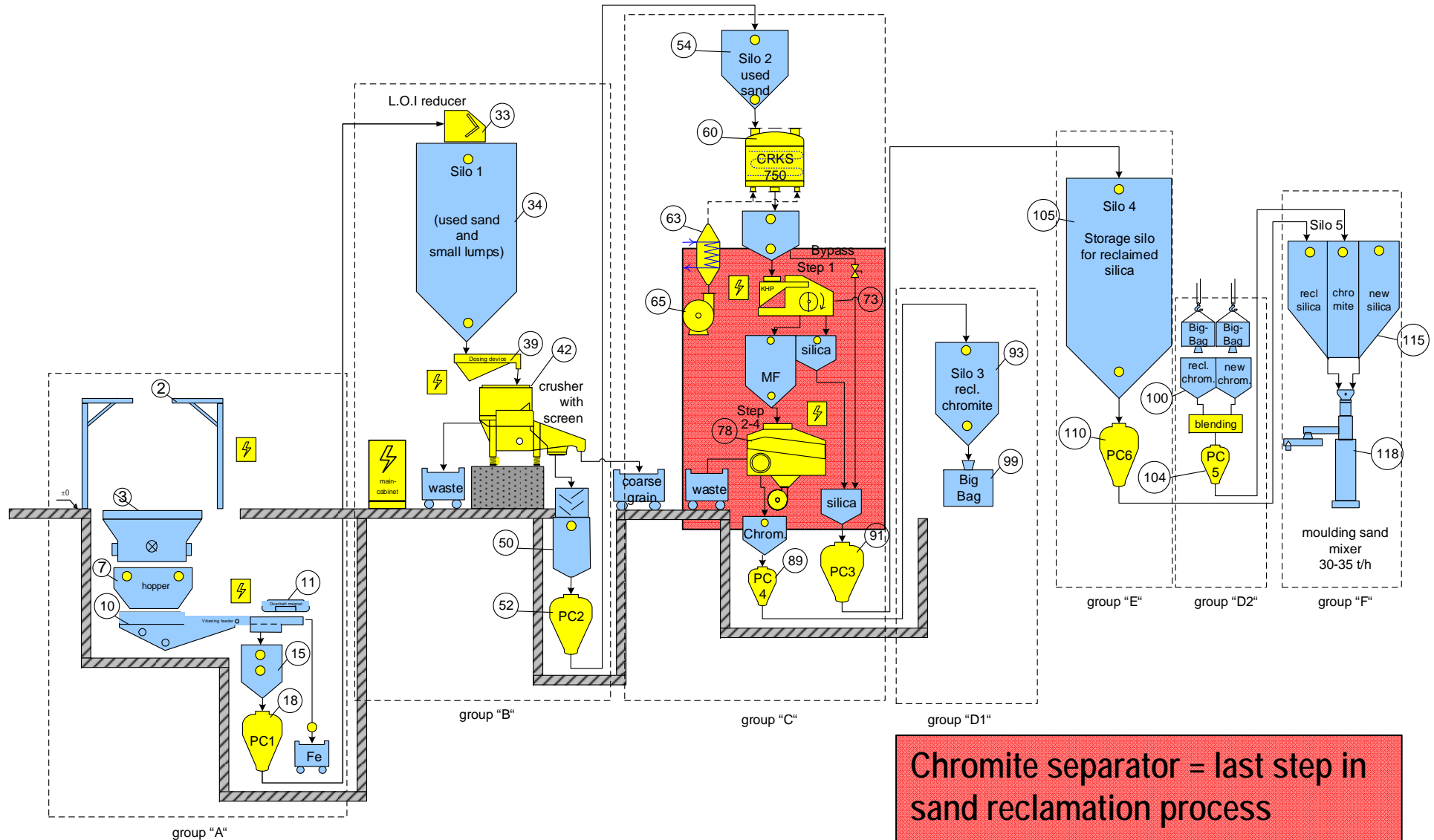
... very often many drives have only a simple „on/off“ switch – resulting in unnecessary running times

- Intelligent Plant software ...
  - ... switches unnecessary running drives off and re-starts them automatically if required, f.e.: filter and water re-cooling plants
  - ... can save easy 5-10 % of energy cost of main and auxilliary machinery

- about G U T
- Nobake Sand Reclamation in general
- Plant Capacity Design - less can be more
- Sand Transportation – proper Plant Engineering required
- Automatisisation and Energy Saving – „low hanging fruits“
- **Chromite Separation – good example on cost savings**

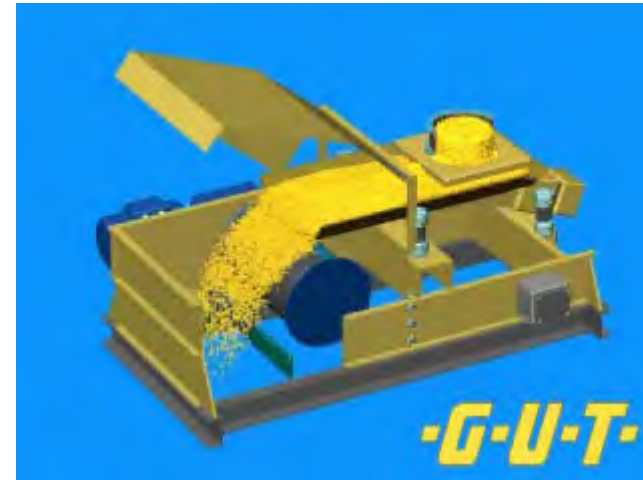
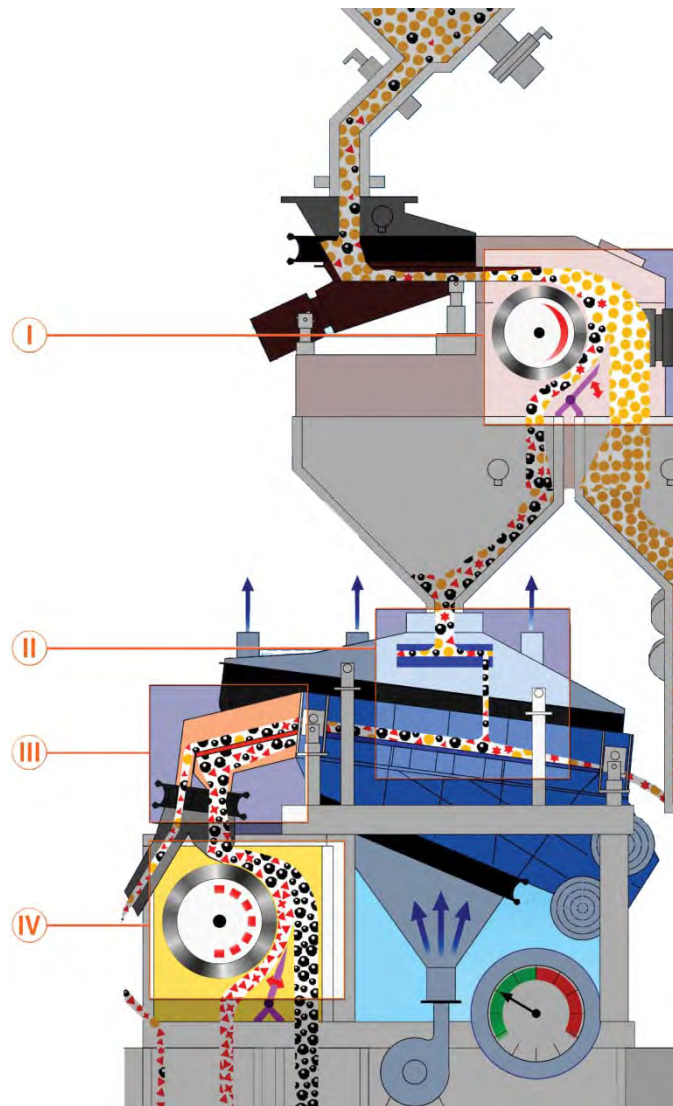


# Flowchart Sand Reclamation and Chromite Separation

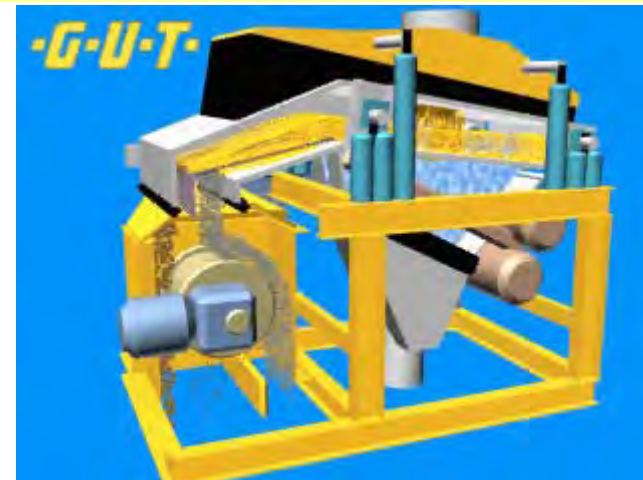


**Chromite separator = last step in sand reclamation process**

# G U T Chromite separation – 4 step technology



4 steps = separation result suits reuse in steel foundries





- average recovery rate about 80 %
- short R.O.I.
- very low energy consumption
- more than 50 plants running
- blend of 80 % reclaimed and 20 % new Chromite recommended for re-use
- proofed for Furan / Pepset / Alphaset / Phenolic / Alkydic Resins



# Example: Economic Analysis 1



## Example:

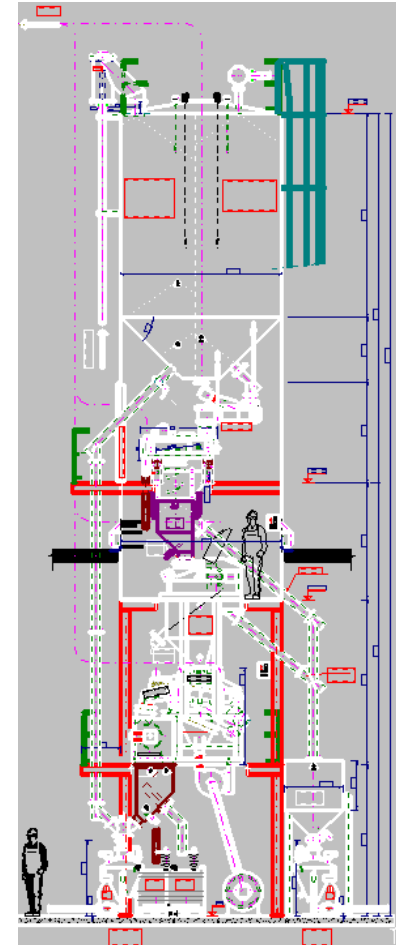
Chromite Separation Plant

## Basic Approach:

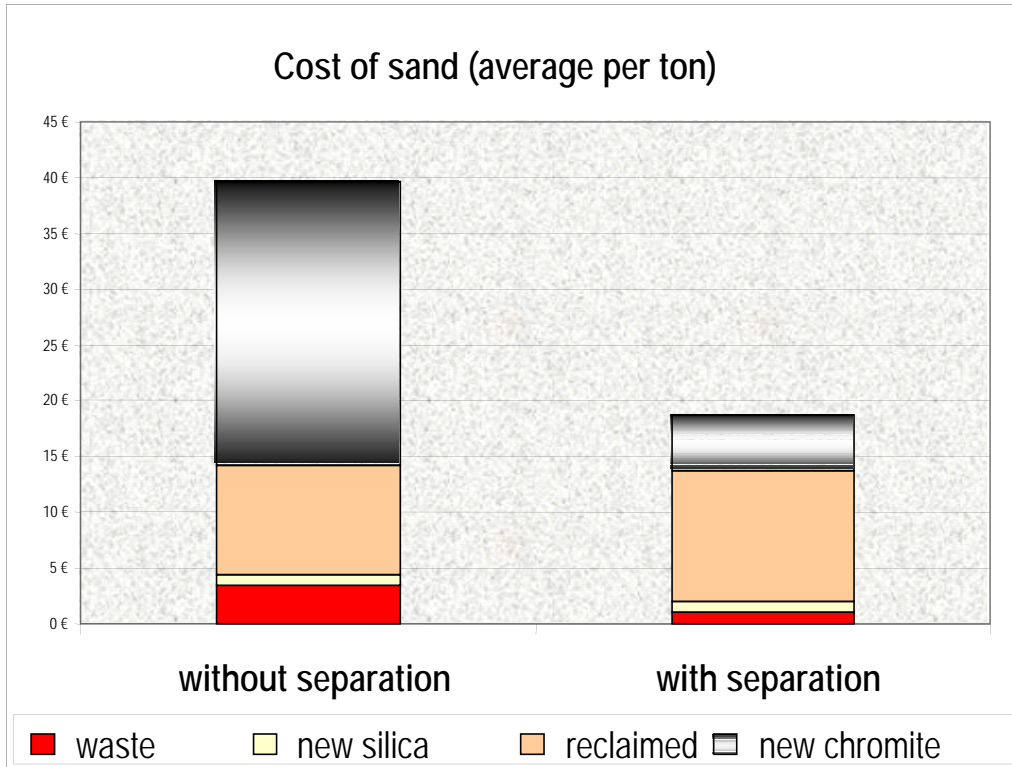
Calculation of average sand costs

## Boundary Conditions:

- Steel Foundry,
- Portion of Chromite: 15%,
- 10.000 tons of good castings per year,
- Sand : Metal Ratio = 4 : 1



# Example: Economic Analysis 2

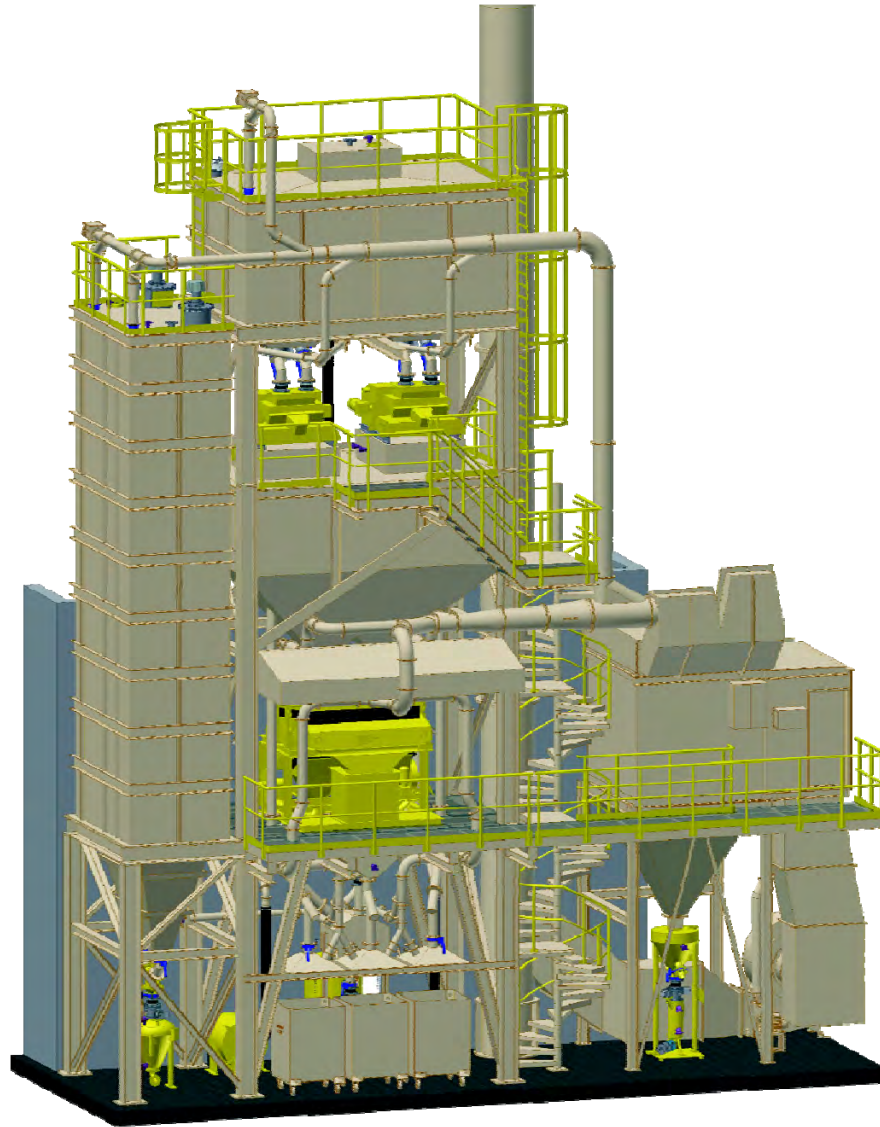


Dumping Costs	20 €/t
Running costs for sand reclamation plant	10 €/t
Running costs for chromite separation	2 €/t

**Potential Savings:**  
 50 % of total sand costs,  
 or:       appr. 20 € per ton of sand,  
 or:       appr. 800.000 € per year

	Total Sand per year	New Sand costs	Amount of new sands (without chromite separation)	Amount of new sands (with chromite separation)
Silica	34.000 t	35 €/t	3 %	3 %
Chromite	6.000 t	170 €/t	100 %	20 %

# Chromite Separator Plant



left: ECO-FORM    righth: standard

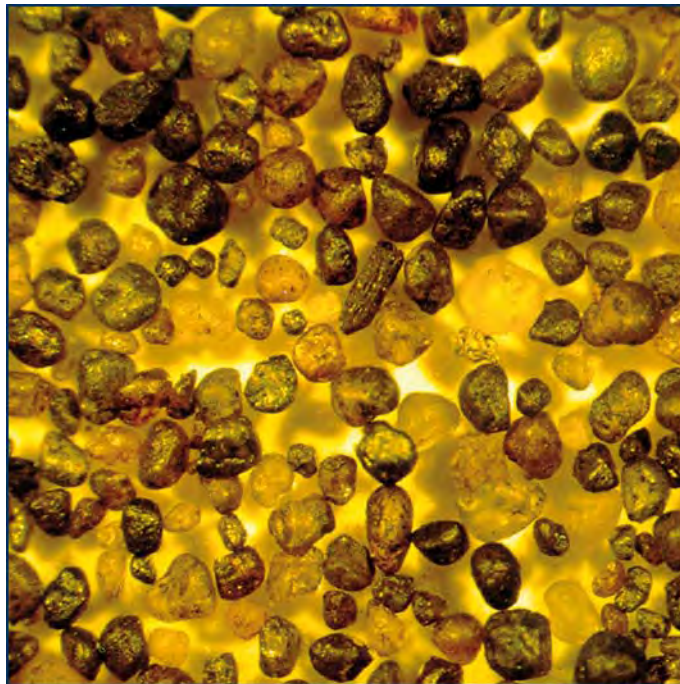


**ECO FORM**

powered by **-G-U-T-**

**-G-U-T-**

**... specialists for nobake foundries!**



**-G-U-T-**  
Giesserei Umwelt Technik GmbH

Obere Hommeswiese 2-4  
57258 Freudenberg

Fon: +49 (0)2734 2809-0  
Fax: +49 (0)2734 2809-70  
Email: [info@gut-gmbh.de](mailto:info@gut-gmbh.de)

[www.gut-gmbh.de](http://www.gut-gmbh.de)

