TRIBO S.R.O.

non-metallic
wear resistant materials

multiplied life span
of industrial equipment

more
www.iTRIBO.cz

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Introduction of the company and its activities:

TRIBO s.r.o. provides for complex service in protection of industrial facilities, objects and machines against unnecessary wear caused by wear in possible combination with high temperatures or corrosion.

We offer:

Protection of industrial facilities against wear
Supplies of wear resistant materials
Consulting and recommendations when selecting suitable wear resistant materials
Complex service

Company activities:

Solutions - consulting, studies, concept designs, introductory projects
Projecting activities - own projects, constructing, assembly technologies
Trading - bid processing, direct supplies, assemblies, user service
Manufacturing - manufacturing and development of own wear resistant materials

Advantages for you:

Multiplied life span of your industrial equipment
We help you in resolving your wear problems
We recommend optimal economical and quality solutions of your problems
We recommend and supply suitable materials for the wear resistant protection
We implement applications (assembly) of wear resistant protection means

Enlargement:

By implementing a wide range of suitable wear resistant materials in specially exposed places, we provide customers for multiplied life span of their equipment. The most suitable wear resistant materials are consulted with customers in order to make the resulting protection the best suited to customers' technological and economical conditions.

The company utilises the long-term experience of its workers in the tribology industry and its commercial contacts with important world companies active in the same industry for the optimising of all its solutions.

Our services do not have to create a complex unit. We may provide for consulting, projects, and studies separately, or we can participate in a project only as a supplier of materials and, possibly, supervise their processing and applications. Specific forms of co-operation and project completion always depend on agreements made with the relevant customer.

As the utilisation of wear resistant materials is very extensive in practice and cannot be restricted to any specific list of uses, we are ready to resolve our customers' problems individually and prepare an offer of the best solution, which combines the customer's quality demands with the price of the equipment protection.

WEAR RESISTANT CONCRETE

Tribet

1000
2000
3000

Special wear resistant kinds of concrete make up a group of modern wear resistant materials, which provide for excellent wear resistant characteristics, very simple applications on protected equipment, and acceptable prices.

The application of Tribet kinds of concrete is based on the creation of wear resistant lining on the surface of equipment exposed to attrition. The lining is created by common masonry technologies on metal surfaces of the equipment equipped with a holding mesh, which ensures the perfect gripping of the lining and the base. The resistance of the lining allows for local regulation, according to the local exposure to attrition, by the application of different kinds of Tribet concrete and by the continuous increases, or decreases in the lining thickness. The thickness of the lining varies mostly within the range from 15 to 30mm. Thanks to the simple nature of the lining application there are no restrictions in regard to the equipment shape.

The extensive range of Tribet kinds of concrete allows for the provision of a suitable protection of equipment, according to the existing conditions and according to the economic requirements of the investor. A suitable selection of the wear resistant Tribet kind of concrete and its lining thickness allows for the regulation of the appropriate quality (the life span of the protected equipment) and the protection application price ratio.

The excellent strength characteristics of the Tribet kinds of concrete exist thanks to the special cement bonding, which is several times stronger than usual kinds of cement. Wear resistance is ensured by the hardness of the concrete aggregate. The Tribet material aggregates are prepared on the corundum mineral base.

WEAR RESISTANT CONCRETE

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ADVANTAGES OF A LINING MADE OF WEAR RESISTANT KINDS OF CONCRETE

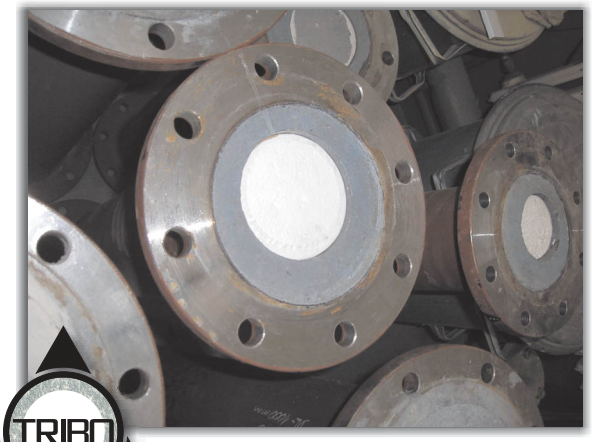
(compared especially with cast basalt formpieces)

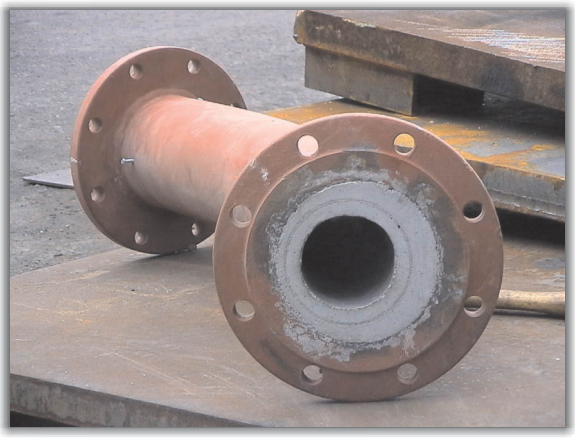
- ☑ **Up to 4 times higher wear resistance than cast basalt**
- ☑ **Uniform and compact protection surfaces without cracks**
- ☑ The lining can cover **equipment of any complex shape** (no tiles must be assembled)

Quality variations of the concrete kinds:

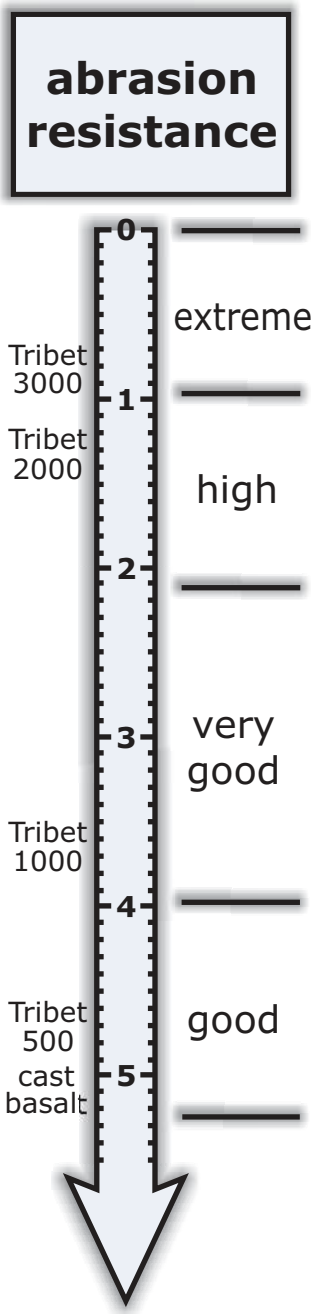
- ☑ **A suitable concrete kind is selected**, according to the local exposure to attrition - the transition between different kinds of concrete is continuous
- ☑ **A suitable thickness of the protective layer is selected**, according to the local exposure to attrition - the transition between different kinds of concrete is continuous
- ☑ The kind and the thickness of concrete lining is selected, **according to economic requirements and the required life span**

- ☑ **The perfect concrete gripping on the surface** is ensured by the weld on steel mesh inside the lining
- ☑ **Simple and fast application of the lining** in the form of classic masonry works
- ☑ **Savings of weight and thickness of the lining**
- ☑ **Easy and safe handling in bags to the lining application places**





Tribet 1000 2000 3000



Tribet 3000

Characterization:	high abrasion resistivity, suitable to extremely strain segments of plant
Abrasion resistance*:	0,8 - 1
Base (Content):	pure corundum-sand with optimal granulity
Max. temperature:	350°C
Density:	2900 kg/m^3
Characteristic applications:	Bends in air-operated transport, mills, crushers

Tribet 2000

Characterization:	very good abrasion resistivity, suitable to most of applications
Abrasion resistance*:	1,2 - 1,4
Base (Content):	pure corundum-sand with natural granulity
Max. temperature:	350°C
Density:	2900 kg/m^3
Characteristic applications:	Cyclone clarifiers, bends in suction piping, straight sections in the air-operated transport, masse conveyers, conveyors, chutes, separators

Tribet 1000

Characterization:	good abrasion resistivity, suitable to less strain segments of plant
Abrasion resistance*:	3,5 - 3,8
Base (Content):	corundum-baddeleyit sand
Max. temperature:	350°C
Density:	2700 kg/m^3
Characteristic applications:	Straight sections in the suction piping less strain segments of cyclones, chutes

***) Abrasion resistance**
is measured by method Böhme (DIN 52108). The number is determine decrease of capacity in cm^3 on area 50 cm^2 on standard abrading.

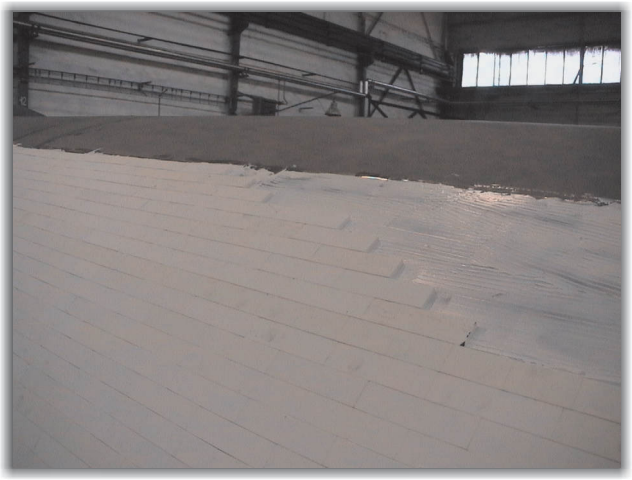
WEAR RESISTANT CERAMIC

Keralox

KERALOX (Alumina ceramic)

Specifications:	the highly wear resistant ceramics prepared on the sintered corundum base
Abrasion resistance:*	less than 0.1
Form:	plates of different sizes up to 100 x 150 x 25mm
Application:	gluing on surfaces with silicone glues and cements
Thermal resistance:	the material itself up to 1600°C (the resulting resistance is decreased down to about 240°C by the glue)
Density:	3650 kg/m^3
Usually used lining thickness:	6 or 12 mm
Characteristics:	extremely high resistance against wear, the lining is light and thin (when 6 mm thick, it weights about 22 Kg/m^2)
Characteristic applications:	the most wear exposed places bends in air-transport, cyclone clarifiers, separators, and crushers

*) see page 4



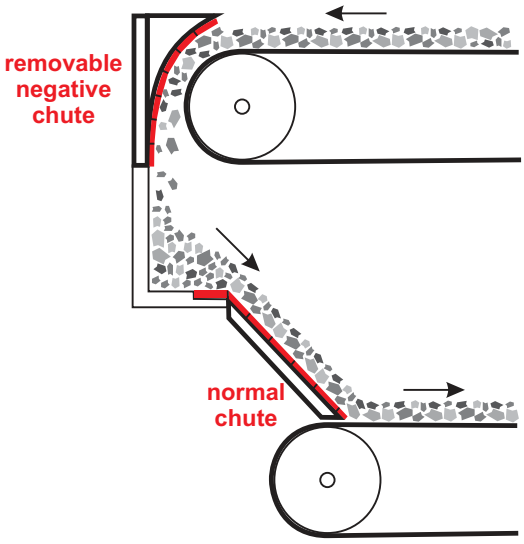
WEAR RESISTANT CERAMIC

Baddalox

BADDALOX (Zirconia ceramic)

Specifications:	the highly wear resistant cast material
Abrasion resistance:*	0.7
Form:	castings (e.g. the modules of grill separators, or tiles of the sizes of about 200 x 200 x 30mm)
Application:	gluing on the surface by concrete, etc.
Thermal resistance:	the material itself up to 1 700°C
Density:	3400 kg/m^3
Usually used lining thickness:	30 mm
Characteristics:	castings of different shapes, a very high wear resistance
Characteristic applications:	places highly exposed to wear outlets, chutes, grill separators individual castings allow for the setting up of highly wear resistant bars for grill separators (when used for the coke separation, up to 10 times longer life span than metal rods)

*) see page 4



Typical examples of the use of wear resistant materials in transport and processing of abrasive materials:

Operations:

- Cement works
- Coking plants
- Iron and steel works
- Coal power stations
- Paper-mills
- Incinerators
- Foundries

Facilities:

Coal and cement mills
Sorters and separators
Cyclone clarifiers
Tubes for air-operated transport
Suction pipelines
Combustion channels
Scroll feeders
Compensators
Sally boxes
Chutes, outlets
Storage bins
Separators
Silos
Masse conveyers
Hoppers
Conveyors

Abrasive materials:

Cement, clinker, cement dust, slag, coke, coke dust, coal, coal dust, combustion products, wooden pulp, fly ash, silica sand, sparry sand

problem solving:

OUR MATERIALS

KERALOX (alumina ceramic)

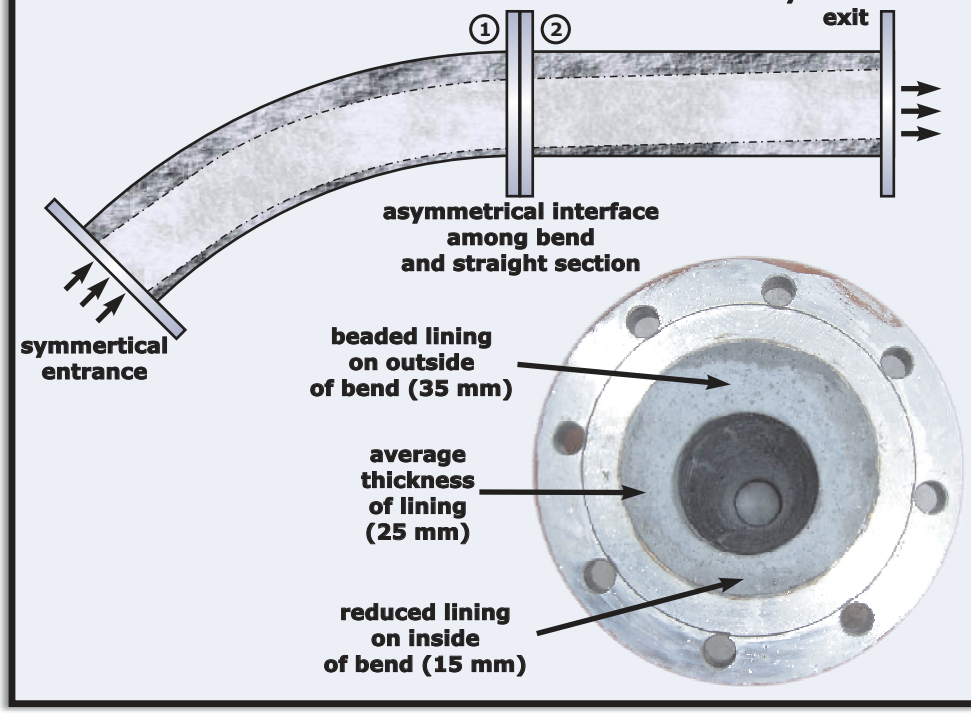
WEAR RESISTANT CONCRETE

Tribet 1000 2000 3000

BADDALOX (zirconia ceramic)

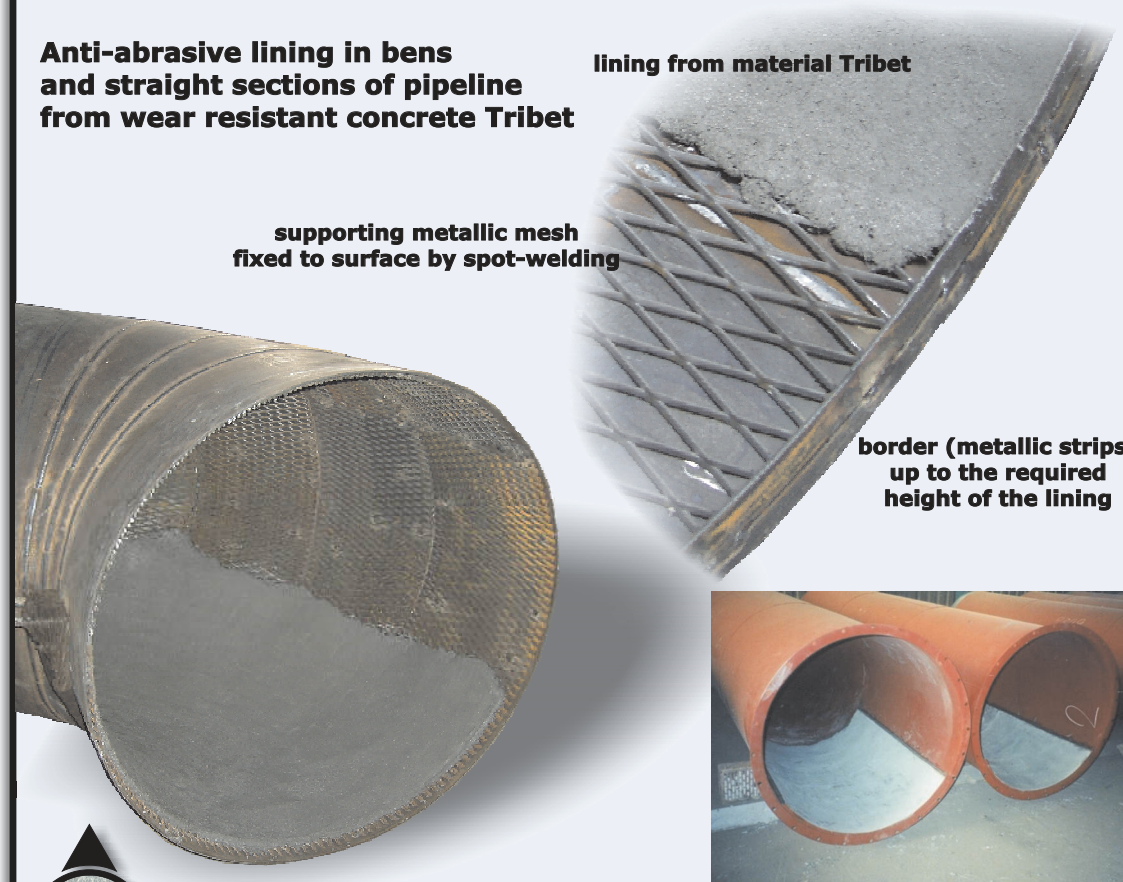
AIR-OPERATED TRANSPORT
(slim diameters)

**Anti-abrasive lining in bend (1)
and outbound straight section of pipeline (2)
from wear resistant concrete Tribet**



SUCTION PIPING
(wide diametres)

**Anti-abrasive lining in bens
and straight sections of pipeline
from wear resistant concrete Tribet**



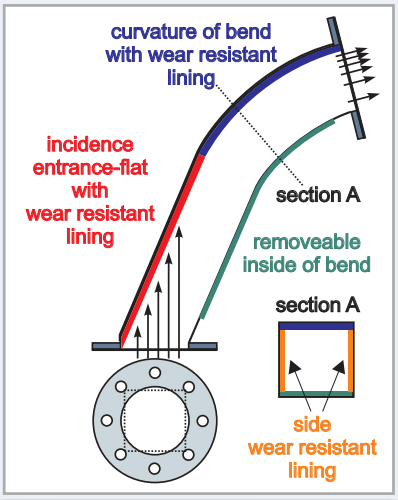
SPECIAL BENDS
WITH EXTREME WEAR RESISTANCE

Model 1:

BEND WITH RECTANGULAR CROSS-SECTION

Description and advantages:

1. Bend cross-section is not circular, but rectangular ⇨ abrasive particles press and change flow direction on bigger surface ⇨ heavy reduction of abrasion impact
2. The most stressed flat is protected by extreme wear resistant materials (Keralox, Baddalox)
3. Bend curvature is not equable ⇨ incidence angle of particle streem in bend entrance is constant and acceptable low
4. Inside of bend can be removeable ⇨ easy checkning and repair of wear resistant lining without demounting bend from operation ⇨ there is no need to bend ever change

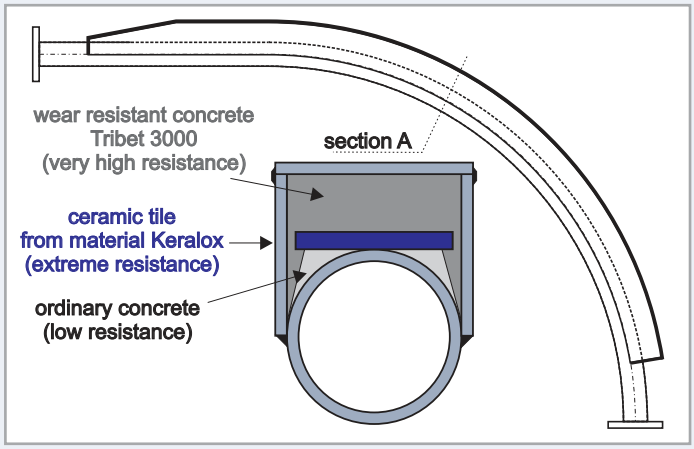


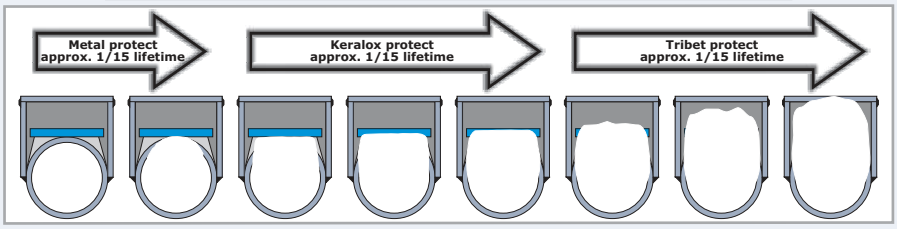
Model 2:

BEND WITH SANDWICH POCKET

Description and advantages:

1. Outside wear resistant lining is flat after primary pipe wear ⇨ abrasive particles press and change flow direction on bigger surface ⇨ heavy reduction of abrasion impact
2. The most stressed flat is protected by extreme wear resistant materials (Keralox, Baddalox)
3. It is possible make bend together with outbound straight section, which is also very subjected to abrasion
4. There is no need to change pipeline diameter and to make atypical join-flange due to lining
5. After total pipe-lining wear it is possible repair the bend and return this to operation

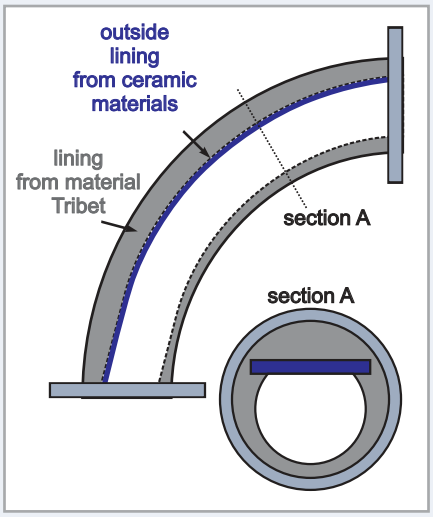




Model 3: **BEND WITH SANDWICH LINING**

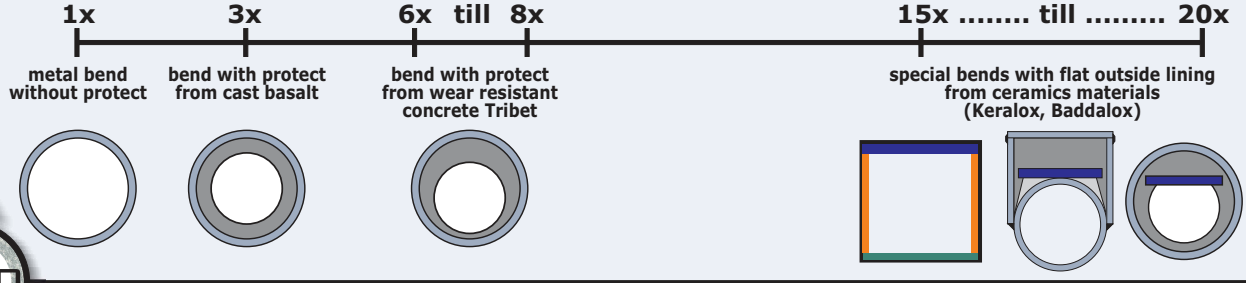
Description and advantages:

1. Outside wear resistant lining is flat ⇨ abrasive particles press and change flow direction on bigger surface ⇨ heavy reduction of abrasion impact
2. The most stressed flat is protected by extreme wear resistant materials (Keralox, Baddalox)
3. Wear resistant lining is not equally curved ⇨ incidence angle of particle streem in bend entrance is constant and acceptable low



APPROXIMATE LIFETIMES OF BENDS IN ABRASIVE INFLUENCE

(lifetime multiple of bend without protect)



Trademark:		TRIBET 3000	TRIBET 2000	TRIBET 1000
Content (base):		Corundum	Corundum	Corundum-baddeleyite
Form of installation:		mortar or cast	mortar or cast	mortar or cast
Abrasion resistance (DIN 52108 Böhme):	$cm^3/50cm^2$	0,8 -1	1,2 - 1,4	3,5 - 3,8
Physical properties:				
Thermal resistance:	°C	350	350	350
Max. short-time thermal load (max. 15 min.):	°C	400	400	400
Volume weight:	kg/m^3	2900	2900	2700
Maximum grain-size:	mm	3	3	3
Casting shrinkage:	%	0,2	0,2	0,2
Strength after 2 days (in 20°C):				
Compressive strength (% from final strength):	%	60-70	60-70	60-70
Flexural strength (% from final strength):	%	60-70	60-70	60-70
Strength after 28 days (in 20°C):				
Compressive strength:	N/mm^2	180	175	155
Flexural strength:	N/mm^2	25	22	17
Thermal properties:				
Specific heat:	kJ/kg°C	0,9 - 1,0	0,9 - 1,0	0,9 - 1,0
Thermal conductivity:	W/m°C	1,5	1,5	1,5
Coefficient of thermal expansion:	1/°C	$1,0 \times 10^{-5}$	$1,0 \times 10^{-5}$	$1,0 \times 10^{-5}$
Chemical composition:				
CaO	%	14	14	14
SiO_2	%	17	17	26
Al_2O_3	%	65	65	35
ZrO_2	%			21
Next properties:				
Mass activity Ra 226:	Bq/kg	15	15	15
Aggregate steel fibres:	hmot. %	4,5 - 8,0	4,5 - 8,0	4,5 - 8,0
Water addition into concrete:	hmot. %	6 - 7	7 - 8	7,5 - 8,5
Material usage at 10 mm thickness:	kg/m^2	29	29	27

Mentioned values was measured by Technical and Test Institute for Construction Prague (member of European Union for Technical Approvals in Construction and World Federation of Technical Assessment Organisations), which issued Certificate No. 060-039148 on materials Tribet.
Mentioned values constitute mean value at standard type. These are not values warranted in terms of guarantee.

WEAR RESISTANT CONCRETE

Tribet

DATA SHEET

1000
2000
3000

REFERENCE LIST

wear resistant concrete TRIBET

Cement factory Salonit Ahnovo (Slovenia):
wear resistant lining in cyclones, exhaust pipelines and separator

Cement factory Lukavac (Bosnia and Herzegovina):
wear resistant lining in cyclones, exhaust pipelines and separator

Cement factory Voskresensk (Russia):
wear resistant lining in cyclones, exhaust pipelines and separator

Cement factory Beocin (Serbia):
wear resistant lining in cyclones, exhaust pipelines and separator

Cement factory Ladce (Slovakia):
wear resistant lining in cyclones, exhaust pipelines and separator,
wear resistant lining in pipelines for air-operated transport of coal dust

OKD, OKK, a.s. - Coking plant Svoboda (Czech Rep. - Ostrava):
wear resistant lining in pipelines for air-operated transport of coke dust

Trinecke zelezarny a.s. - Moravia Steel a.s. (Czech Rep. - Trinec):
wear resistant lining in cyclones and pipelines for exhaust a coke dust

BADDALOX (Zirconia ceramic)

OKD, OKK, a.s. - Coking plant Svoboda, Coking plant Sverma (Czech Rep. - Ostrava):
ceramic grill separators for sorting coke,
chutes for transport of coke

Trinecke zelezarny a.s. - Moravia Steel a.s. (Czech Rep. - Trinec):
ceramic grill separators for sorting coke
chutes for transport of coke

Technistone s.r.o. (Czech Rep. - Hradec Kralove):
wear resistant lining in U-pipes for air-operated transport of silica sand

KERALOX (Alumina ceramic)

Trinecke zelezarny a.s. - Moravia Steel a.s. (Czech Rep. - Trinec):
wear resistant lining in cyclones and pipelines for exhaust a coke dust

ZPS Zlin a.s. (Czech Rep. - Zlin):
wear resistant lining in U-pipes for air-operated transport of silica sand

Steel-foundry Vsetin (Czech Rep. - Vsetin):
wear resistant lining in U-pipes for air-operated transport of silica sand