



**průmyslová
keramika**

REFRACTORY
MATERIALS FOR POWER
AGGREGATE LINING

**“Everything will burn
perfectly on our lining”**

OUR ADVANTAGES:

- o Tailor-made refractory materials
- o On time deliveries
- o Lining engineering and construction
- o Cooperation with prestigious companies
- o Technical assistance and installation supervision
- o Quick responses to changes in the preparation and implementation stages
- o All types of fuels (gas, liquid fuels, coal, wood, biomass, wastes)



LININGS FOR WIDE PERFORMANCE SPECTRE OF AGGREGATES

- | | |
|---|-----------------------|
| A) Small residential heating appliances (stoves, cookers, fireplaces, pots) | ~ 10 kW |
| B) Small boilers for larger buildings | ~ 100 kW |
| C) Medium-sized boilers | ~ 1,000 kW (1 MW) |
| D) Large boiler houses, small power generation units | ~ 10,000 kW (10 MW) |
| E) Large power generation units | ~ 100,000 kW (100 MW) |
| F) Incineration plants | |
| G) Cremation kilns | |

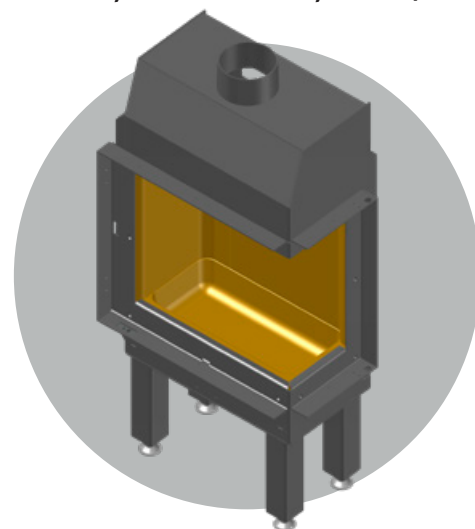


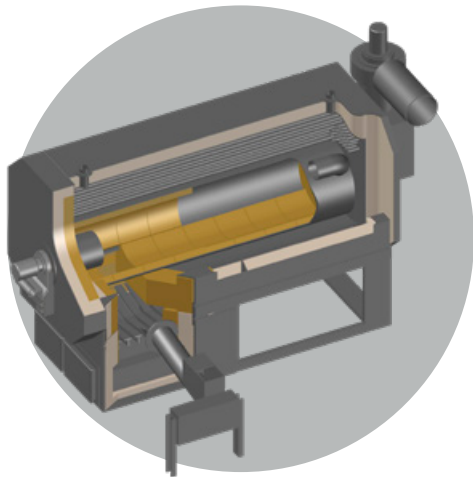
A) SMALL RESIDENTIAL HEATING APPLIANCES (STOVES, COOKERS, FIREPLACES, POTS)

Stoves
Cookers
Fireplaces
Small pots
Pizza ovens

Materials: pre-formed castable shapes, special pre-formed shapes, stove-fitting mortars, plasters, mastics

Requirements to linings: resistance to thermal shock, resistance to alkali bursting, complicated shapes, surface image



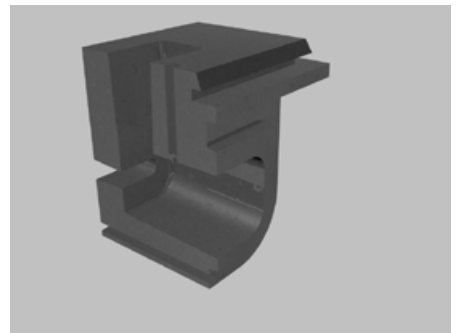
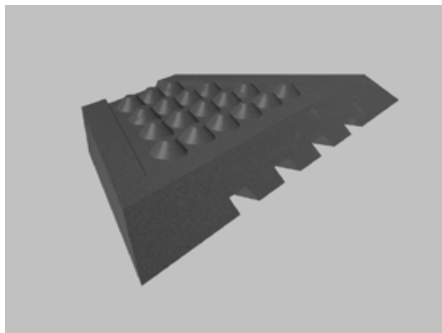
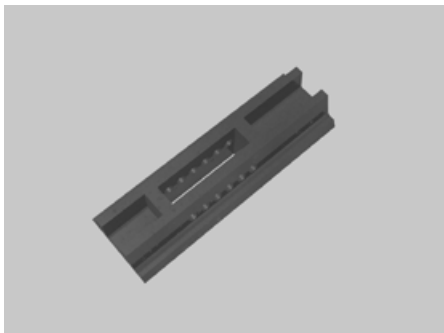
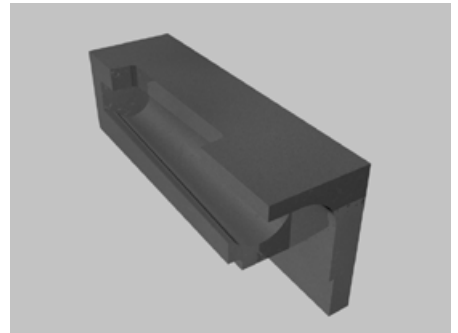
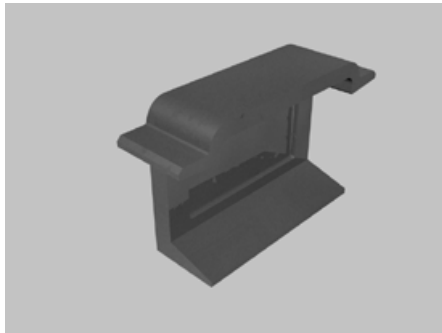
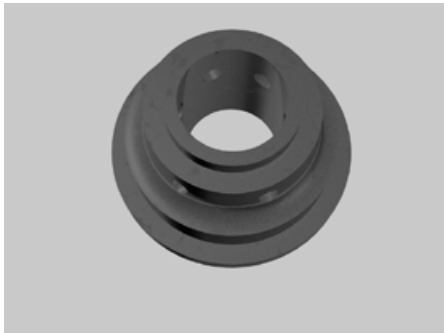


B) and C) SMALL AND MEDIUM-SIZED BOILERS

Predominating fuels: coal, wood, biomass

Materials: mainly pre-formed shapes

Requirements to linings: resistance to thermal shock, mechanical strength, resistance to alkali bursting



D) and E) LARGE BOILER HOUSES, LARGE POWER GENERATION UNITS

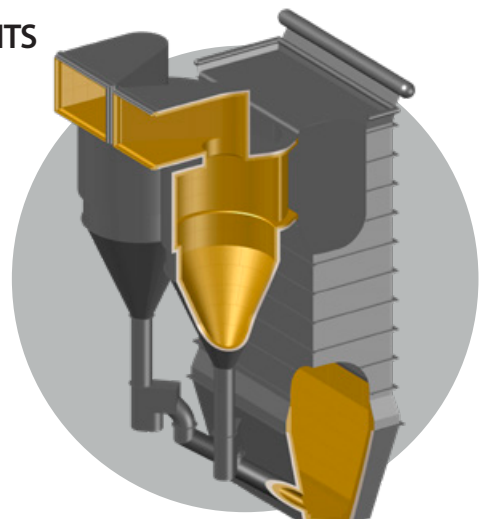
Coal and biomass for lower performances

Coal prevails for high performances: grate firing boilers, pulverized fuel fired boilers, fluidized-bed boilers

Materials: mainly monolithic linings made from refractory castables, moulded, gunning castables

Requirements to material:

- strength and abrasion resistance
- resistance to alkali bursting
- resistance to lining disruption by CO
- requirements to different thermal conductivity (e.g., higher – materials containing SiC)
- requirement to bad adhesion of build-ups
- requirement to hot and cold repair without protracted first tempering



F) WASTE INCINERATORS

General requirements to linings:

- resistance to chemical corrosion, products of combustion (gases, melts)
- abrasion resistance
- thermostability (discontinuous service)

Chamber kilns

Hospital and hazardous waste

Materials: prefabricated blocks, partially monoliths

Rotation kilns

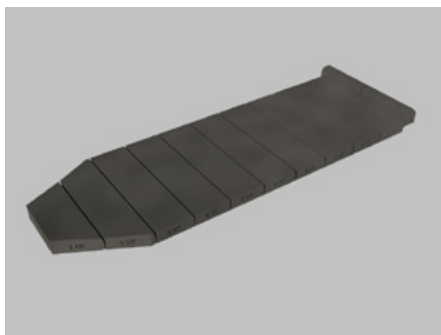
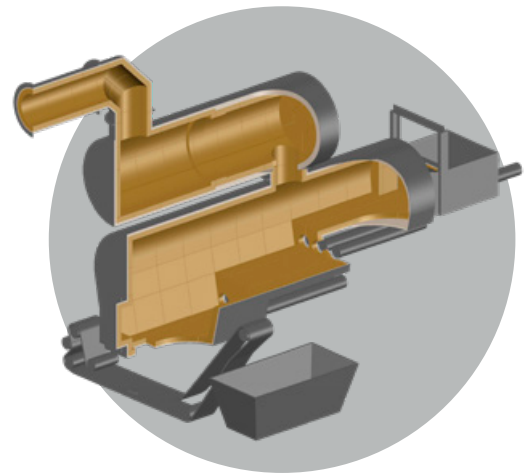
Primarily industrial waste, contaminated with soil

Materials: pre-formed shapes, monoliths, frequently resistant to melt corrosion

Municipal waste incineration plants (boilers)

Mainly municipal waste

Materials: SiC pre-formed shapes, SiC monoliths, refractory castables, SiC ramming mixes



G) CREMATION KILNS

Pre-formed shapes

- Requirements to materials:**
- thermostability (thermal shock resistance)
 - abrasion resistance
 - resistance to alkali bursting

Base materials for the power generation facility lining

A) SPECIAL PRE-FORMED SHAPES FOR BOILERS BURNING WOOD, PELLETS AND BIOMASS – THE MOST DEMANDING PARTS OF THE BOILER

Type of Product	Installation method	Basic raw material	Classification temperature [°C]	Material required [kg.m ⁻³]	Chemical analysis [%]		Cold crushing strenght min. [MPa]	Permanent lineare change (1400) °C max [%]	Thermal conductivity [W.m ⁻¹ .K ⁻¹]			
					Al ₂ O ₃	SiC			400 °C	600 °C	800 °C	1000 °C
NAPAG MSIC30	only shapes	mullite, SiC	1500	2400	40	30	70	0.4				
NAPAG ASIC60	only shapes	andalusite, SiC	1500	2450	25	60	70	0.2				
NAPAG SiC90	only shapes	SiC	1500	2420		90	70	0.2	7.7	9.3	10.3	10.7

B) MATERIALS FOR PRE-FORMED CASTABLE SHAPES FOR BOILERS BURNING WOOD, BIOMASS ETC., CREMATION KILNS

Type of Product	Installation method	Basic raw material	Classification temperature [°C]	Material required [kg.m ⁻³]	Grain size [mm]	Chemical analysis [%]			Mixing liquid	Cold crushing strenght [MPa]			Permanent lineare change (x) °C max. [%]	Thermal conductivity [W.m ⁻¹ .K ⁻¹]			
						Al ₂ O ₃	CaO	other		110 °C	800 °C	(x) °C		400 °C	600 °C	800 °C	1000 °C
NOVOBET 1350-RA	V	fireclay	1350	2.25	0-6	36	1.8	49 (SiO ₂), 3 (Fe ₂ O ₃)	water	80	90	80 (1350)	+0.4 (1350)	1.53	1.61	1.78	1.98
NOVOBET 1450-RA	V	low iron fireclay, SiC	1450	2.30	0-6	40	1.8		water	80	90	100 (1450)	-1.1 (1450)	1.66	1.70	1.90	2.02
NOVOBET 1500-SIC-ZR-RA	V	synthetic aluminosilicate raw materials, SiC, zircon	1500	2.40	0-6	40	2.0	8,5 (SiC), 8 (ZrO ₂)	water	85	100	105 (1500)	-0.5 (1500)	2.05	2.16	2.21	2.34
NOVOBET 1550-M-SIC-ZR-RA-HT	V	mullite, SiC, zircon	1550	2.60	0-6	52	2.0	9 (SiC), 8 (ZrO ₂)	water	90	115	110 (1500)	+0.4 (1500)	2.26	2.35	2.39	2.52
NOVOBET 1350/1,7-RA	V / R	insulating fireclay	1350	1.70	0-6	39	2.3	47 (SiO ₂), 3 (Fe ₂ O ₃)	water	35	40	50 (1350)	-0.6 (1350)	0.94	0.94	0.97	1.17

C) MATERIALS FOR MONOLITHIC BOILER LININGS

- Casted

Type of Product	Installation method	Basic raw material	Classification temperature [°C]	Material required [kg.m ⁻³]	Grain size [mm]	Chemical analysis [%]			Mixing liquid	Cold crushing strenght [MPa]			Permanent lineare change (x) °C max. [%]	Thermal conductivity [W.m ⁻¹ .K ⁻¹]			
						Al ₂ O ₃	CaO	other		110 °C	800 °C	(x) °C		400 °C	600 °C	800 °C	1000 °C
NOVOBET 1450-RA	V	low iron fireclay, SiC	1450	2.30	0-6	40	1.8		water	80	90	100 (1450)	-1.1 (1450)	1.66	1.70	1.90	2.02
NOVOBET (d) 1500-RA-eroz	V	fireclay	1500	2.25	0-6	37	1.8	48 (SiO ₂), 1 (Fe ₂ O ₃)	water	90	105	85 (1500)	-0.6 (1500)	1.55	1.63	1.77	1.95
NOVOBET 1350-RA	V	fireclay	1350	2.25	0-6	36	1.8		water	80	90	80 (1350)	+0.4 (1350)	1.53	1.61	1.78	1.98
NOVOBET 1450-XA	V	dense fireclay	1450	2.30	0-6	47	2.2		water	105	110	105 (1450)	±0.3 (1450)	1.51	1.62	1.78	1.90
NOVOBET 1550-BS	V	bauxite, fireclay	1550	2.55	0-6	65	2.2		water	120	130	110 (1500)	+1.2 (1500)	2.60	2.29	2.18	2.02
NOVOBET 1600-B-ex	V	bauxite	1600	2.85	0-6	78	1.8		water	120	150	130 (1500)	+0.3 (1500)	3.61	3.18	3.05	3.02
MEBET 1350-BS-DC	V	fireclay, bauxite	1350	2.50	0-6	63	5.0	26 (SiO ₂), 2 (Fe ₂ O ₃)	water	105	100	90 (1350)	-0.5 (1350)	1.53	1.60	1.76	1.95
MEBET 1550	V	bauxite	1550	2.85	0-6	78	3.5	14 (SiO ₂), 1.3 (Fe ₂ O ₃)	water	120	120	90 (1500)	±1.2 (1500)	2.54	2.40	2.31	2.34

- Gunning mixes

Type of Product	Installation method	Basic raw material	Classification temperature [°C]	Material required [kg.m ⁻³]	Grain size [mm]	Chemical analysis [%]			Mixing liquid	Cold crushing strenght [MPa]			Permanent lineare change (x) °C max. [%]	Thermal conductivity [W.m ⁻¹ .K ⁻¹]			
						Al ₂ O ₃	CaO	other		110 °C	800 °C	(x) °C		400 °C	600 °C	800 °C	1000 °C
ZÁROBET TOR-1200-plast	G	fireclay	1200	2.1*)	0-6	34	9.5		water	50	35	15 (1200)	-1.0 (1200)	0.97	1.02	1.11	1.18
ZÁROBET TOR-1350-plast	G	fireclay, bauxite	1350	2.2*)	0-6	53	7.5		water	90	65	30 (1350)	-0.8 (1350)	0.99	1.02	1.11	1.17
ZÁROBET TOR-1400-plast	G	low iron fireclay	1400	2.1*)	0-6	46	10.0		water	75	55	40 (1400)	+0.9 (1400)	0.93	0.96	1.02	1.10
MEBET TOR-1350	G	fireclay	1350	2.2*)	0-6	41	5.5	45 (SiO ₂), 2.5 (Fe ₂ O ₃)	water	55	70	70	±0.5 (1350)	1.19	1.25	1.35	1.39
MEBET TOR-1550	G	bauxite	1550	2.6*)	0-6	81	3.5	11 (SiO ₂), 1.2 (Fe ₂ O ₃)	water	90	85	100 (1500)	-1.5 (1500)	2.34	2.20	2.13	2.15
NOVOBET TOR-1450-RA	G	low iron fireclay	1450	2.2*)	0-6	40	2.5	51 (SiO ₂), 1.3 (Fe ₂ O ₃)	water	55	75	65 (1450)	-0.8 (1450)	1.41	1.54	1.68	1.82


- Gunning mixes for hot and cold repairs without long drying

Type of Product	Installation method	Basic raw material	Classification temperature [°C]	Material required [kg.m ⁻³]	Grain size [mm]	Chemical analysis [%]			Mixing liquid	Cold crushing strenght [MPa]			Permanent lineare change (x) °C max. [%]	Thermal conductivity [W.m ⁻¹ .K ⁻¹]			
						Al ₂ O ₃	CaO	other		110 °C	800 °C	(x) °C		400 °C	600 °C	800 °C	1000 °C
CHEMOBET TOR-1450-sol	G / R	fireclay	1450	2.2*)	0-6	45		46 (SiO ₂)	REFRAFIX T40	85	105	70 (1450)	-0.7 (1450)	1.97	1.91	1.86	1.83
CHEMOBET TOR-1500-acid	G / R	synthetic acid-resistant aluminosilicate raw materials	1500	2.1*)	0-6	40		55 (SiO ₂)	REFRAFIX T40	40	50	70	-0.8 (1500)	1.15	1.21	1.29	1.31
CHEMOBET TOR-1500-SiC-50-sol	G / R	SiC, andalusite	1500	2.4*)	0-6	29		55 (SiC), 15 (SiO ₂)	REFRAFIX T40	75	110	80	-0.6 (1500)	4.01	4.20	4.71	5.12
UNIBET TOR 1450-RA	G / R / V	fireclay	1450	2.15*)	0-6	43		49 (SiO ₂), 1.2 (Fe ₂ O ₃)	REFRAFIX PX	60	40	85 (1450)	+0.5 (1450)	1.30	1.36	1.43	1.49

- Materials for incineration plants

Type of Product	Installation method	Basic raw material	Classification temperature [°C]	Material required [kg.m ⁻³]	Grain size [mm]	Chemical analysis [%]			Mixing liquid	Cold crushing strenght [MPa]			Permanent lineare change (x) °C max. [%]	Thermal conductivity [W.m ⁻¹ .K ⁻¹]			
						Al ₂ O ₃	CaO	other		110 °C	800 °C	(x) °C		400 °C	600 °C	800 °C	1000 °C
NOVOBET 1450	V	low iron fireclay	1450	2.30	0-6	46	2.1		water	65	75	90 (1450)	-0.8 (1450)	1.64	1.72	1.89	2.00
NOVOBET 1500	V	synthetic aluminosilicate raw materials	1500	2.35	0-6	51	2.5		water	70	80	90 (1500)	-0.7 (1500)	1.99	2.03	2.05	2.10
ULTRABET 1700-TMZ-Cr	V	tabular alumina, mullite, zircon	1700	2.90	0-6	80	0.7	2 (Cr ₂ O ₃)	water	75	130	150 (1500)	-0.7 (1500)	2.88	2.65	2.69	2.85
NOVOBET 1400-SiC-25-RA	V	low iron fireclay, SiC	1400	2.35	0-6	32	1.8	37 (SiO ₂), 25 (SiC)	water	85	90	95 (1400)	+0.7 (1400)	2.97	2.95	2.90	2.86
NOVOBET TOR-1400-SiC-25	G	synthetic aluminosilicate raw materials, SiC	1400	2.15*)	0-6	34	2.5	35 (SiO ₂), 25 (SiC)	water	45	65	60 (1400)	+0.8 (1400)	2.97	2.92	2.87	2.83
RUDOPLAST DH-1700-SiC-P	R	silicon carbide	1700	2.60	0-3	13		4 (SiO ₂), 82 (SiC)	REFRAFIX P-35	70	90	100 (1500)	±0.3 (1500)	8.28	8.87	9.00	9.20

*) no allowance for waste
V - vibrating
R - ramming
G - gunning



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