AFCM 2015 VIETNAM
24th Technical Symposium & Exhibition

schenck process

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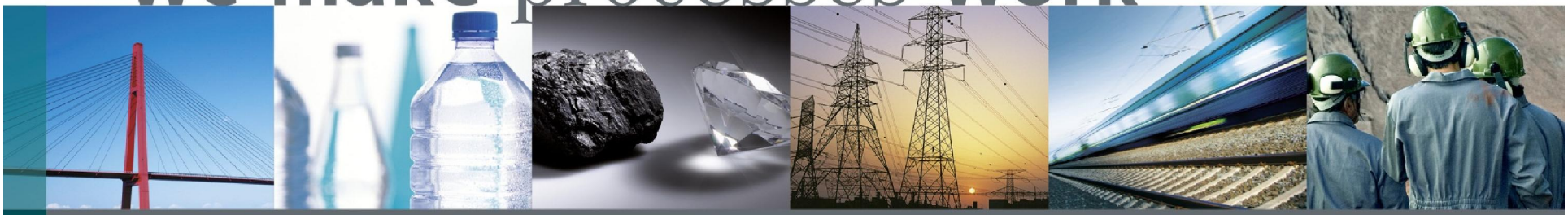
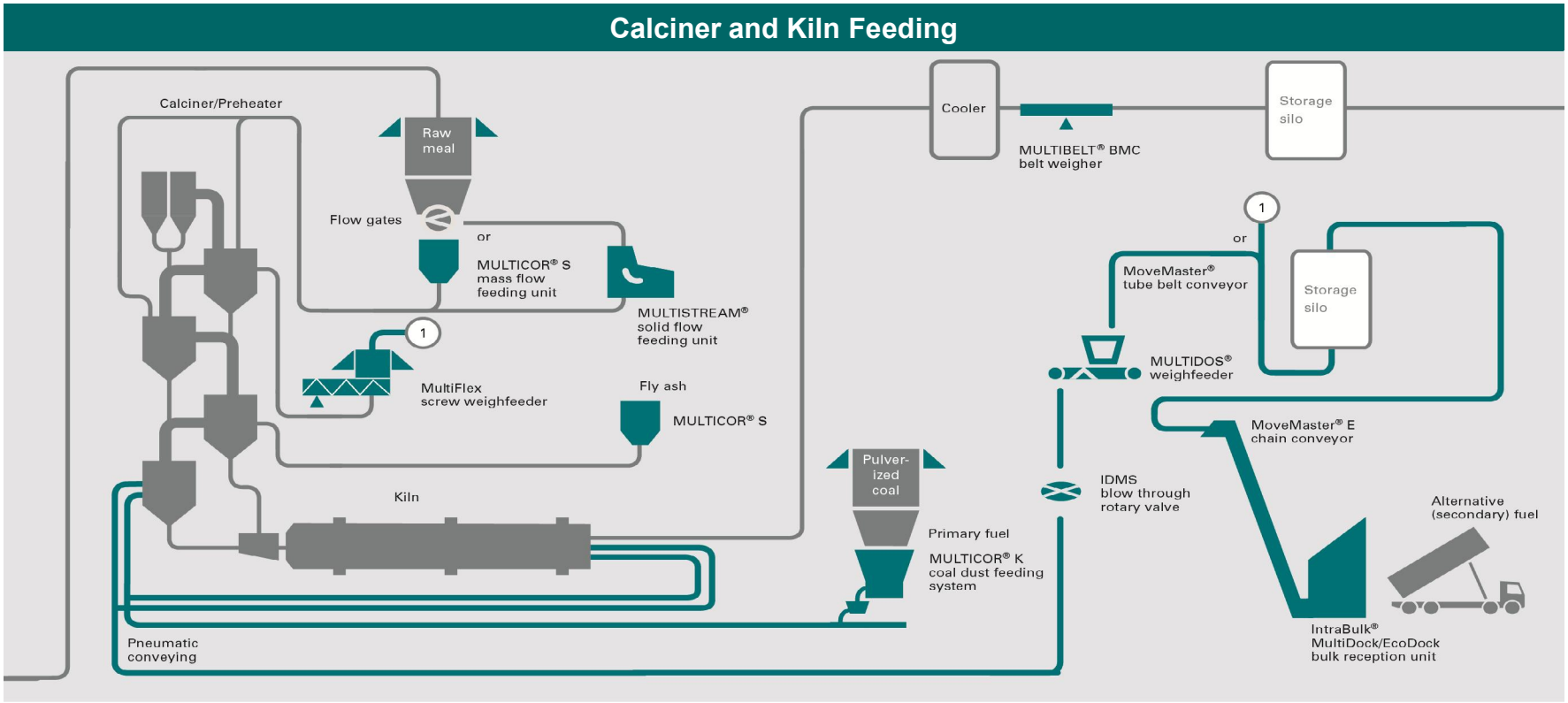


Schenck Process Group
Alternative Fuels feeding concepts for the Cement industry
Flexible solutions for RDF plants according to customers requirements

by Karsten Grünewald 24th of April 2015

WHERE are normally the locations of alternative fuel feeding systems in a cement plant ?



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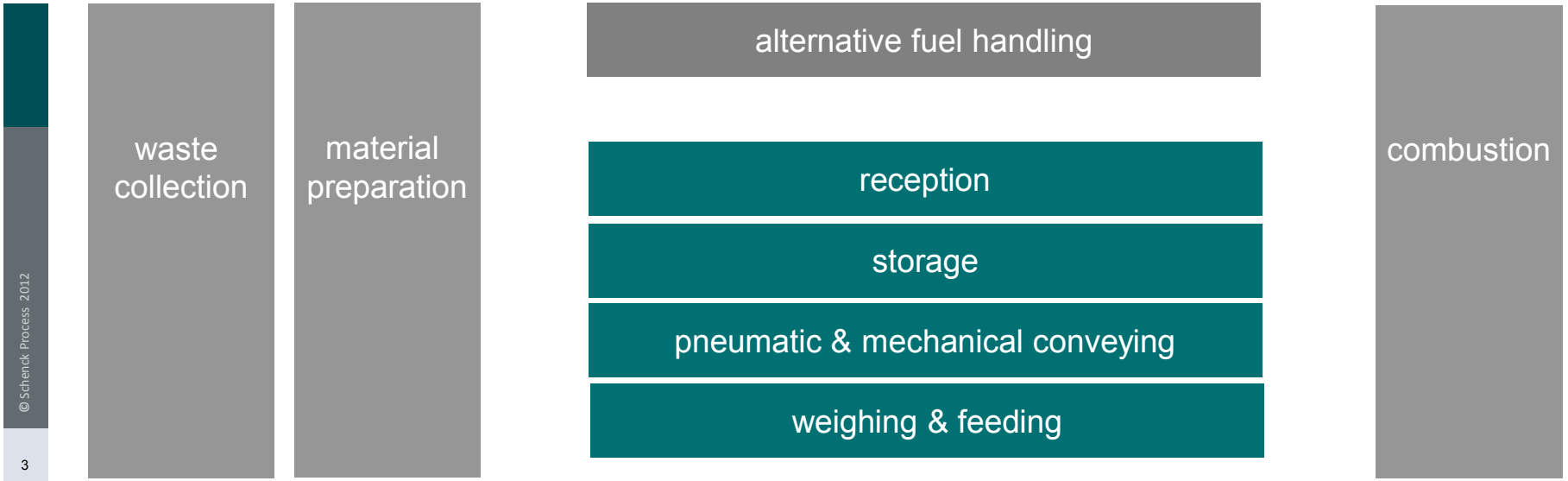
WHAT are the process steps to be covered in use of alternative fuels ?



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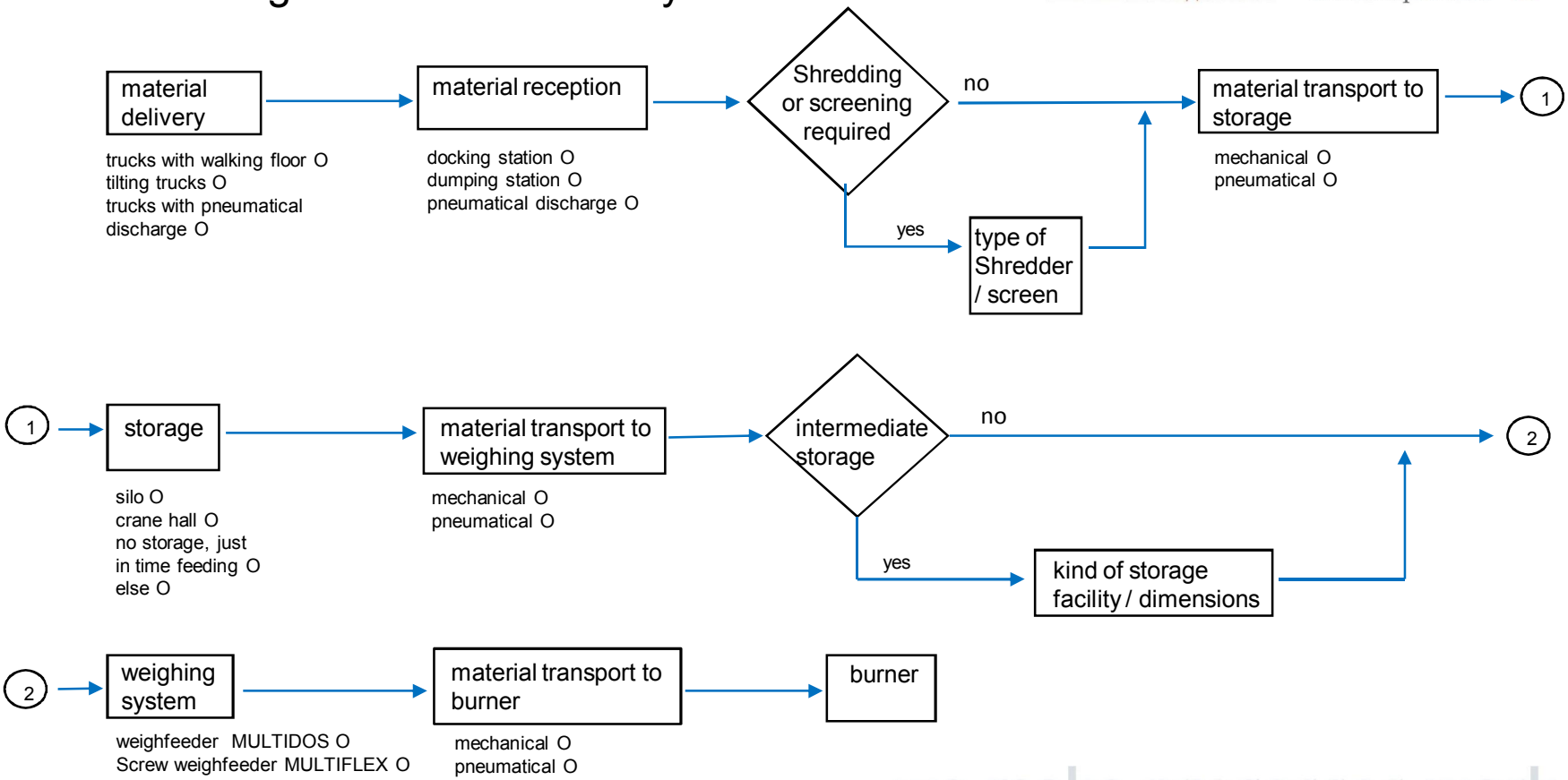
HOW to design alternative fuels systems ?

Three golden rules:

- **Apply robust equipment despite the low bulk density !**
  ➔ ensures high availability.
- **Avoid bottlenecks – secondary fuels tend to bridging!**
  ➔ avoids down times caused by blockages.
- **Allow for varying bulk density and flowability!**
  ➔ ensures high flexibility in fuel usages.

HOW to design alternative fuels systems ?



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Material

Use of alternative fuels in cement production: Multiple fuel types

- shredded plastics
- foil chips
- conditioned sewage sludge
- wood chips & saw meal
- shredded tyres
- palm kernel shells
- rice husk
- animal meal
- mixtures of the above

Alternative fuels have a high calorific value that can even exceed the heat value of hard coal (20 MJ/kg):

foil chips:

grain size : 1-50 mm
heat value : 22 MJ/kg
bulk density: 0.08 t/m^3

BPG (solid fuel out of industrial waste):

grain size : 1-30 mm
heat value : 22 MJ/kg
bulk density: 0.2 t/m^3

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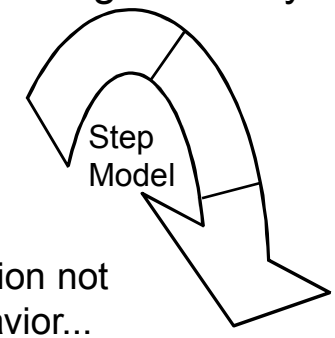
Waste is as long waste until

somebody touches it.

Material

It's all about material: … suggestion for a 2 step approach during feasibility study

FOCUS: AF HANDLING AND FEEDING



STEP 1 Characterize the AF sources for the present/future as best as possible

Invest time!
Tests ...

→ size distribution and chemical composition not enough, <u>also</u> compressibility, time behavior...
→ extrapolate to possible variances (critical aspect)

Why:

Realistic pre-treatment and handling concepts are mandatory

STEP 2 Accept and consider that each technical (or technological) machine/concept has an „optimal" area of application and certain limitations

→ perform material processing/conveying tests, document and discuss limitations

Reliability evaluation

Wear & tear, OPEX- budgets

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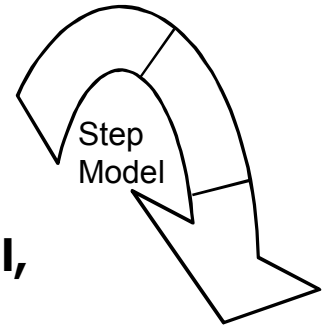
Material

It's all about material: … suggestion for a 2 step approach during feasibility study

FOCUS: AF HANDLING AND FEEDING



!! Install equipment only

after given careful thought about the feeding material, otherwise it will lead to difficulties …,

but it happens quite often.

Material

Use of alternative fuels in cement production: multiple fuel types

non-ATEX design	Rice straw	RDF	Sewage sludge	Animal meal
GENERAL MATERIAL PROPERTIES FOR THE COMPLETE INSTALLATION (INCL. SHREDDER)				
moisture	max. 10 %	max. 20 %	max. 10 %	max. 10 %
fines < 500 µm	max. 3 %	max. 3 %	max. 3 %	max. 3 %
fat content	/			max. 14 %
temperature	ambient			
flow properties	slightly sluggish, tending to bridging			
ash content	max. 15%			
foreign bodies (incl. inert materials)	max. 3 %, max. 50 mm, three- and two-dimensional			
ferrous / non-ferrous metal	max. 0,5%, max. 40 mm, two- and one-dimensional			
MATERIAL PROPERTIES FOR FEEDING / DOSING SYSTEM				
bulk density min - max	0,03 - 0,07 t/m³	0,1 - 0,2 t/m³	0,5 - 0,7 t/m³	0,5 - 0,7 t/m³
grain size	0 - 30 mm, 1 - 3 % max. 50 mm	0 - 30 mm, 1 - 3 % max. 50 mm	0 - 5 mm	0 - 5 mm
grain shape	two-dimensional / granular			
DOSING SYSTEM				
feedrate gravimetric max.	0.0 t/h	0.0 t/h	0.0 t/h	0.0 t/h
feedrate gravimetric min.	0.0 t/h	0.0 t/h	0.0 t/h	0.0 t/h
feedrange	1 : ___	1 : ___	1 : ___	1 : ___
feedrate volumetric max.	0.0 m³/h			
feeding accuracy	+/- 1 % referring to the set feedrate			
ADDITIONAL DATA				
truck discharge feedrate	___ m³/h, max. ___ t/h			
silo / storage volume	___ m³ at ___ t/m³			
silo extraction volumetric feedrate	___ m³/h			

Additional ATEX material properties	
rate of pressure rise (K_{st})	max. ___ bar*m/s
max. explosion pressure (p_{max})	___ bar
class number (Brennzahl)	___
smouldering temperatue	min. ___ °C
self ignition temperature	min. ___ °C

Material reception

MULTIDOCK – alternative fuels reception
High speed and spillage free unloading of trucks

standard trailers can be used
volume approx. 90 m^3

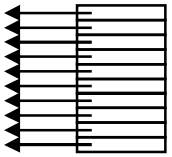
The discharge is controlled automatically

standard containers can be used
volume 30-40 m^3

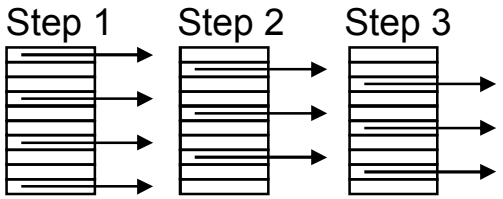
Material reception

Walking floor discharge system installed in trailer

simultaneous feed into docking station

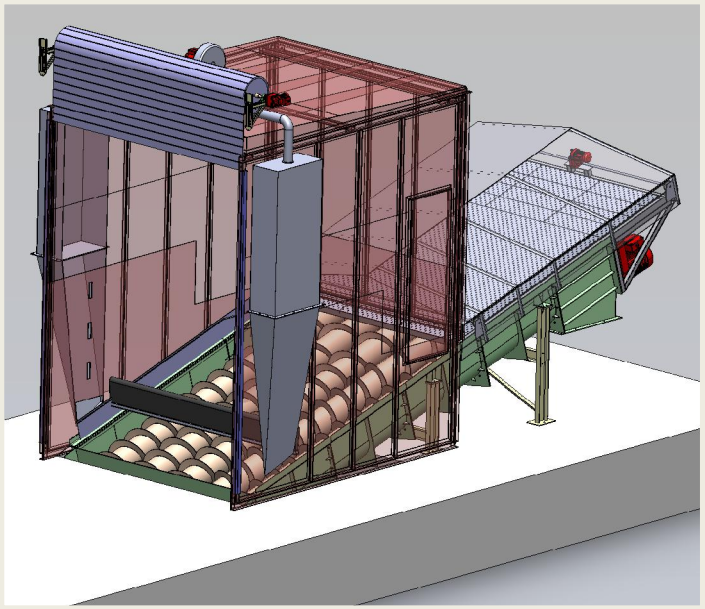


return in staggered sections



Material reception

MULTIDOCK – alternative fuels reception
High speed and spillage free unloading of trucks

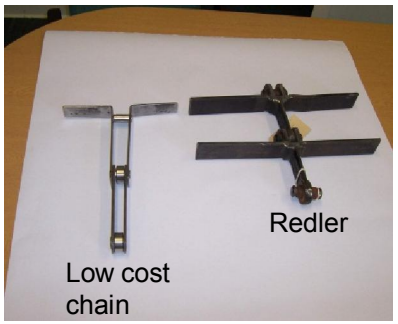


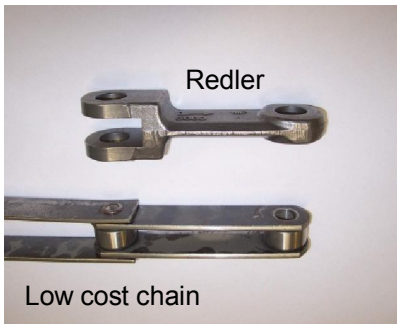
- ☑ truck unloading capacity > 500m³/h
- ☑ double sealing, spillage cleaning
- ☑ access to the truck inside of the box

Mechanical material transport

MoveMaster® chain conveyors: High reliability by robust design

The **REDLER** drop forged chain, tensile load up to 70 kN





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Mechanical material transport

MoveMaster® chain conveyors: High reliability by robust design

swan neck type
inclination up to 75°

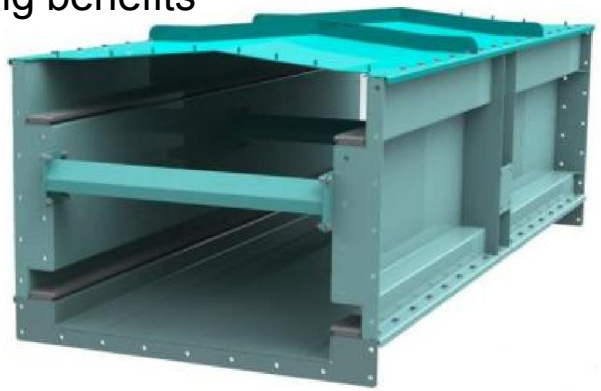
L type
inclination up to 45°

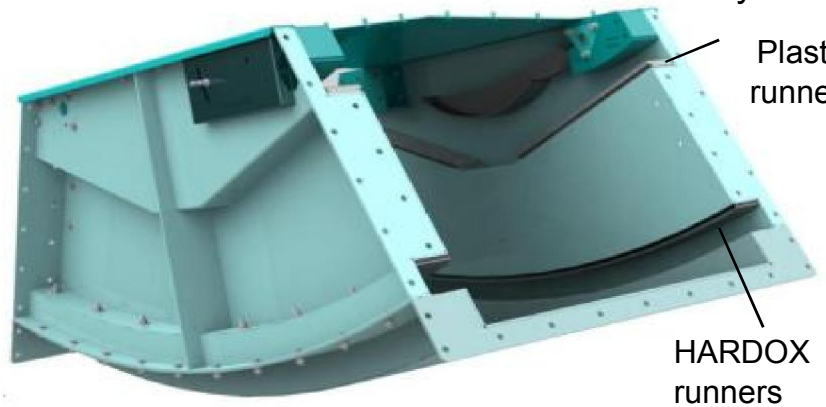
horizontal type
inclination up to 10°

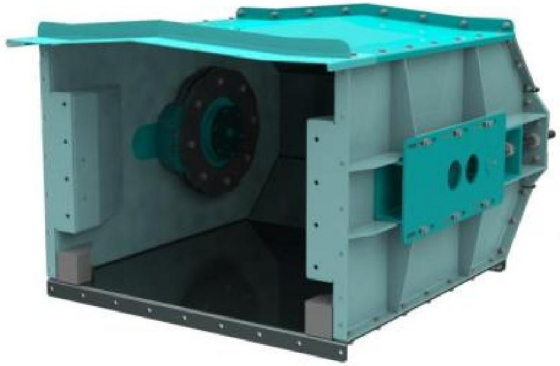
Mechanical material transport

MoveMaster® chain conveyors: New design result in following benefits

1. Weight reduction due to the reinforced shape
2. Chain protection against stream of feed material
3. Straight shape inside
4. Tension end with new trailing wheel design
   and shaftless design of trailing wheels
5. New chain / flight configuration result in weight reduction,
   but withstand higher forces absorbing different extension
   of the chain links on both side of the conveyor







Mechanical material transport

TEDO tube and U – conveyor:
Reliable and spillage free conveying – if necessary around obstacles

- able to handle long distances and problematic topographic areas
- spillage free transportation of alternative fuels
- inclination up to 30°
- walk way integrated in support structure
- long distance between support piles possible (>24m)

"We will either find a way, or make one."

Hannibal

Mechanical material transport

TEDO tube and U – conveyor:
Reliable and spillage free conveying – if necessary around obstacles

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Storage Systems

Storage silos with discharge

Aslan Cimento, OYAK Group, Turkey
Silos with explosion venting and silo extraction screw

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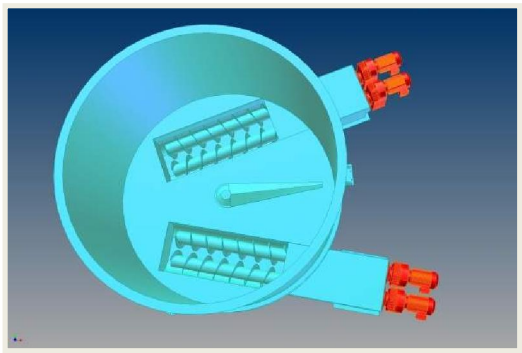
Intermediate storage and distribution

LAFARGE Poland, Malogosz plant

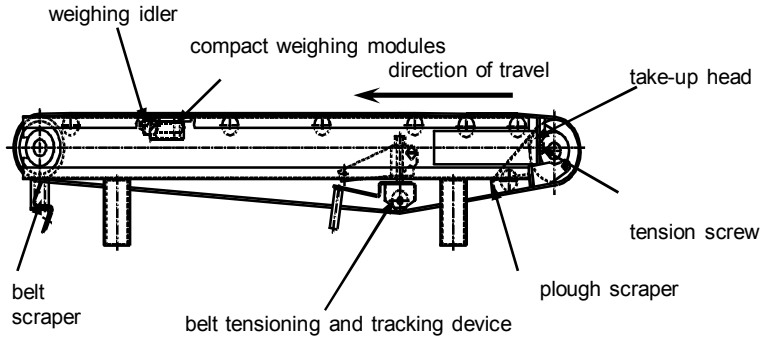
Intermediate and distribution hopper

- huge diameter of double extraction screws, shaftless screws available as option to avoid any wind ups
- huge inlet area ensures continuous filling of feeding screw
- more than 50 installations around the world
- variable speed drive for extraction screws and agitator, controlled by downstream weigh belt feeder MULTIDOS ®
- capacity up to 50 m³ available
- dust tight



Weighing systems

MULTIDOS® belt weighfeeder



MULTIDOS® belt weighfeeder

- continuous gravimetric feeding of bulk solids
- accuracy (related to actual value): ± 1%
- rugged design suitable for the harshest demands
- MechaTronic design with integrated electronics
- safe belt run monitoring and tracking
- easy belt change without auxiliaries
- throughput rate: up to 200 m³/hr
- conveying speed: max. 0.5 m/s

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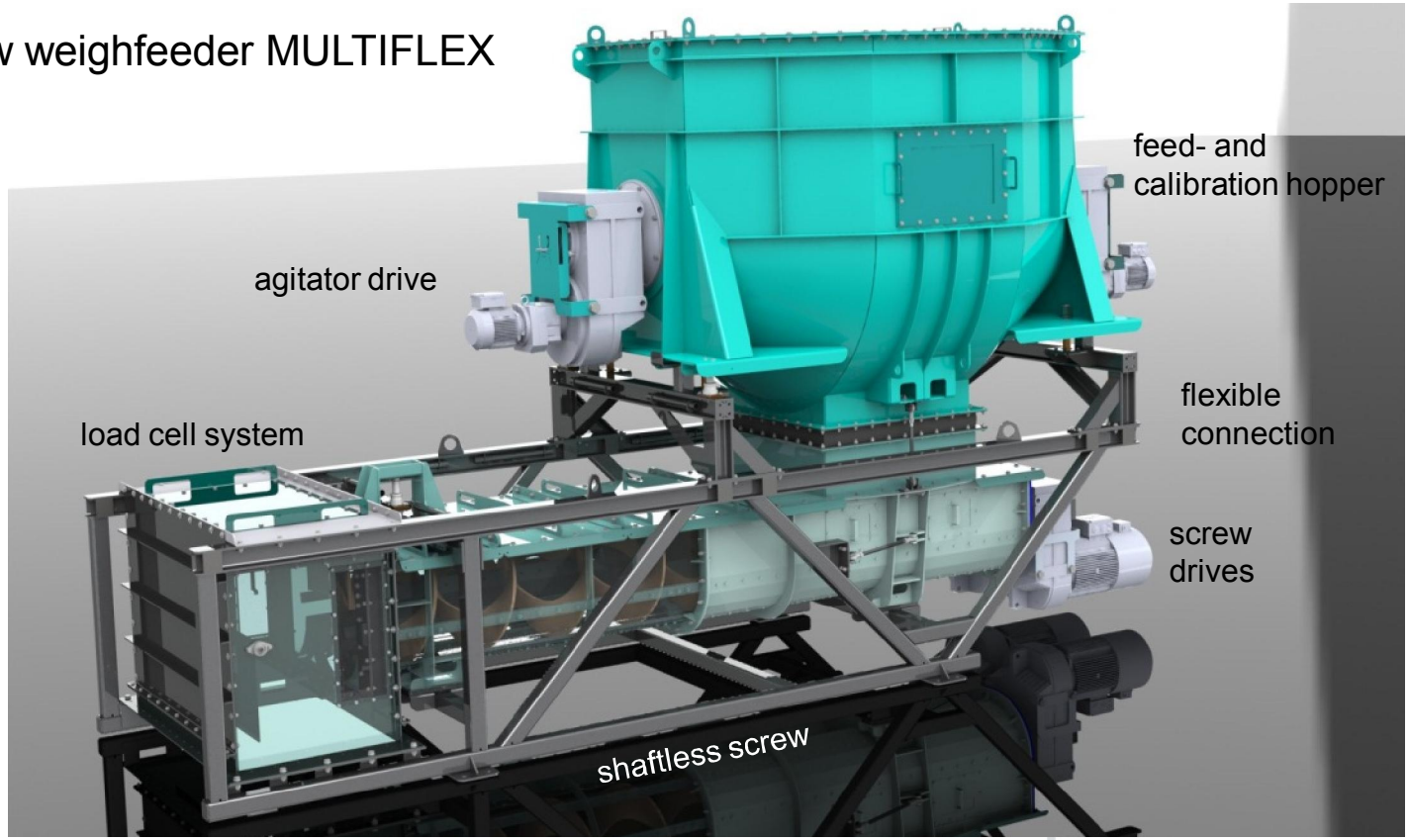
Weighing systems

Screw weighfeeder MULTIFLEX

- flexible screw weighfeeder in dust-tight, enclosed design
- suitable for all kinds of alternative fuels (explosive and non-explosive)
- designed for materials with bulk density between 0.05 - 0.7 t/m^3 and particle size up to 100mm
- designed for hoppers of up to 25m^3
- feed rate of 1 to 20 t/hr (up to 400m^3/hr)
- high feed constancy, reliability & flexibility
- easy maintenance

Weighing systems

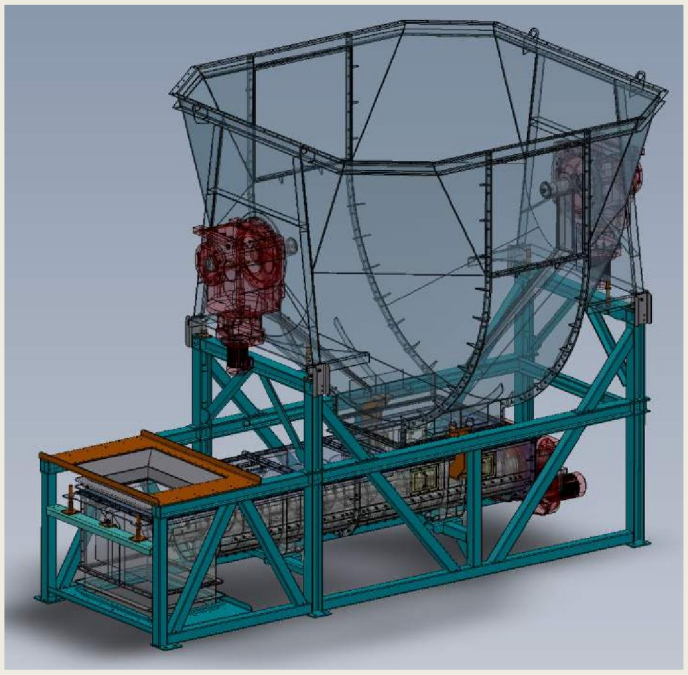
Screw weighfeeder MULTIFLEX



Weighing systems

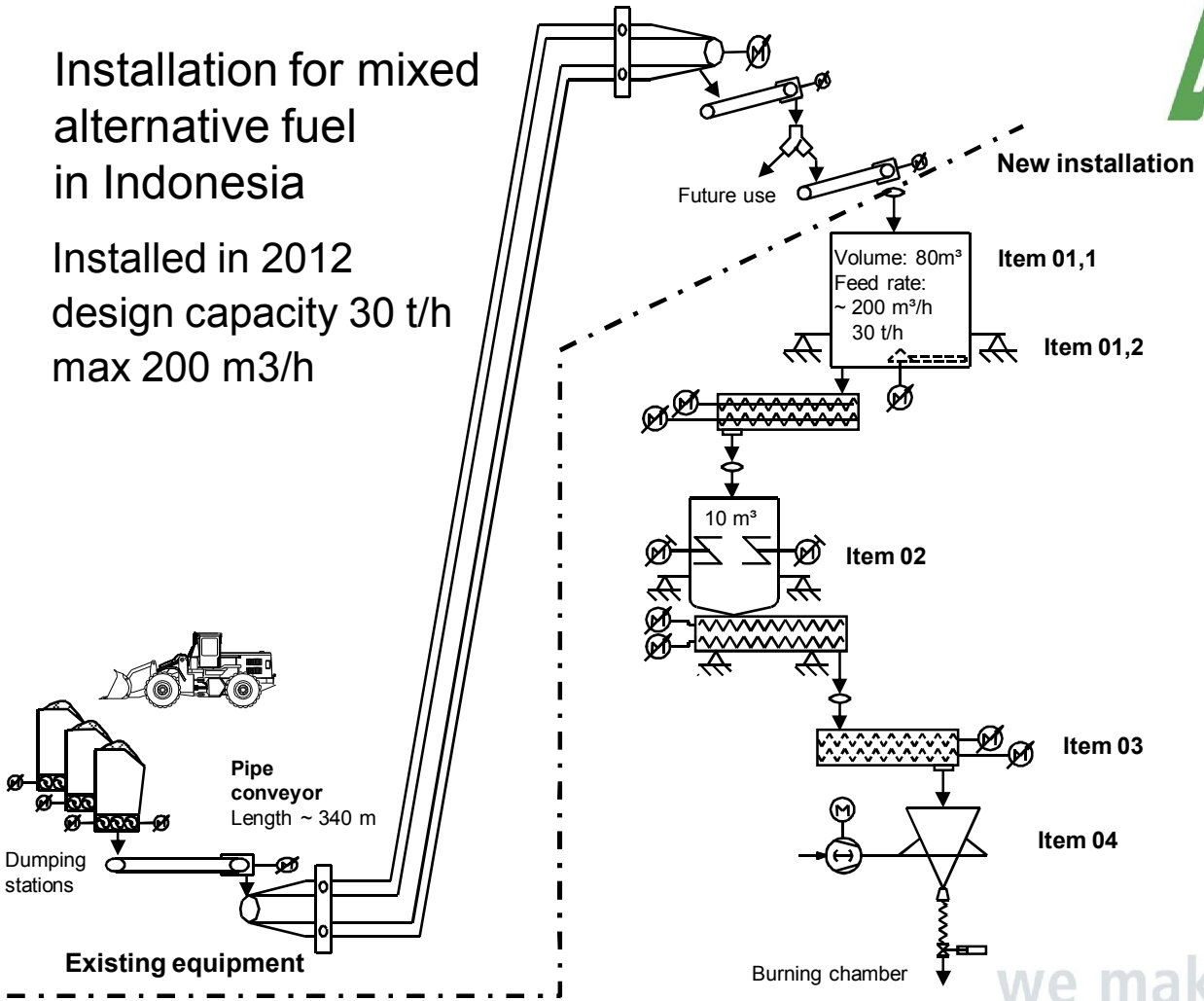
Screw weighfeeder MULTIFLEX

Hopper 25 m^3
Helix 2 x DN 400
Cap.: 200 m^3/h



Installation for mixed alternative fuel in Indonesia

Installed in 2012
design capacity 30 t/h
max 200 m3/h

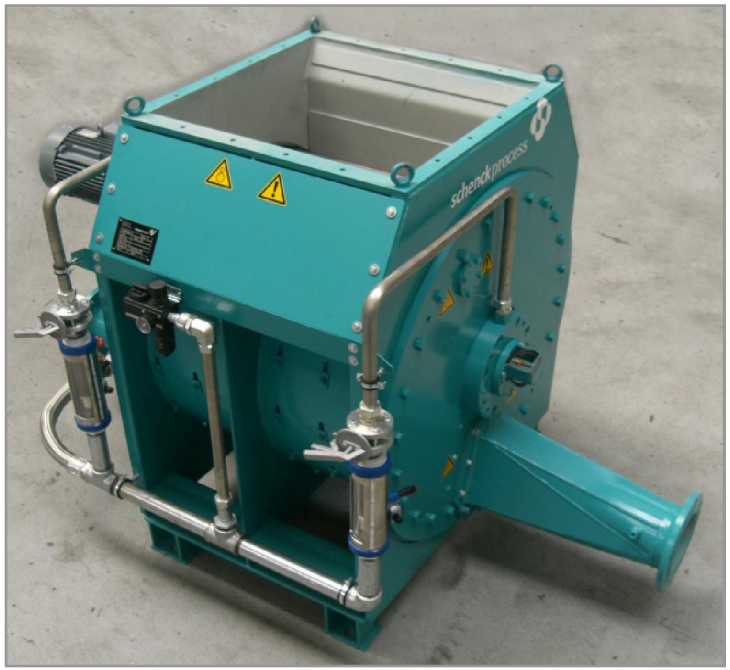


Equipment list:

Item 01,1	:	Buffer bin with agitator
Item 01,2	:	Bin weighing system
Item 02	:	MULTIFLEX A200
Item 03	:	Double Helix for transport
Item 04	:	Inducer

Pneumatical material transport

IDMS blow through rotary valve

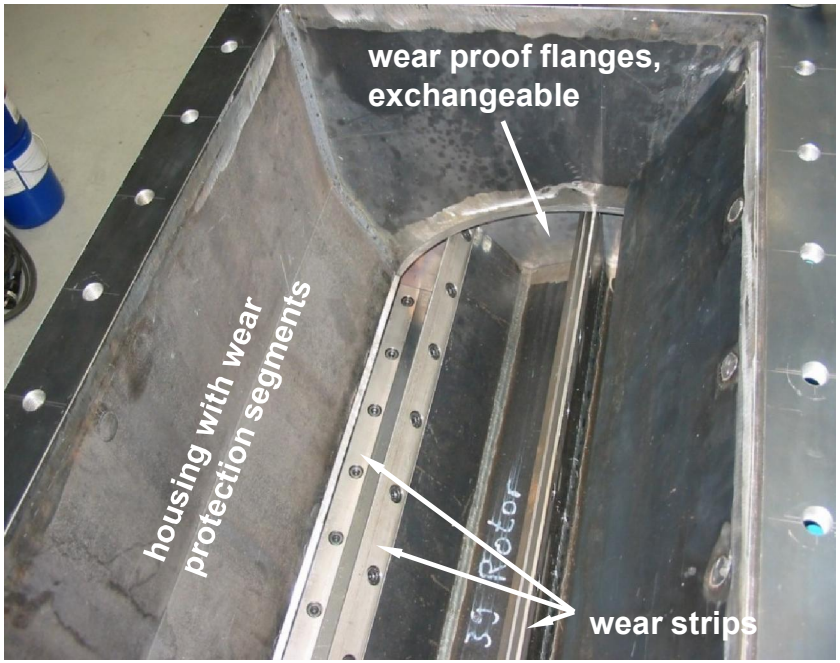


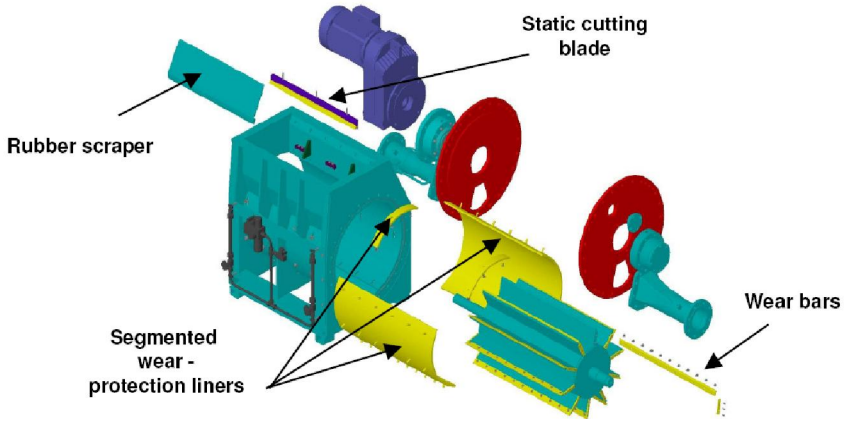
IDMS blow through rotary valve

- in-line feeding to pressurised pneumatic conveying systems
- all wear parts exchangeable from the plant site
- robust cutting blade for reliable handling of oversize material
- blow through design for feeding cohesive fuels
- high degree of filling through large inlet section
- feed rate up to 20 t/hr (200 m³/h)

Pneumatical material transport

IDMS blow through rotary valve





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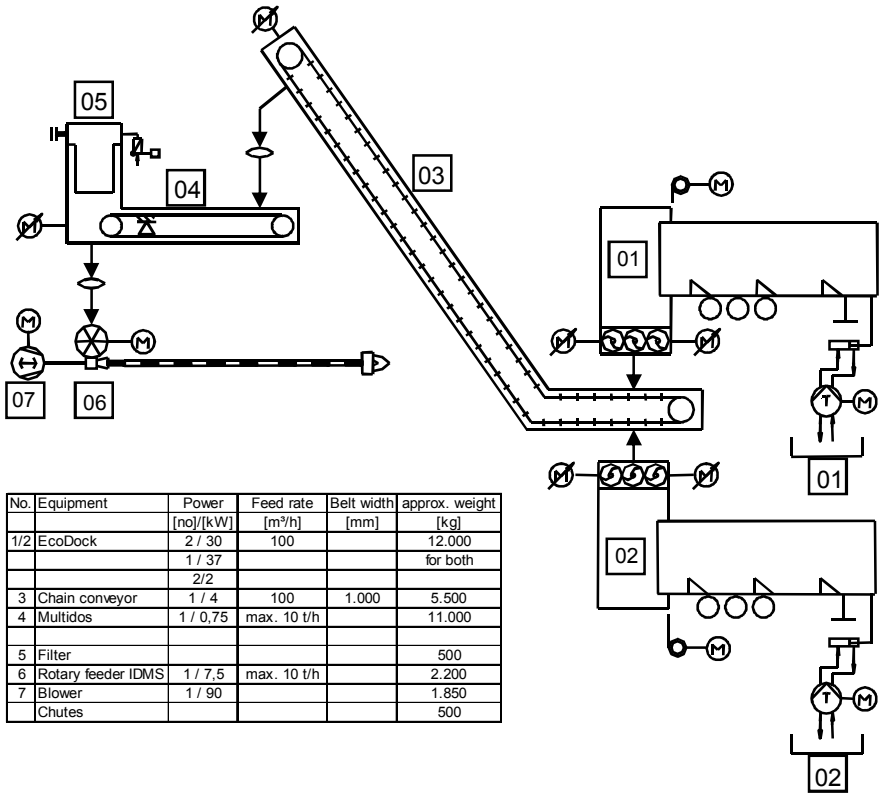
RDF dosing system in Thailand

Installed in 2013 / capacity 10 t/h



No.	Equipment	Power	Feed rate	Belt width	approx. weight
		[no]/[kW]	[m³/h]	[mm]	[kg]
1/2	EcoDock	2 / 30	100		12.000
		1 / 37			for both
		2/2			
3	Chain conveyor	1 / 4	100	1.000	5.500
4	Multidos	1 / 0,75	max. 10 t/h		11.000
5	Filter				500
6	Rotary feeder IDMS	1 / 7,5	max. 10 t/h		2.200
7	Blower	1 / 90			1.850
	Chutes				500

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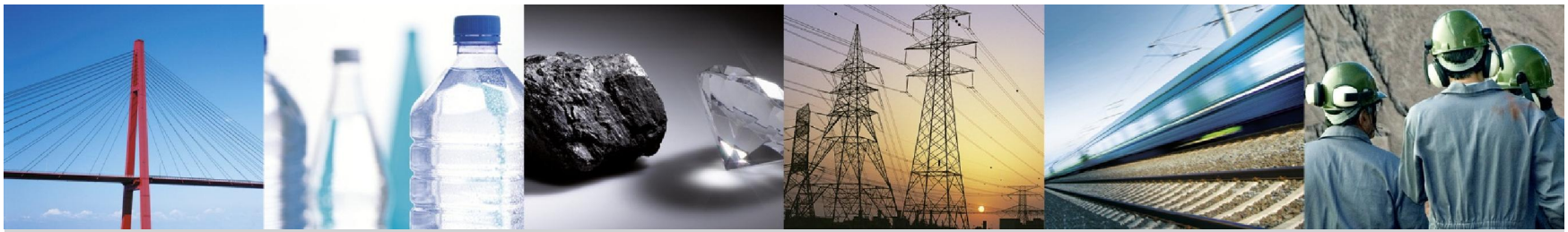

THANK YOU VERY MUCH
FOR YOUR ATTENTION

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