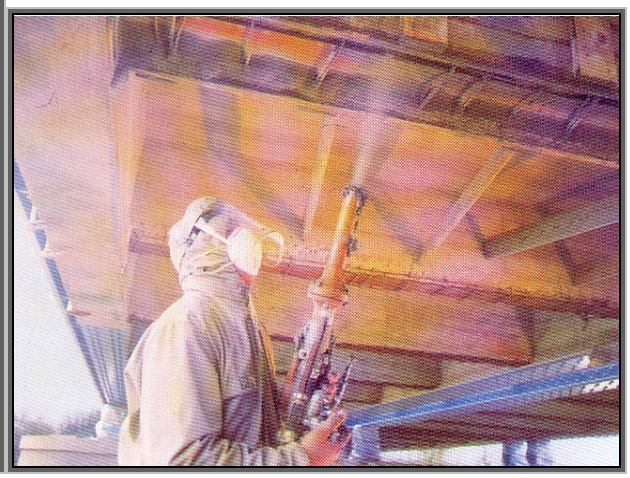
RED ENERGY SDN BHD (99405-H)
11A, JALAN PJS 11/20, BANDAR SUNWAY,
PETALING JAYA 46150,
SELANGOR, MALAYSIA
TEL : + 603 56347738 FAX : + 603 56345865 / 56345874
Website : www.redenergy.com.my
E-mail: felicia@redenergy.com.my
pcyap@redenergy.com.my, alexwong@redenergy.com.my

WEAR PROTECTION LINING

Densit



Densit® wear protection in

The cement industry

- ensures continuous operation of critical components

Continuous operation is essential to maximise return on investment in a cement plant. For economical running, maintenance costs must be minimised throughout the plant, requiring engineering skill and reliable components so that shutdowns can be scheduled.

In particular the heart of the process, the kiln, must always run as first priority. Unscheduled shutdowns must be avoided, primarily to avoid production loss but also to minimise maintenance costs.
Keeping energy consumption low is also an important factor in running an economical plant, affecting many aspects of process flow and component selection. Compliance with environmental dust control legislation is an increasing and vital priority.

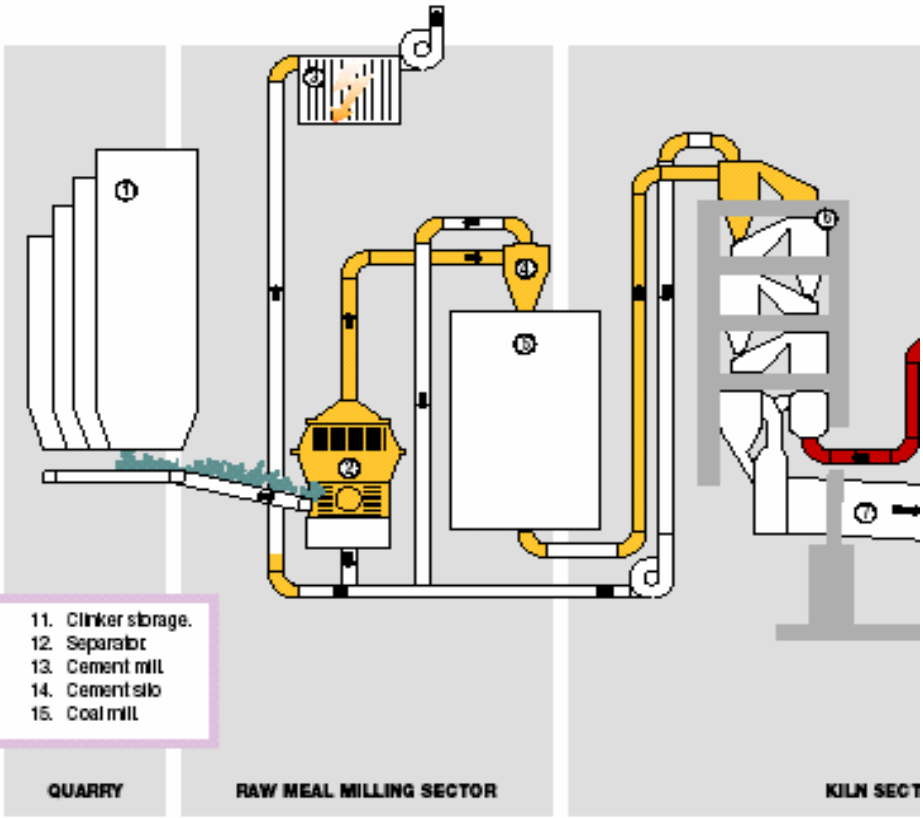
Densit® wear protection systems is a useful tool in the ongoing battle for continuous improvement and minimum operating costs. Reliable wear linings are essential for effective maintenance planning, and a Densit® solution offers both reliability and long life: less frequent planned maintenance, no unscheduled maintenance and no unexpected leaks.
Densit® wear protection systems can be designed to minimise heat loss in components, ducts and pipes.

Densit

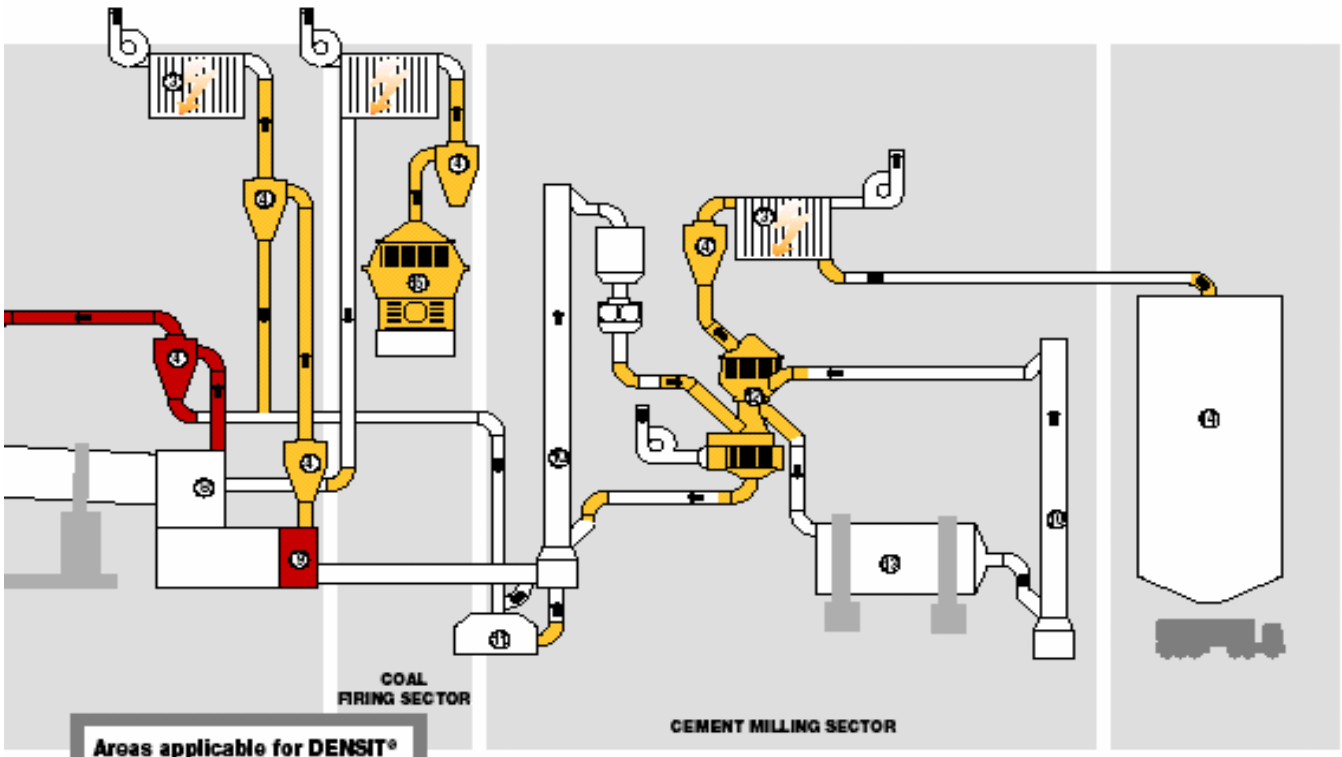
FLOW SHEET

Typical process flow in the cement industry, showing components where Densit® wear-resistant lining solutions are installed.

1. Rawmill storage.
2. Raw mill.
3. Filter
4. Cyclone.
5. Raw mill silo.
6. Pre-heater tower.
7. Kiln.
8. Cooler hood.
9. Clinker dedusting.
10. Elevator.
11. Clinker storage.
12. Separator
13. Cement mill.
14. Cement silo
15. Coal mill.



COMPONENT	PROCESS PARAMETERS	MEDIA TYPE	TYPICAL SERVICE TEMP.	RECOMMENDED DENSIT® SOLUTION
Pipes, ducts, bends, valves, conveyors, flash dryer, riser pipe for 1st stage preheater cyclone	Transport of process air, ground media, flue gases containing dust in variable concentrations.	Raw meal, clinker or cement.	Up to 450°C (840°F)	Densit® WearFlex/Cast 500 or Densit® WearFlex/Cast 2000 depending on media type. Densit® WearFlex 2000 HT for T>400°C. Prelined Densit® components. Eccentric or seamlessly graduated linings. Densulate concept where calorie conservation is required. Densit® WearTik 2000/DensiBond concept.
Tertiary air duct	Critical continuous operation component (kiln). Environment with variable complex chemistry dependent upon firing fuel.	Clinker.	700°C to 900°C (900°F to 1650°F)	Recommendation of lining product requires chemical analysis of system. Densulate concept where calorie conservation is required.
Vertical mill	Grinding of media.	Raw meal, coal, cement.	Up to 120°C (250°F)	Densit® WearFlex/Cast 500 or Densit® WearFlex/Cast 2000 depending on media type. Densit® WearTik 2000/DensiBond concept.
Separator	Separation of fine particles from process air.	Raw meal, coal, cement.	Up to 120°C (250°F)	Densit® WearFlex/Cast 500 or Densit® WearFlex/Cast 2000 depending on media type. Densit® WearTik 2000/DensiBond concept.
Dedusting cyclone, 1st preheater cyclone	Separation of fine particles from process air or flue gases.	Raw meal, clinker, coal, cement.	Up to 500°C (750°F)	Densit® WearFlex/Cast 500 or Densit® WearFlex/Cast 2000 depending on media type. Densit® WearFlex/Cast 2000 HT for T>400°C. Seamlessly graduated linings for most exposed sections (inlet, vortex finder, base outlet). Densulate concept. Densit® WearTik 2000/DensiBond concept.
Filter	Separation of fine particles from flue gases.	Raw meal, clinker, cement.	Up to 250°C (480°F)	Densit® WearFlex/Cast 500 or Densit® WearFlex/Cast 2000 depending on media type. Lining for inlets and outlets only. Densit® WearTik 2000/DensiBond concept.



Areas applicable for DENSIT®

Shade matches operating temperature:

- 0 – 400°C (32 - 750°F)
- 400 – 1200°C (750 - 2190°F)

RAW MEAL MILL

High electricity consumption operation, therefore operates most at off-peak electricity rates.

General process parameters relevant for wear:

Raw meal dust, low temperature.

COMPONENTS

Vertical raw meal mill:
Upper housing.

Raw meal mill separator.

Dedusting pipe:
Mill to cyclone/filter (pipe bends + inlet to filter).

Dedusting pipe:
Mill to cyclone/silo (pipe + pipe bends).

Raw meal dedusting cyclone.

KILN

Continuous operation critical.

General process parameters relevant for wear:

Raw meal and clinker dust, high temperature, alkali environment.

COMPONENTS

Riser pipe for 1st stage preheater cyclone: Duct + bends.

First stage preheater cyclone.

Tertiary air duct:
Duct + bends.

Tertiary air settling chambers.

COAL FIRING

Continuous operation critical.

General process parameters relevant for wear:

Coal dust, fly ash, low temperature.

COMPONENTS

Vertical coal mill:
Complete housing.

Coal mill separator.

Dedusting pipe:
Cyclone to filter (pipe bends, inlet to filter).

Coal burner:
Inlet to coal burner.

CEMENT MILL

General process parameters relevant for wear:

Cement/slag dust
Low temperatures.

COMPONENTS

Grate cooler:
Strategic parts.

Dedusting duct:
Clinker cooler to cyclone.
Cyclone to filter (pipe + pipe bends + inlet to filter).

Dedusting cyclone.

Vertical cement mill:
Top part housing.

High-efficiency separator.

Dedusting cyclones.

Pipe to cement stock:
Separator to filter (pipes + pipe bends + inlet to filter).

Chain conveyors.

DENSIT® ECONOMY WITH SEAMLESS AND FLEXIBLE LININGS

The intrinsic nature of Densit® wear lining systems means that they are completely jointless, and can be formed into any geometry. This flexibility provides the capability for installing seamlessly graduated eccentric linings of variable thickness. In this way the most economical lining solution is achieved, thicker protection being applied where wear is most extreme, and thinner protection where less wear occurs, with smooth graduation in between. This feature is particularly recommended for lining components such as pipes, ducts and cyclones, where wear exposure varies within the component. For the same reason, eccentric linings are especially recommended for pipe bends.

IN-SITU INSTALLATION

Densit® wear protection is applied by casting, trowelling or spraying, depending upon the component size and geometry. Densulate insulated linings are suitable for high-temperature applications where minimising heat loss is critical.

DENSIT® COMPONENTS

Pre-lined Densit® components in any geometry are also available, for situations where in-situ lining is impractical or uneconomical.

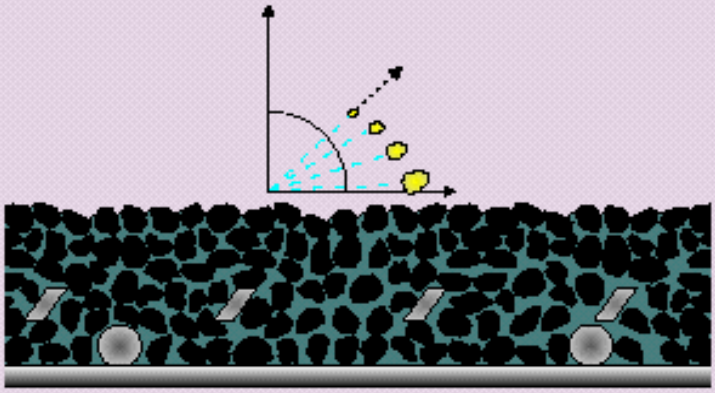
General

Technical Guidelines

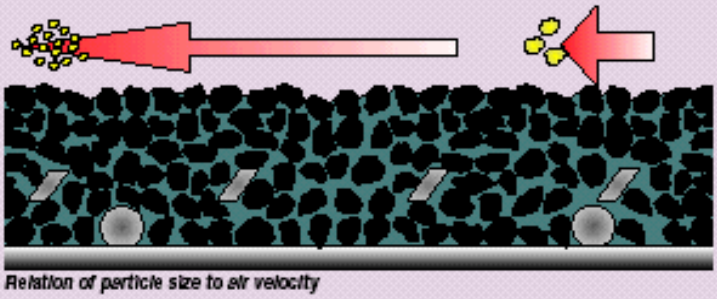
The lifetime of Densit® wear protection increases with reduction in particle size, slower particle velocity, and a smaller angle of particle impact.

Wear rates increase exponentially with particle velocity.

Wear rates increase with hardness and angularity of particles, determined by media mineralogy and physical form.



Relation of particle size to angle of incidence



Relation of particle size to air velocity

Densit

Data sheet

Densit® WearFlex 500
Densit® WearCast 500

- ambient temperature wear protection

Densit® WearFlex 500 and Densit® WearCast 500 wear-resistant lining provide excellent protection against low to moderate wear, at process temperatures of up to 400ºC (750ºF).

TECHNICAL DATA

The technical data depend upon curing temperature. The figures given are typical for 28 days curing at 20ºC.

PROPERTIES	Standard	Densit® WearFlex 500	Densit® WearCast 500
Density kg/m^3(lb/ft^3)	EN 1015-6	2400(149.8)	2400(149.8)
Compressive strength Mpa	EN 12190	100	130
Flexural strength Mpa	EN 196-1	16	16
Casting shrinkage Vol. %		0.2	0.2
Thermal conductivity w/mºC		1.5	1.5
Coefficient of thermal Expansion 1/ºC(1/ºF)	EN 1770	1.0 X 10^{-5} (5.6 X 10^{-5})	1.0 X 10^{-5} (5.6 X 10^{-5})
Maximum service Temperature ºC(ºF)		400 (750)	400 (750)
Abrasion resistance cm^3/50cm^2	DIN 52108	2.5 – 3.5	2.5 – 3.5
Erosion resistance min/cm^3		55	60
Chemical composition %CaO %SiO_2		16 82	16 82
Typical thickness mm(in)		20 - 50 (0.8 - 2.0)	20 - 50 (0.8 - 2.0)

Data sheet

Densit® WearFlex 1000
Densit® WearCast 1000

- Moderate temperature wear protection

Densit® WearFlex 1000 and Densit® WearCast 1000 wear-resistant lining provide excellent protection against moderate to severe wear, at process temperatures of up to 400ºC (750ºF).

TECHNICAL DATA

The technical data depend upon curing temperature. The figures given are typical for 28 days curing at 20ºC.

PROPERTIES	Standard	Densit® WearFlex 1000	Densit® WearCast 1000
Density kg/m^3(lb/ft^3)	EN 1015-6	2750	2750
Compressive strength Mpa	EN 12190	130	150
Flexural strength Mpa	EN 196-1	18	20
Casting shrinkage Vol. %		0.2	0.2
Thermal conductivity w/mºC		1.5	1.5
Coefficient of thermal Expansion 1/ºC(1/ºF)	EN 1770	1.0 X 10^{-5} (5.6 X 10^{-5})	1.0 X 10^{-5} (5.6 X 10^{-5})
Maximum service Temperature ºC(ºF)		400 (750)	400 (750)
Abrasion resistance cm^3/50cm^2	DIN 52108	1.7 – 2.0	1.7 – 2.0
Erosion resistance min/cm^3		70	80
Chemical composition %CaO %SiO_2 %Al_2O_3+TiO_2		21 16 58	21 16 58
Typical thickness mm(in)		20 - 50 (0.8 - 2.0)	20 - 50 (0.8 - 2.0)

Data sheet

Densit® WearFlex 2000
Densit® WearCast 2000

- Moderate temperature wear protection

Densit® WearFlex 2000 and Densit® WearCast 2000 wear-resistant lining provide superior protection against moderate to severe wear, at process temperatures of up to 400ºC (750ºF).

TECHNICAL DATA

The technical data depend upon curing temperature. The figures given are typical for 28 days curing at 20ºC.

PROPERTIES	Standard	Densit® WearFlex 2000	Densit® WearCast 2000
Density kg/m^3(lb/ft^3)	EN 1015-6	2850 (177.9)	2850 (177.9)
Compressive strength Mpa	EN 12190	160	170
Flexural strength Mpa	EN 196-1	20	23
Casting shrinkage Vol. %		0.2	0.2
Thermal conductivity w/mºC		1.5	1.5
Coefficient of thermal Expansion 1/ºC(1/ºF)	EN 1770	1.0 X 10^{-5} (5.6 X 10^{-5})	1.0 X 10^{-5} (5.6 X 10^{-5})
Maximum service Temperature ºC(ºF)		400 (750)	400 (750)
Abrasion resistance cm^3/50cm^2	DIN 52108	0.5 – 1.0	0.5 – 1.0
Erosion resistance min/cm^3		130	140
Chemical composition %CaO %SiO_2 %Al_2O_3+TiO_2		14 30 53	14 30 53
Typical thickness mm(in)		20 - 50 (0.8 - 2.0)	20 - 50 (0.8 - 2.0)

Data sheet

Densit® WearFlex 2000 HT
Densit® WearCast 2000 HT

- Superior ambient temperature wear protection

Densit® WearFlex 2000 HT and Densit® WearCast 2000 HT wear-resistant lining provide superior protection against moderate to severe wear, at process temperatures of up to 1200ºC (2190ºF). Combined with insulation, these linings minimize loss of process heat radiation.

TECHNICAL DATA

The technical data depend upon curing temperature. The figures given are typical for 28 days curing at 20ºC.

PROPERTIES	Standard	Densit® WearFlex 2000 HT	Densit® WearCast 2000 HT
Density kg/m^3(lb/ft^3)	EN 1015-6	2970 (185.40	3000 (187.3)
Compressive strength Mpa	EN 12190	135	170
Flexural strength Mpa	EN 196-1	15	16
Casting shrinkage Vol. %		0.2	0.2
Thermal conductivity w/mºC		1.5	1.5
Coefficient of thermal Expansion 1/ºC(1/ºF)	EN 1770	1.0 X 10^{-5} (5.6 X 10^{-5})	1.0 X 10^{-5} (5.6 X 10^{-5})
Maximum service Temperature ºC(ºF)		1200 (2190)	1200 (2190)
Shrinkage after firing at 500 ºC %		0.1	0.1
Shrinkage after firing at 800 ºC %		0.3	0.3
Shrinkage after firing at 1200 ºC %		0.3	0.3
Abrasion resistance cm^3/50cm^2	DIN 52108	0.5 – 1.0	0.5 – 1.0
Erosion resistance min/cm^3		140	175
Chemical composition %CaO %SiO_2 %Al_2O_3+TiO_2		6 7 84	6 7 84
Typical thickness mm(in)		20 - 50 (0.8 - 2.0)	20 - 50 (0.8 - 2.0)

RED ENERGY SDN BHD (99405-H)
11A, JALAN PJS 11/20, BANDAR SUNWAY,
PETALING JAYA 46150,
SELANGOR, MALAYSIA
TEL : + 603 56347738 FAX : + 603 56345865 / 56345874
Website : www.redenergy.com.my
E-mail: felicia@redenergy.com.my
pcyap@redenergy.com.my, alexwong@redenergy.com.my