

# **Efficiency und reliability in Coal Grinding**

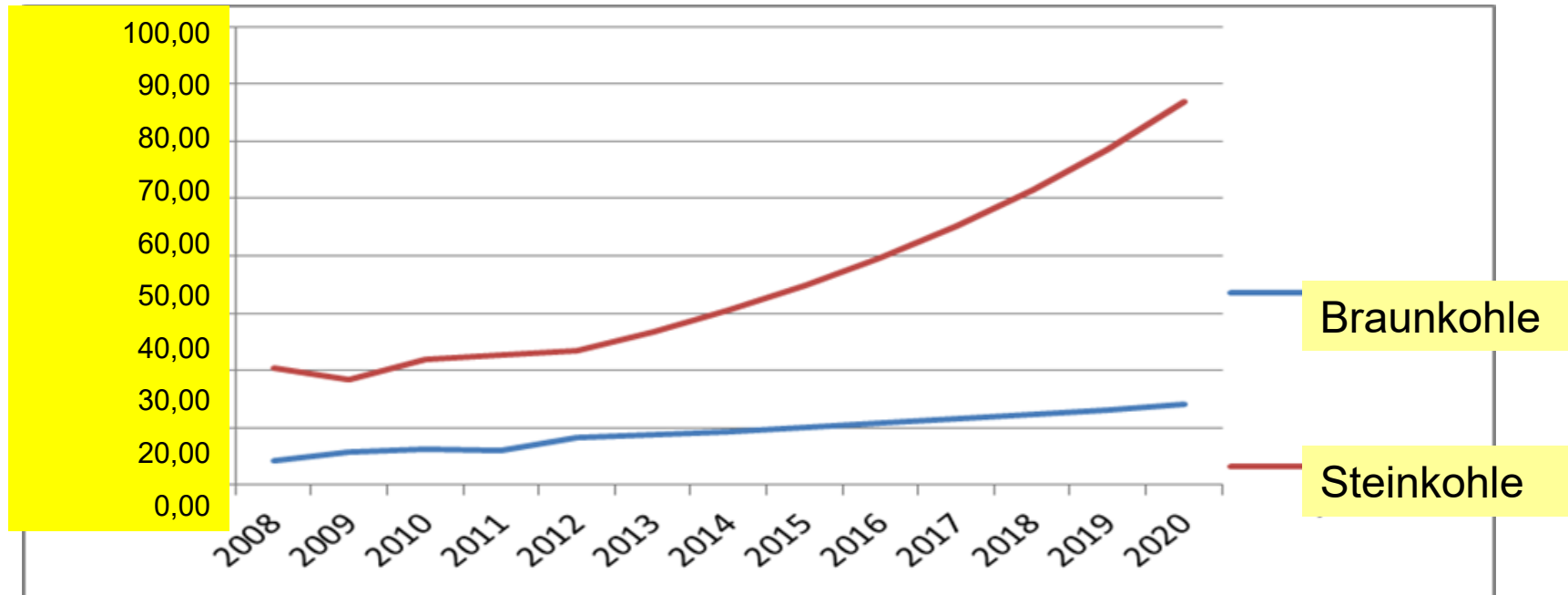
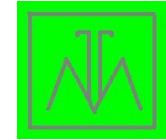
## **Economic coal preparation process for low rank coals**

Lösungen Ing. Büro FTT  
mit Loesche - Mühlen

Dr.-Ing.W.Garber

# Prognose für mittlere Kohlepreise, EUR /Tonne

Fazit: **Steigerung der Anwendung von LR-Coals**

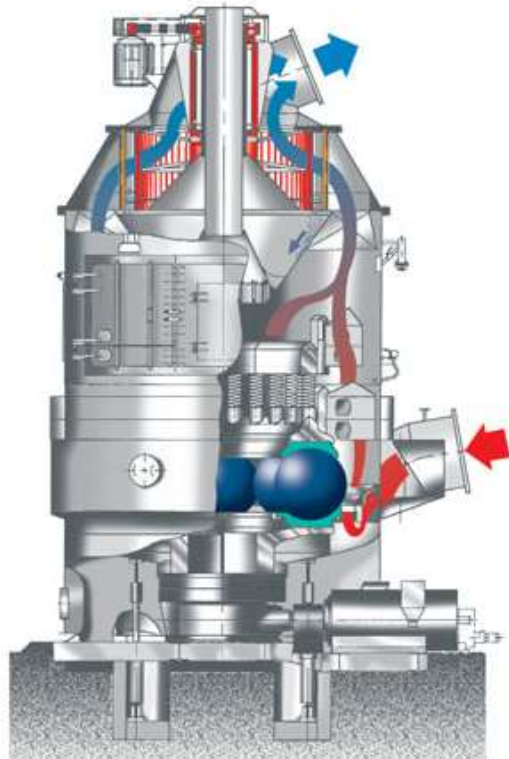


Preisdynamik bis 2020 basierend:

- für Braunkohle gemäß erwartetem Inflationsniveau;
- für Steinkohle gemäß erwarteter Preissteigerung für Erdgas.

Preis-Prognose berechnet gemäß Richtlinien КД ГД

## Was können/ wissen Konkurrenten, z.B. Fa. Claudius Peters

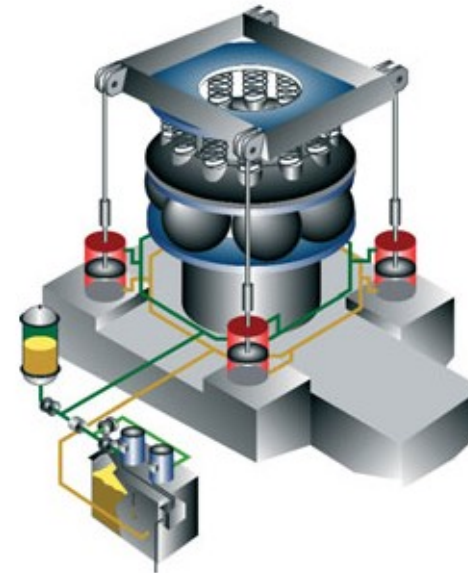
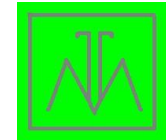


EM110-7115 with dynamic classifier

- Processing of hard, bituminous and lignite coals, other fossil fuels and minerals
- Up to 25% moisture content in the raw material
- Fineness between 1% and 50% residue on 0,09 mm

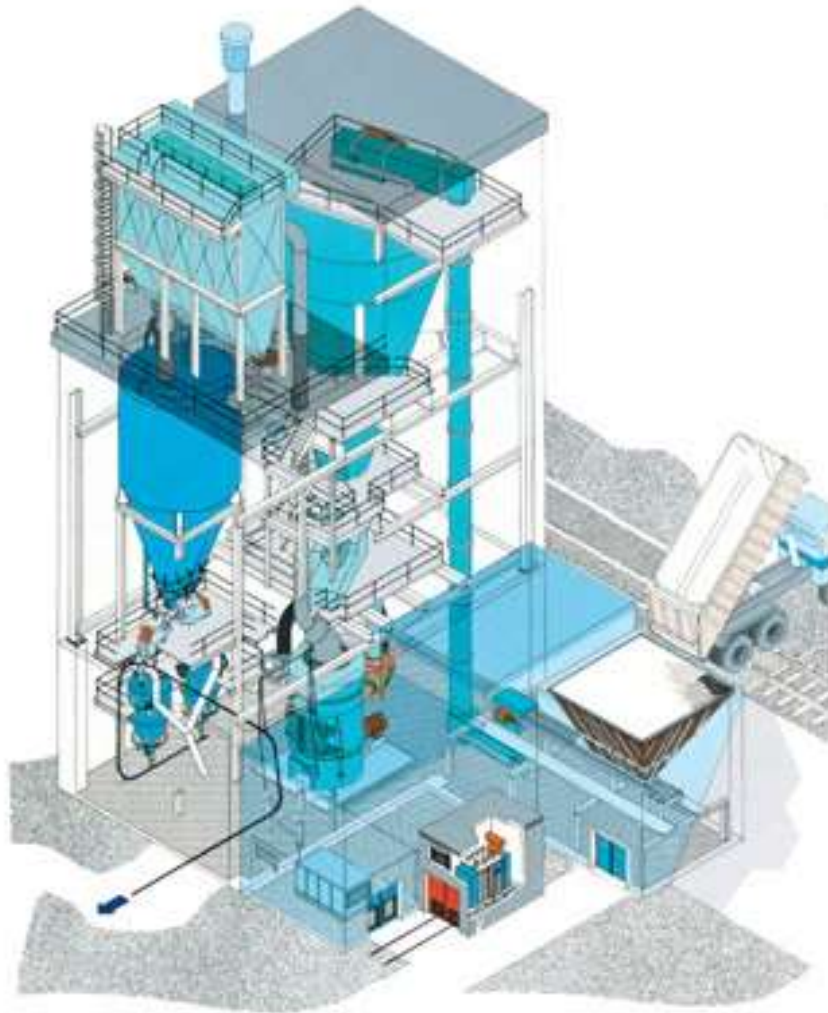
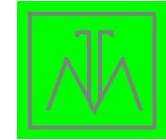
The characteristic features of EM-Mills are:

- Minimal sound emissions
- High productivity
- Low maintenance requirements
- Self adjusting hydraulic tensioning unit
- Mill inlet temperature up to 650 °C / 1200 °F
- No material remaining inside the mill during standstill



Shock-absorbing, self-adjusting hydraulic system: Pressure and wear optimization for low energy consumption.

## Was können/ wissen Konkurrenten, z.B. Fa. Claudius Peters



*Coal Milling, Drying and Injection Plant for a Blast Furnace*

### Safety

Claudius Peters grinding plant can operate under a variety of safety criteria.

In the safest process, inert operation, the oxygen level is lowered to less than 10% under all operating conditions. All values of O<sub>2</sub> and CO are continuously monitored and optimized automatically, thereby preventing dust explosions.

Alternatively when inert operation is not possible, for instance in power station service, the pressure shock resistant mill design (up to 3.5 bar g) guarantees the highest possible operational safety.

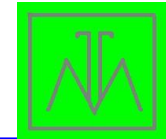
**Claudius Peters hat eine Versuchsanlage mit dem Flash Dryer**

Due to the high moisture content of so called "low rank coals (moisture content up to 60%)" the requested residual moisture will be achieved in a two-step drying system only. Prior to the coal milling and drying plant a raw coal pre drying plant will be installed.

- In a first step the pre-crushed coal (< 25 mm) will be dried to approximately 20% moisture using higher temperatures than allowed for pulverized coal at a reasonable airflow and a low pressure drop
- In a second step the coal will be ground to the requested fineness and dried from about 20 % moisture to the required residual moisture at the maximum allowed temperature for pulverized coals

Combination of the two steps is the most economical and safe solution for the design of coal preparation plants for low rank coals.

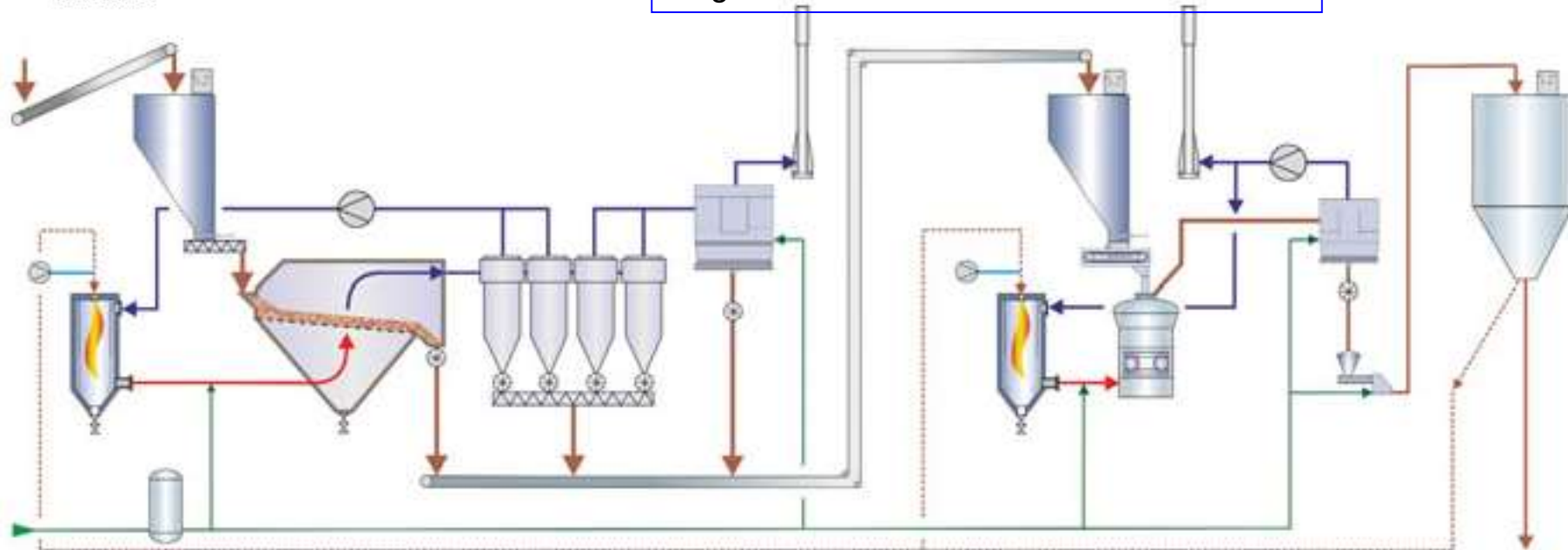
## Lösung von Claudius Peters



Leistung Braunkohlestaub 50-60 T/h  
 Rohkohle Wassergehalt 30-40%  
 BKS 1-50%R90 mkm.

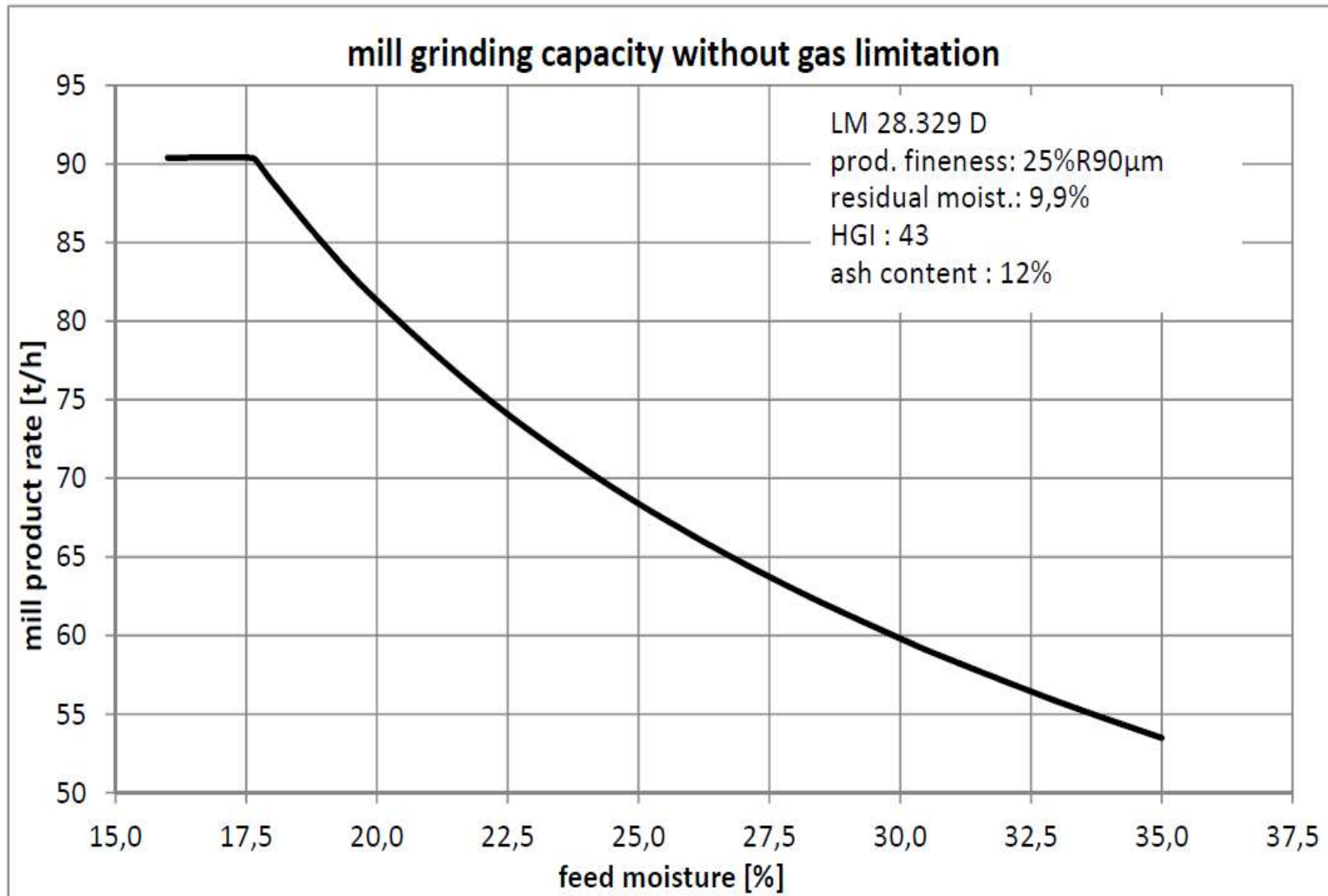
**separate komplette Trocknungsanlage**  
**separate komplette Trocknung- Mahlanlage**

Preis Mahlanlage €  
 Preis Trocknungsanlage €  
 insgesamt: €



Flow diagram of Coal Preparation Plant

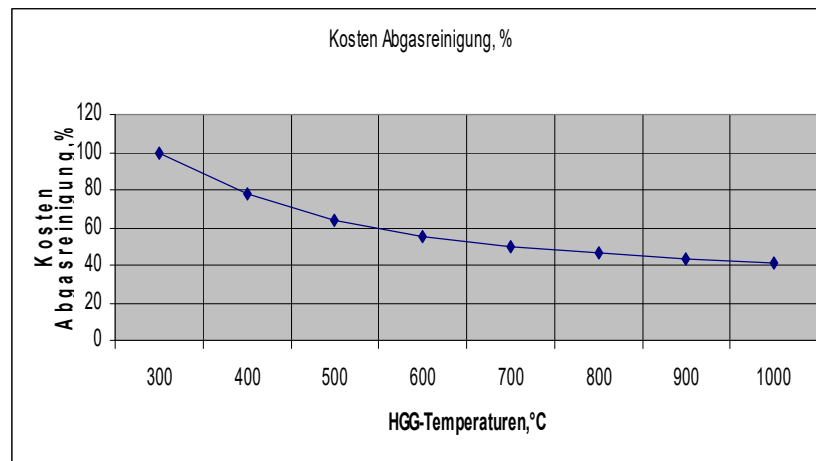
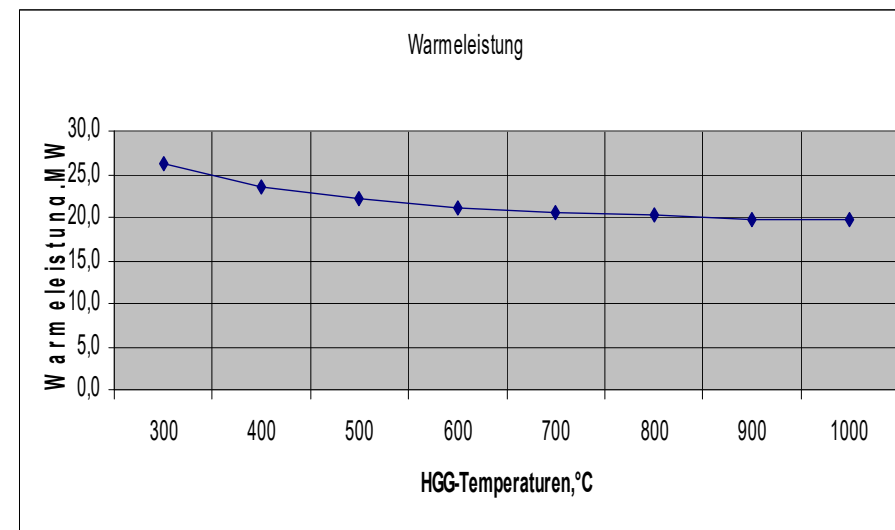
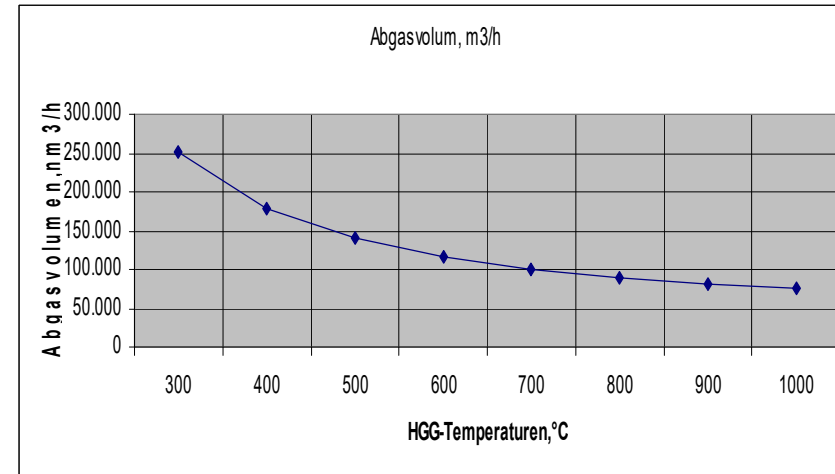
# Verfahrens-technische Mühleoptimierung



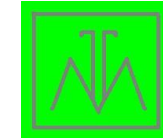
# Leistung- Steigerung durch Heißgastemperaturen



| Verfahren | Mühle Leistung | Heißgas Temperatur | Abgas Menge | HGG Leistung |
|-----------|----------------|--------------------|-------------|--------------|
|           | t/h            | °C                 | m3/h        | MW           |
| 1.        | 50             | 700                | 172.536     | 22,57        |
| 2.        | 60             | 700                | 207.042     | 27,07        |
| 3.        | 60             | 800                | 184.073     | 26,52        |
| 4.        | 60             | 900                | 166.787     | 26,11        |
| 5.        | 70             | 900                | 194.585     | 30,46        |
| 6.        | 70             | 1000               | 178.864     | 30,07        |
| 7.        | 70             | 1100               | 166.267     | 29,77        |



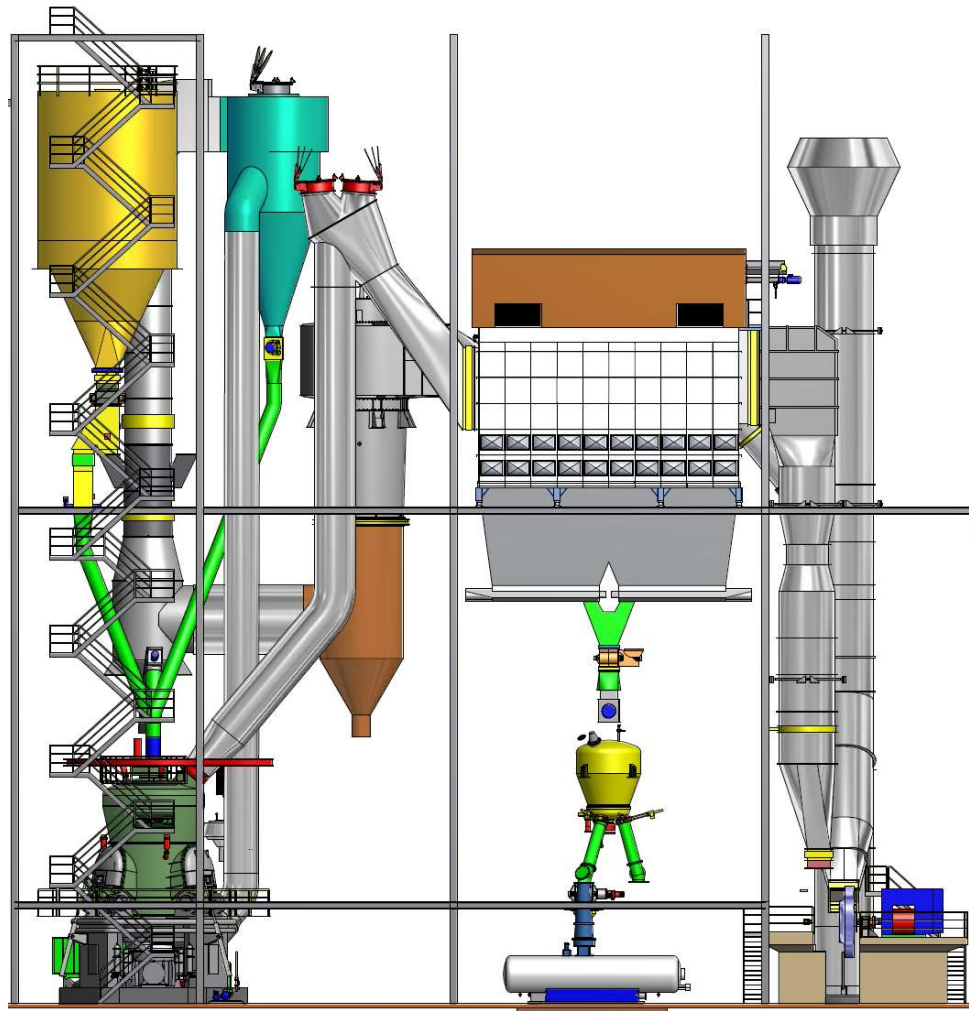
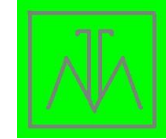
# Abhängigkeit Anlageparameter von Heißgastemperatur, Beispiel Kohle Trocknung- Vermahlung bei W1=35%, W2= 9%



| Heißgastemperatur             | °C    | 300     | 400     | 500     | 600     | 700     | 800     | 1000    |
|-------------------------------|-------|---------|---------|---------|---------|---------|---------|---------|
| Abgase nach Trocknung         | Nm3/h | 250.000 | 180.000 | 140.000 | 120.000 | 100.000 | 90.000  | 75.000  |
| Wärme-Leistung                | MW    | 26,3    | 23,5    | 22,1    | 21,2    | 20,6    | 20,2    | 19,6    |
| Brennstoff Bedarf             | Kg/h  | 4030    | 3600    | 3380    | 3240    | 3150    | 3090    | 3000    |
| Preis Schlauchfilter          | EUR   | 580.000 | 459.360 | 373.520 | 334.080 | 290.000 | 271.440 | 243.600 |
| Preisdifferenz Schlauchfilter | EUR   |         | 120.640 | 206.480 | 245.920 | 290.000 | 308.560 | 336.400 |
| Kosten Abgasreinigung         | %     | 100     | 79      | 64      | 58      | 50      | 47      | 42      |



# Lösung Loesche for Low Rank Coal Grinding



**Vorgeschaltete SRT- Vortrockner**  
mit gemeinsamen Heizgaserzeuger,  
Abgasreinigung, Hauptgebläse und Kamin  
Heißgastemperaturen bis zum 1000°C

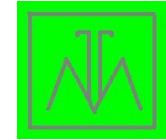
Leistung Braunkohlestaub 60-75 T/h  
Rohkohle Wassergehalt 30-40%  
Vorzerkleinerung bis ca. 10-20 mm.  
BKS 10-60%R90 mkm.

Preis Mahlanlage €  
integrierte Trocknungsanlage €  
Insgesamt €

Kunde Atschinsk- Glinozem RussALL  
Pilot Anlage LM28.3D Jahr 2014  
Weitere 4 Anlagen Jahr 2017

**Vertriebsgebiete**  
Russland, Kasachstan, China, Indien,  
Indonesien, Australien, USA, Europa,

# BKS- Selbsterzündung und Kohlestaubkühler



## Fazit IBEXU:

**ohne Kohlestaubkühler keine Braunkohlevermahlung mit Silo-Lagerung**

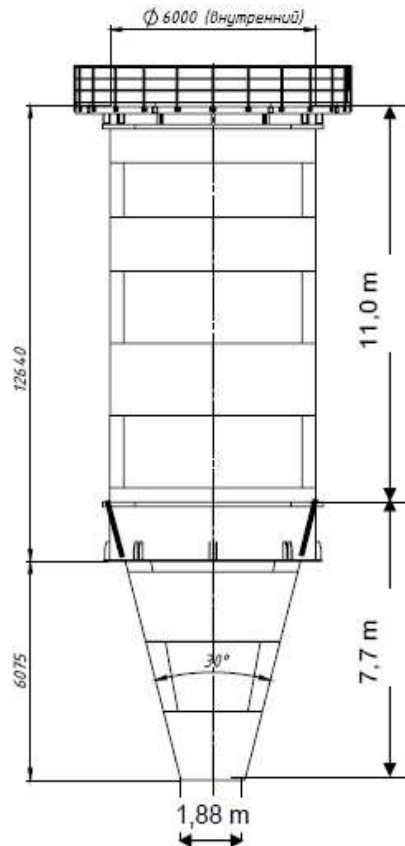
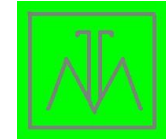


Bild 1: 350 m<sup>3</sup>-Silo nach Zeichnung Nr. AC 032 0101

| Low rank Kohle         | Temperatur nach der Mühle, °C | Selbsterzündung Temperatur in 1 m <sup>3</sup> , °C |
|------------------------|-------------------------------|---|
| Borodinskij Braunkohle | 100-90                        | <b>52,3</b>   |
| Berezovskij Kohle      | 100-90                        | <b>52,5</b>   |

# Sättigungspunkt in Abgasen



Bedingungen in Atschinsk:

Taupunkt 68-73°C

Lufttemperatur in Sommer = 26°C

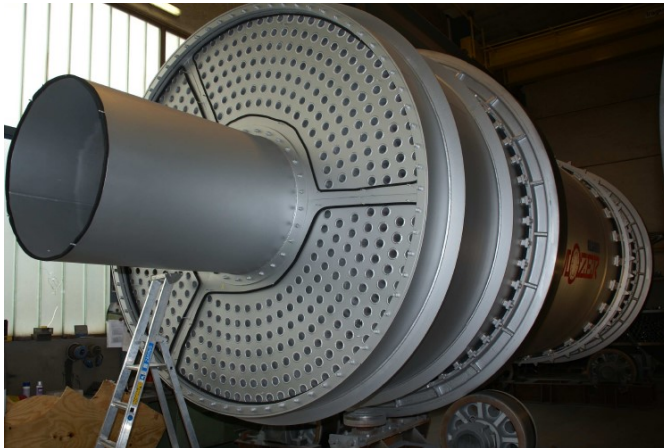
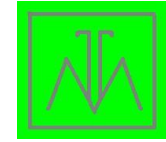
Lufttemperatur in Winter = bis zum minus 48°C

Sättigungspunkt in Abgasen bei  
Heißgasen 300- 700 °C

Lufttransport

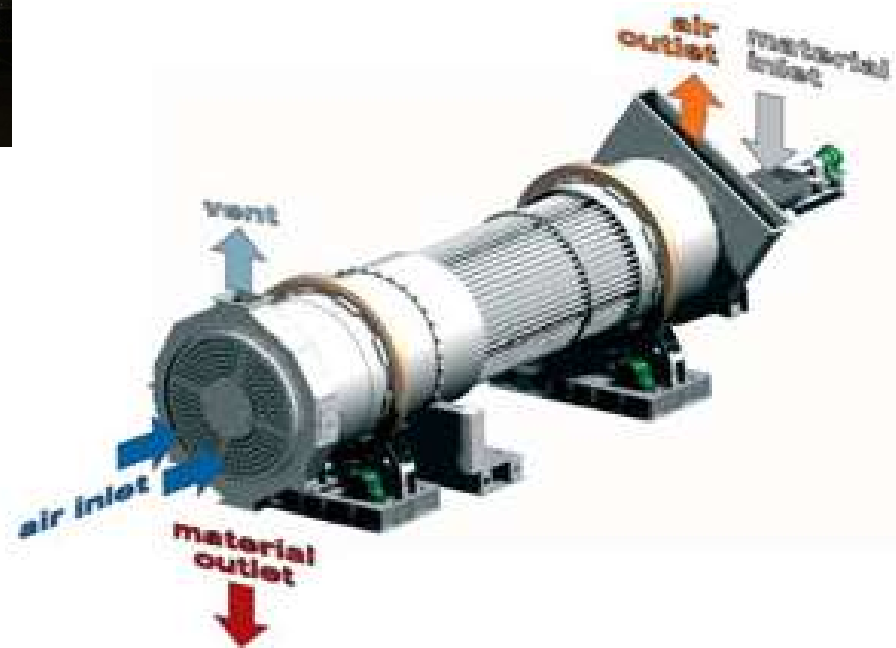
|   |                       |         |        |        |        |        |         |         |
|---|-----------------------|---------|--------|--------|--------|--------|---------|---------|
| Luftzusatz zur Verdünnung                         | m3                    | 0       | 135,71 | 235,71 | 535,71 | 935,71 | 1935,71 | 3935,71 |
| Luftmenge zwischen Partikeln<br>von Kohlestaub    | m3/kg.Kohle-<br>Staub | 0,00129 |        |        |        |        |         |         |
| Gesamt Luftmenge in 50 Tonne<br>Kohlestaub        | m3                    | 64,29   | 200    | 300    | 600    | 1000   | 2000    | 4000    |
| Wassermenge in Luft-Abgasen<br>nach der Trocknung | kg/m3                 | 0,37    | 0,37   | 0,37   | 0,37   | 0,37   | 0,37    | 0,37    |
| Gesamt Wassermenge in Luft<br>mit 50 T Kohlstaub  | kg                    | 23,79   | 23,79  | 23,79  | 23,79  | 23,79  | 23,79   | 23,79   |
| Gehalt Wasser in Recyclung<br>Abgasen             | kg/kg                 | 0,29    | 0,09   | 0,06   | 0,03   | 0,02   | 0,01    | 0,005   |
| <b>Taupunkt</b>                                   | °C                    | 68      | 51     | 42     | 30     | 20     | 10      | <5      |

# KS-Kühler von Allgaier / Claudius Peters Roraty Drum Cooler

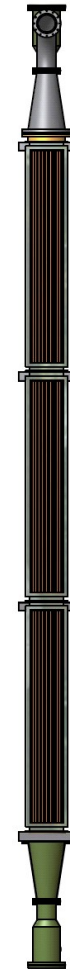
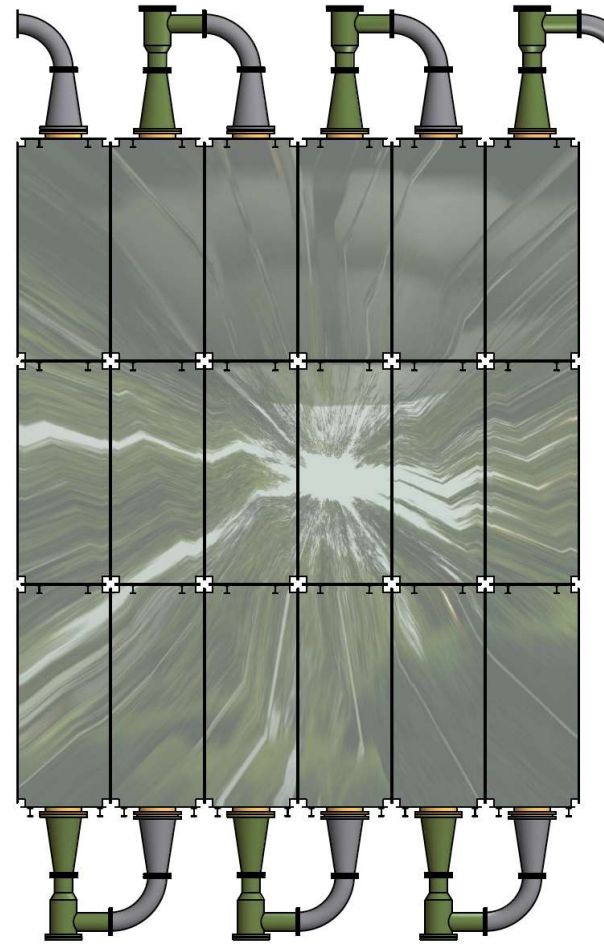
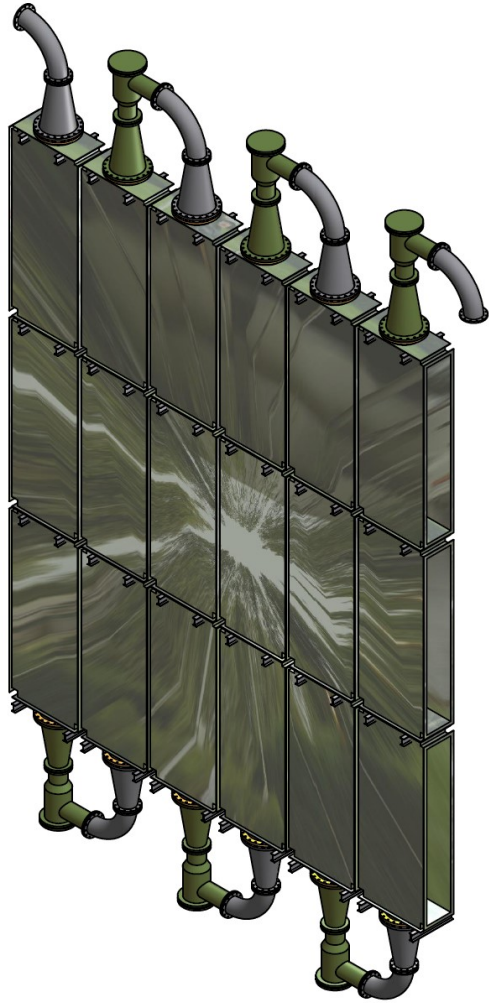
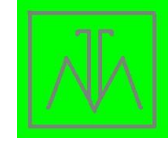


Indirekte Luftkühler Kohlestaubkühler  
60 T/h BKS  
Staub – 100°C, Luft – 25°C  
Abmessungen: Trommel 3 x 12 m  
Verdünnung – Luft ca. 4000 m<sup>3</sup>/h

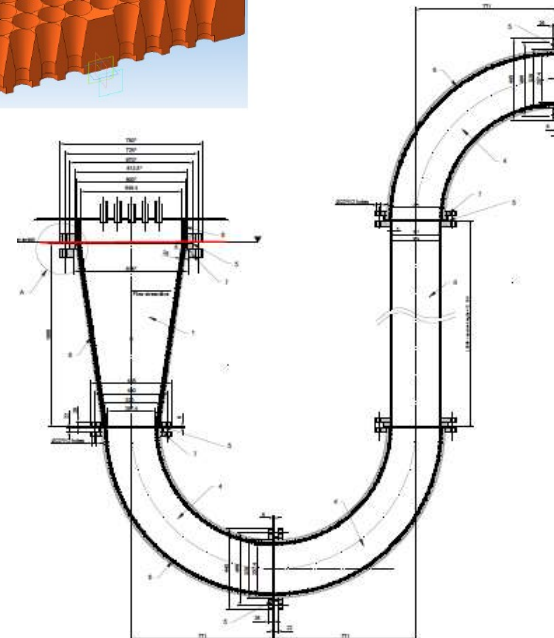
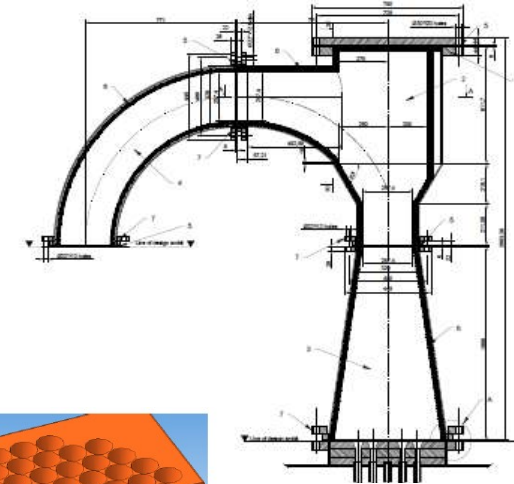
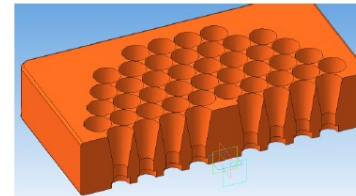
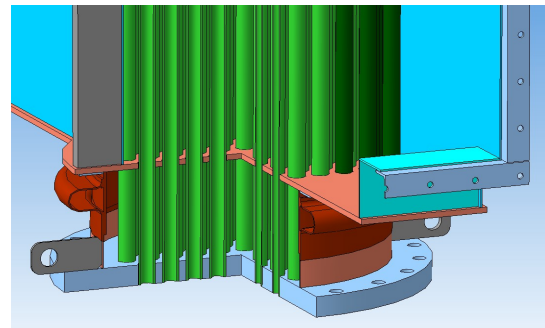
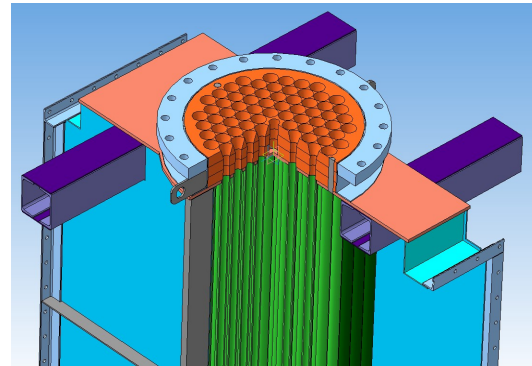
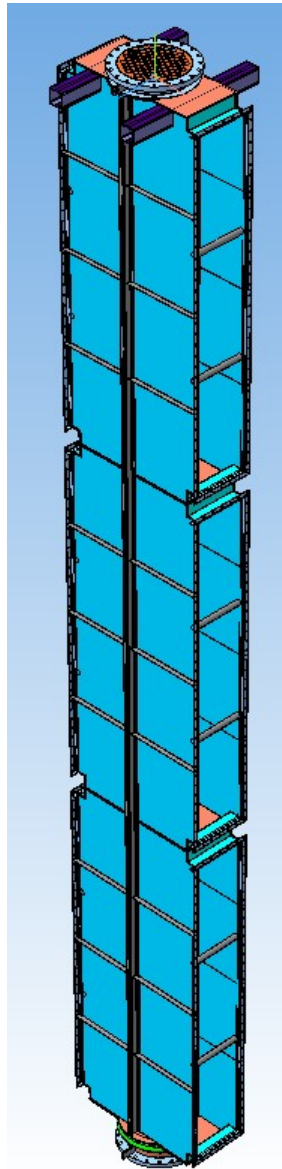
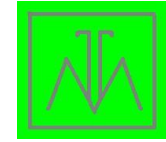
Preis: Ex- Work 850.000 €  
Optionen: 150.000 €  
insgesamt: ca. 1.000.000 €



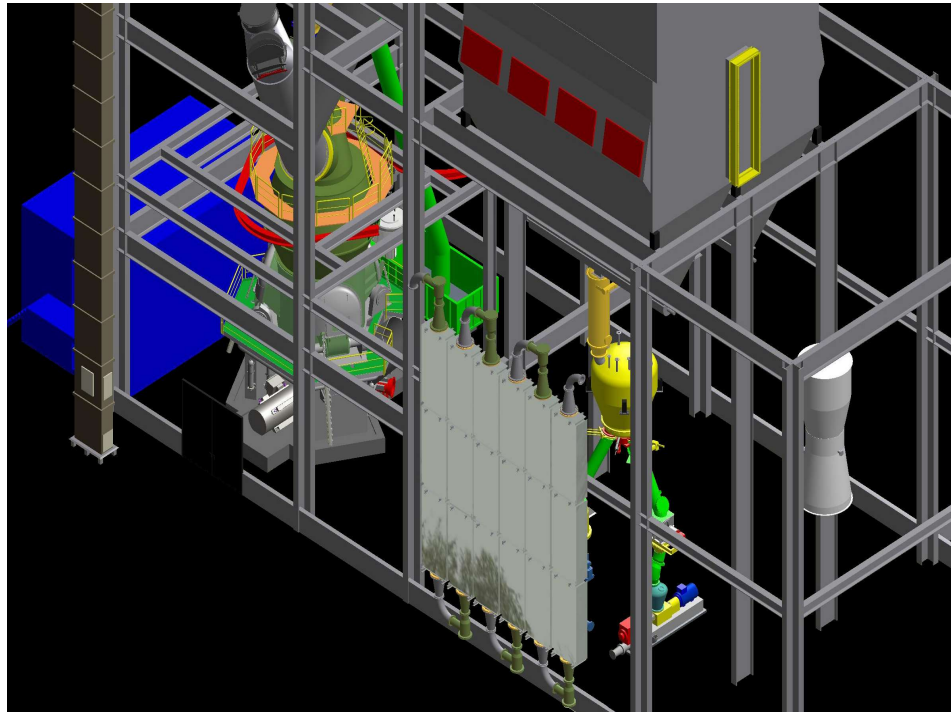
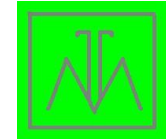
# Strömungs-Kohlestaub-Kühler FTT- Loesche



# Strömungs-Kohlestaub-Kühler FTT- Loesche, Sektion und Übergänge



# Strömungs-Kohlestaub-Kühler FTT - Loesche



## Vertriebsgebiete

Russland, Kasachstan, China, Indien,  
Indonesien, Australien, USA, Europa,

## Indirekte Luftkühler Kohlestaubkühler

50 - 70 T/h BKS, KS, Holzstaub usw.

Kühlt Staub – von 100°C bis zum 50°C

Abmessungen: 6 Sektion- Paket

B 0,5m x H13 m x L 9,2m

Verdünnung – Druck-Luft ca. 4167 kg/h

Wärmerückgewinnung ca. 0,75 MW

**Preis:** Ex- Work 350.000 €

Optionen: 150.000 €

insgesamt: ca. 500.000 €

## Anwendungen:

Kühlung nach Vermahlung

Braunkohlestaub,

Steinkohlestaub,

Holz Kohlestaub,

Zementstaub,

sonstige Pulver

bzw. Pulver - Erhitzung

**БЛАГОДАРЮ ВАС ЗА ВНИМАНИЕ!**

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