

REFRACTORY LININGS
FOR THERMAL EQUIPMENT


TEPLOTECHNA **DIS**
OLOMOUC

WWW.TEPLOTECHNADIS.CZ



The company **Teplotechna DIS, s. r. o.** was founded in 1998 by former employees of the state company Teplotechna PKZ (doing projects for all its subsidiaries) and Teplotechna DIZ Olomouc (realized deliveries at home and abroad).

By creating a team of employees with many years of experience in designing of linings (with specific realization and management of people) and manually skilled and technically savvy fireclay builders we founded a company that was able to successfully assert itself in the business of refractory linings for thermal units.

Our employees have many years of experience in the design and implementation of refractory linings of thermal units.

The experienced team consists of:

- Sales Department,
- Realization Department,
- Lining Design Department,
- Employees qualified for refractory works, welding works on auxiliary structures etc.

For larger projects and constructions, we are able to provide other experienced fireclay builders, carpenters and locksmiths as needed.

We specialize in the supply of refractory linings for the following areas:

- production of building materials (cement and lime kilns)
- energy production (boilers)
- chemicals and petrochemicals (recuperators, heat exchangers, combustion chambers, etc.)
- other industrial furnaces (melting, annealing, heating furnaces, etc.).

Services we provide to our customers:

- technical documentation and engineering,
- supply of materials including auxiliary anchoring structures,
- installation of linings including welding of fasteners
- dismantling of linings,
- drying of linings.

At present, our company operates mainly in the Czech and European market, where it has established a steady good position. Our advantage is the high flexibility and fast adaptation to customer requirements.

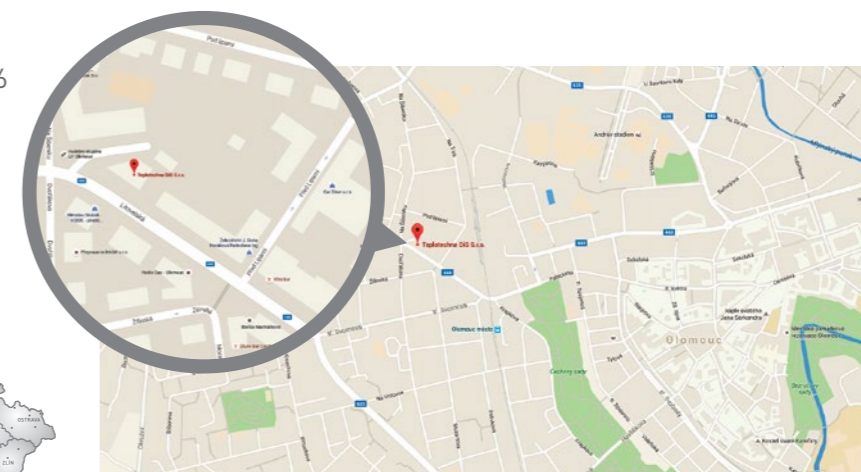
Teplotechna DIS, s. r. o. is certified to **ISO 9001**.



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CEMENT KILNS

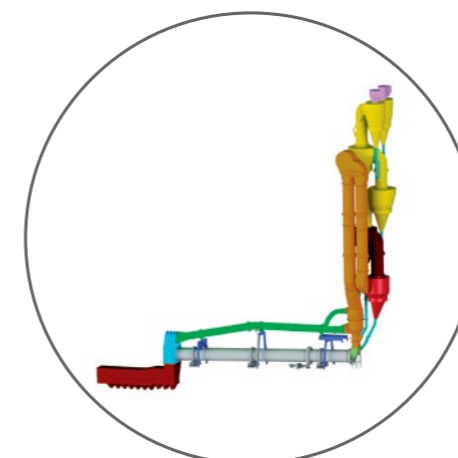
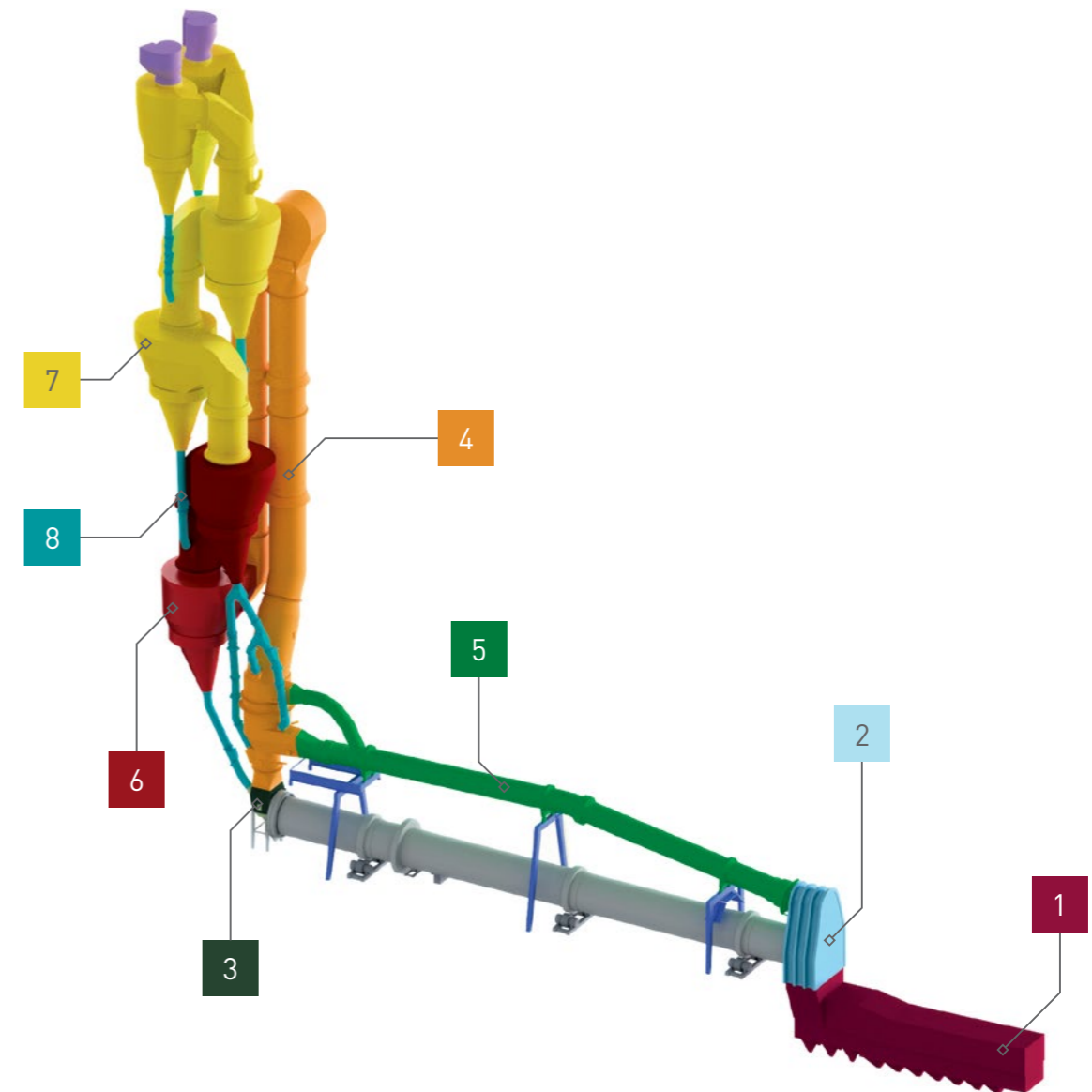
We are one of the most experienced suppliers of refractory linings for the cement manufacturing lines.

Thanks to many years of experience gained in the construction of new cement kilns and their annual repairs, we can say that there has been a relatively large increase in the demand for quality and durability of the refractory linings. The main reason is the increasing use of alternative fuels, which are associated with formation of chemical compounds on the basis of Cl, F and SO₂, which adversely affect the service life of the conventional refractory lining and the steel fasteners. At present the cement plants in which we operate, burn about 30 -70% alternative fuels (TAP or bone meal), which has a negative impact on the life of the refractory linings.

In cooperation with the manufacturers of firebricks and refractory concrete we responsibly recommend the most suitable type of material for the process conditions of a given cement manufacturing line. We do not prefer refractory concrete or fireclay material, so we can really choose the best quality and mutually combine materials from different manufacturers so that the result truly meets the purpose and use of the various parts of the cement line.

In the Cement Journal we published two articles on the topic:

1. Proposal of suspended ceilings made of shaped fireclay bricks (published 6/2014).
2. Proposal of monolithic lining (published 9/2015).



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1. GRATE COOLER

- › It is a place with substantial changes in temperature and the linings are under mechanical stress due to abrasion. Therefore, it is necessary to select materials that can withstand temperature changes, alkali corrosion and abrasion.
- › The most stressed part are the covers around grates. There is strong abrasion and large temperature changes.
- › For lining of the walls and ceiling there is used mostly fireclay material.
- › Ceilings are solved by means of suspended shaped pieces made of fireclay material.
- › Side walls above the grate are primarily made of LCC refractory concrete with higher resistance to abrasion and thermal shock.

2. KILN HOOD

- › The use of alternative fuels promotes corrosion of the hot head. For this reason, we choose fireclay materials and alkali resistant LCC refractory concrete.
- › Lining in the kiln hood is made mostly from fireclay material.
- › Ceilings are solved by means of suspended shaped pieces of fireclay material.
- › Gates to the kiln hood are made of LCC refractory concrete with SiC content.
- › For critical points around the connection of the rotary kiln and the mouthing of the pipe TAD (if TAD pipe leads into the kiln hood) is used lining made of suitable LCC refractory concrete - most often, we choose an installation by casting into formwork under vibration.



3. INLET CHAMBER

- › There are applied linings resistant to alkaline corrosion, abrasion, build-ups formation and dynamic loads (air blasters, rotary kiln).
- › This is a very articulated section, so there we choose mainly a lining of suitable refractory concrete with a higher proportion of SiC (10-25%).
- › In straighter sections, instead of refractory linings we can use pre-dried shaped bricks made of suitable refractory concrete.

4. CALCINING CHANNEL - KKN

KKN consists of:

- Ascending part of KKN,
- Descending part of KKN,
- Vortex head.
- › From structural viewpoint calcination channel has a circular or rectangular cross section.
- › The temperature ranges 900 - 1100°C.
- › Mostly (from 80%) there is suitable lining from fireclay material, even in the round and rectangular cross section.
- › In places like transition pieces, etc., we choose a lining from LCC refractory concrete, which is installed by casting into formwork.
- › For the lower part of the ascending channel we choose quality materials, due to higher temperatures, alkaline corrosion, abrasion and formation of build-ups.
- › At the bottom of KKN there is evident the pronounced influence of the use of alternative fuels.
- › In the vortex head the material is chosen according to its particular shape.
- › The ceiling in the vortex head can be solved by means of suspended shaped pieces made of fireclay material or LCC refractory concrete with silicon carbide content.
- › In places where we decide to use refractory concrete lining, we can replace the selected installation method also with gunned concrete.

5. TERTIARY PIPELINE - TAD

- › From structural viewpoint the TAD pipe has a circular cross section.
- › The temperatures here range 900 - 1000°C.

- › Usually (about 90%) the most suitable lining is from fireclay material.
- › In bending points we use lining from suitable refractory concrete, or use a pre-dried shaped bricks made of suitable refractory concrete.
- › In TAD the environment is heavily exposed to abrasion dust.
- › Here we choose abrasion-resistant material resistant to alkalis.
- › The tertiary conduit includes also a damper, which helps against the abrasion of the flowing clinker dust and against temperature variations. Lining of the damper is designed as self-flowing SFC refractory concrete or other suitable refractory concrete.

6. CYCLONES - THE BOTTOM PART

- › The bottom usually includes the lowermost cyclones, CIV and CV.
- › Contemplated temperatures in these cyclones reach 800 to 900°C, in some cases the temperature can reach 1000°C.
- › In these cyclones we can already see a clear impact of alternative fuels on the lining.
- › There is chemical corrosion of linings, corrosion of hot dip steel and formation of build-ups.
- › We mostly chose linings made of fireclay material in combination with a suitable LCC refractory concrete, which is installed by casting into formwork under vibration. It is a circular and conical part of the cyclones.



- › Ceilings of cyclones are formed from suspended fireclay shaped bricks.
- › For lining of ceilings, circular part and conical part there may also be used suitable LCC refractory concrete that resists alkalis with the content of silicon carbide.
- › All steel constructions (brackets, anchors, hinges) are made from heat-resistant stainless steel.



7. CYCLONES - THE UPPER PART

- > The upper part usually includes cyclones CI, CII and CIII.
- > Contemplated temperatures in these cyclones range 300-600°C, in the cyclone CIII it can reach even 800°C.
- > With proper operation of the line, the effects of alternative fuels shall not have impact any more.
- > In these areas there is in particular mechanical stress on the linings – due to abrasion.
- > Here, we choose linings from fireclay materials or sprayed dense and insulating refractory concretes (especially in cyclones CI and CII).
- > Recently there have been used insulating refractory concretes with higher thermal conductivity for single-layer lining.



8. MEAL PIPES

- > Lining is from LCC concrete, which is installed by casting into formwork under vibration.
- > The insulating layer is made of calcium silicate boards.
- > For lining of meal pipes connecting cyclone IV and V, LCC refractory concrete is used which resists alkalis due to presence of silicon carbide.
- > For lining of meal pipes connecting cyclone I, II and III, standard LCC refractory concrete is used.



SELECTED REFERENCES

Petersburgement (Eurocement group)	TAD lining, kiln head, inlet chamber grate cooler, cement plant in Slantsy in Russia	2015	A + B + C
Aliacem, s. r. o.	installation of a new heat exchanger linings, cement plant in Hranice Czech Republic	2014	C
PSP Engineering, a. s.	bypass linings, cement plant Saint Pierre la Court, France	2015	A + B
PSP Engineering, a. s.	lining of a new heat exchanger, cement plant Lafarge Cement, Čížkovice, Czech Republic	2014	A + B + C
Aliacem, s. r. o.	lining of a grate cooler, cement plant Cemmac in Horné Srnie, Slovakia	2013	A + B + C
Aliacem, s. r. o.	lining of a grate cooler, Libya	2013	A + B
PSP Engineering, a. s.	linings of new cement lines, cement plant in Turňa nad Bodvou in Slovakia	2004	A + B + C
PSP Engineering, a. s.	linings of new cement lines, cement plant Cemmac in Horné Srnie, Slovakia	2000	A + B + C

A = documentation and engineering / B = delivery of material / C = mounting / D = supervising

In addition to these contracts, we are involved in repairing the lining in these cement plants:

- Českomoravský cement a.s., plant in Mokrá
- Cement Hranice, a.s,
- CEMMAC, a.s. in Horne Srnie
- Lafarge Cement a.s. in Čížkovice

LIME KILNS

1. LIME KILNS IN SUGAR REFINERIES

We have extensive experience with lining of lime kilns in sugar refineries, which were plenty in the region of Haná. The most widely used are the simple shaft lime kilns with circular cross section and internal heating, where limestone is burned with the aid of coke. The lime kilns are continuous type furnaces, so the risk of thermal shock is minimal.

Teplotechna DIS, s.r.o. performs either complete or partial replacement of magnesite and refractory lining and also lining repairs by gunning (gunned concrete) a layer of a suitable refractory concrete.

Condition of the lining greatly affects the way of operation of the lime plant and dispensing the mixture of coke and limestone. Due to improper stratification of coke in the mixture there occurs local overburning of lining.

SELECTED REFERENCES

Moravskoslezské cukrovary, a. s., sugar refinery in Hrušovany nad Jevišovkou	new lining of a lime kiln no. 1	2000	A + B + C
Slovenské cukrovary, a. s., sugar refinery in Sered'	partial repair of the magnesite housing and spraying of the refractory coating	2015	A + B + C
Litovelská cukrovarna, a. s.,	partial repair of fireclay casing and spraying of a refractory concrete coating	2013	A + B + C
Cukrovar Vrbátky, a. s.	partial repair of fireclay casing and spraying of a refractory concrete layer	2015	A + B + C
Hanácká potravinářská společnost, s. r. o., sugar refinery in Prosenice	partial repair of fireclay casing and spraying of a refractory concrete layer	2014	A + B + C
VUC, a. s.	lining of the upper part of the lime kiln and a new cap for the sugar refinery Agrana	2008	A + B + C

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Depending from the success in annual tenders we carry out repairs in these sugar mills:

- Sugar refinery in Litovel
- Sugar refinery in Vrbátky
- Sugar refinery in Prosenice
- Sugar refinery in Hrušovany nad Jevišovkou

2. LIME KILNS FOR THE MANUFACTURING OF LIME

Maertz type lime kilns
and other shaft furnaces

Line for the production of lime with a rotary kiln
(PSP Engineering design)

Our employees have participated in the construction of refractory lining for Maertz type lime shaft kiln in lime kilns Varin (Dolvap, s.r.o.) and Čertovy schody (Lhoist Group) and the installation of a lime shaft kiln in Kotouč Štramberk, s.r.o.

The line consists of a pre-calciner, rotary kiln, hot head and a shaft cooler, the system of lining is similar to the one of cement kilns. We are able to offer documentation for the lining, material supply and installation of lining in the lime lines.



SELECTED REFERENCES

Carmeuse Czech Republic, s. r. o., plant in Mokrá	new lining of the kiln head	2012	A + B + C
PSP Engineering, a. s.	new lining for a lime kiln in Lithuania	2007	A + B + C

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BOILERS

When designing linings of boilers we build upon the experience of our engineers, who have been designing them during the period of massive construction of power and heating boilers since 1960s.

Repairs of linings are greatly facilitated by the original documents to the boilers, of which a substantial part has been preserved.

We have experience with these types of boilers:

1. WATER PIPE BOILERS

- > upright-tubular boilers (single-drum, double drum and three drum types)
- > chamber boilers
- > radiant heat boilers with natural circulation (ČKD Praga-Tatra, ČKD Oil and gas type)
- > radiant heat boilers with forced circulation up to 100 atm (ČKD powder, oil and gas type, Löffler, La Mont, ZSMK Tlmače)
- > Special high-pressure systems with pressure over 100 atm

SELECTED REFERENCES

Litovelská cukrovarna, a. s.	boiler Sládek	2003	A + B + C
Veolia Energie ČR, a. s., heating plant in Krnov	boiler 75 t/h	2003	A + B + C
Dalkia ČR, a. s., Elektrárna Třebovice	boiler K12	2002	A + B + C
Cukrovar Vrbátky, a. s.	boiler Oschatz	2001	A + B + C
Dalkia ČR, a. s., heating plant in Přerov	boiler 75 t/h	2009	A + B + C

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2. CABINET AND SECTIONAL BOILERS

- > ŽD Bohumín, cast iron (VSB, E, ECA, EMKA, LIGNO, ETERNA)
- > Steel (SNINA, SLATINA, ROUČKA)

SELECTED REFERENCES

Cukrovar Vrbátky, a. s.	boiler Slatina 100 m ²	2003	A + B + C
Litovelská cukrovarna, a. s.	boiler Slatina 80 m ²	2003	A + B + C

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3. FLUIDIZED BED BOILERS

Fluidized bed boiler is a device for fluidized combustion of mostly pulverized coal or biomass. The ground coal is fed to the boiler combustion chamber along with air and granular material (sand), and above the bed it acquires fluid properties. Thus, the fuel in this layer burns in the entire volume of the fluidized bed. Fluidized bed boiler achieves better overall efficiency (up to 80%) than conventional boilers burning coal and thanks milled limestone, which is added to the boiler, it emits less sulfur dioxide.

For the lining of fluidized bed boilers we use a self-flowing LCC refractory concretes and ramming materials with high resistance to abrasion, corrosion, (sulfur dioxide and CO) and thermal shocks. In some types of fluidized bed boilers we can use calcined clay, concrete blocks and special insulation boards.

SELECTED REFERENCES

Dalkia ČR, a. s., heating plant in Olomouc	installation of new linings of boiler K5	1999	C
Dalkia ČR, a. s., heating plant in Olomouc	new lining for combustion chamber of boiler K5	2012	A + B + C
Polycomp a.s.	project documentation of linings	2013	A
ČEZ, a. s., Power plant in Tisová	FK 350t/h	1994	A
Alpiq Generation, s. r. o., heating plant in Zlín	FK 150t/h	1996	A

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4. BIOMASS-FIRED GRATE BOILERS

With the growing popularity of alternative fuels there is increasing demand for biomass-fired boilers.

Over the last 10 years we have developed projects and delivered linings for 40 pieces of these boilers with an output of 1 to 20 MW.

Lining is selected according to the type of boiler and can be made of fireclay shaped bricks or refractory concrete. Material of the working layer must be resistant to alkalis, abrasion and thermal shock. The insulating layer is made of lightweight insulating bricks and calcium silicate boards. The temperature on the housing exceeds about 50°C above the ambient temperature. If technically possible, in most cases we prefer fireclay material to refractory concrete. Refractory concrete is proposed for places around the burners, air jets and transient and complex shaped parts of the boiler. Lining on ceilings and sloping walls shall be from suspended fireclay shaped pieces. We also have experience with realization of lining for straw-fired boilers. In these boilers, because of the frequent formation of the build-ups on the lining we recommend to use lining as little as possible.

SELECTED REFERENCES

Büttner Energie- und Trocknungstechnik GmbH, Německo	lining of a biomass-fired 20 MW boiler	2014	A + B + C
TTS energo, s. r. o.	lining for more than 30 pieces of biomass-fired and straw-fired boilers with a capacity of 2 MW to 10 MW	od roku 2000	A + B + C
Vyncke, s. r. o.	lining for biomass-fired boilers (Hofatex, Slovakia)	2000	A + B + C
Step Trutnov, a. s.	lining for biomass-fired boilers with an output of 1.5 to 3 MW		A + B + C

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In the petrochemical and the chemical industry it is very difficult to select proper refractory material for heat-resistant lining, especially due to various possible chemical effects.

In order to choose suitable type of material it is necessary to know the exact environmental conditions in which the linings are to be installed.

Lining consists largely of acid-proof materials, chemically bonded refractory concrete or refractory shaped bricks.

PETROCHEMICAL INDUSTRY

- > various distillation furnaces
- > furnaces for fission of gases
- > tube furnaces
- > converters and more



These devices are part of larger technological units where a minor failure could cause a shutdown of the entire production line. Its re-launch is in most cases very expensive.

Teplotechna DIS, s. r. o. has extensive experience with lining of apparatuses for production of hydrogen.

We gradually forged and improved the system of design, calculation and installation of linings so that now we have the optimal situation where over the last decade we have successfully put into operation five pairs of these apparatuses. One pair is in a chemical plant in Ostrava and four pairs were exported to the Russian Federation. We are an approved supplier of linings for these devices under the **Haldor Topsoe** license.

CHEMICAL INDUSTRY

- > various chemical furnaces
- > WHB
- > reformers
- > furnaces for the production of titanium dioxide, red paint, pigments
- > deck ovens
- > equipment for the production of sulfuric acid

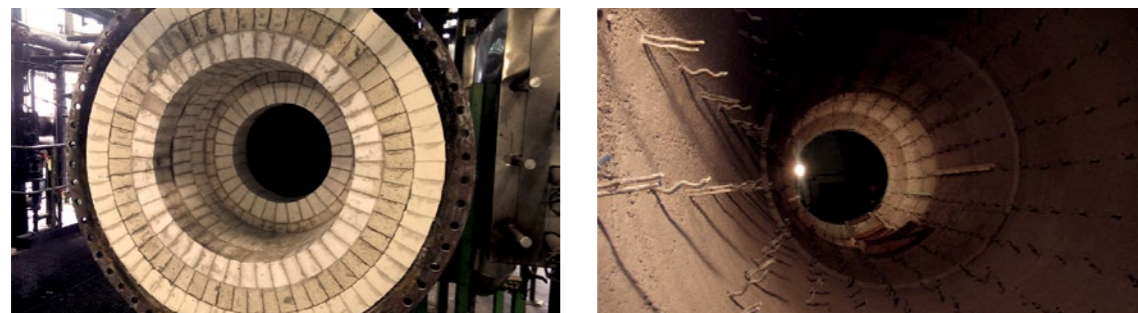
Teplotechna DIS, s. r. o. has long experience with these units.



SELECTED REFERENCES

Precheza, a. s.	lining for the red pigment production lines	2014	A + B + C
Precheza, a. s.	lining for titanium dioxide production lines	od roku 2000	A + B + C
Precheza, a. s.	waste heat fired boiler – sulfuric acid production line	2007	A + B + C
ZVU Engineering, a. s.	lining for soot production - CS Cabot	2015	A + B + C
ZVU Engineering, a. s.	lining for 5 pieces of apparatus to produce hydrogen under Haldor Topsoe license	2006 2012	A + B + C
Ateko, a. s.	lining of a contact reactor for the company Spolana	2012	A + B + C
Excon Steel, a. s.	lining of a collector	2004	A + B + C

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Teplotechna DIS, s. r. o. is also engaged in refractory linings of other equipment and furnaces.



ANNEALING FURNACES AND TROLLEY KILNS

Lining of annealing furnaces is nowadays usually realized as a fibrous lining (see below - section fibrous lining).

Kiln trolley and the lock around the trolley are made from refractory concrete and fireclay shaped bricks. In some ovens, instead of fibrous lining, there are used lining made of lightweight insulating bricks for temperatures up to 1250°C or 1430°C.

SELECTED REFERENCES

ČKD Kutná Hora, a. s.	lining of the kiln trolley for an annealing furnace	2012	A + B + C
Pavus, a. s.	heating furnace lining	2015	A + B + C

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MALT ROASTER

Malt roaster is a sophisticated device that forms the basis of a technological roasting line. It starts with the preparation and feeding of green malt into the roaster and ends with cooling and output of roasted malt. At the bottom of the roaster, in an insulated shaft, there are positioned special natural gas burners with a "soft flame".

In total, we have designed and supplied refractory lining to about 15 malt roasters, which are located in the Czech Republic, Poland, Lithuania, France, New Zealand, Russia and Belarus.

FIBROUS LINING

Fibrous lining is mostly used in afterburner devices and annealing and heating furnaces. It is characterized by superior resistance to thermal shock, low heat and high insulation capacity. The lining is made of mats from ceramic fiber resistant to temperatures up to 1250°C, 1400°C or 1600°C.

The design and installation uses either pre-prepared blocks (modules), or we glue and anchor the lamellas with stainless steel anchors. In some devices can be used the wallpaper installation method, where the lining may be covered with stainless steel sheets.

SELECTED REFERENCES

Asper Envi, s. r. o.	lining of about 10 pieces of reactor for a BASF chemical plant	2007–2013	C
Pavus, a. s.	heating furnace lining	od roku 2000	A + B + C
Thermal Project, s.r.o.	combustion chamber lining	2013	C

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TUNNEL KILNS

We have realized tunnel kiln installation in the company Tondach (Hranice na Moravě and Nitranské Pravno).



GLASS FURNACES

We are in charge of the installation of glass furnace lining in Klatovy and Lednické Rovné. We assemble the glass furnaces in cooperation with a partner company.



DRYING OF LININGS AND TEMPERING

Drying of the refractory lining in a heat unit removes the loosely bound water used in the refractory linings, so it achieves the required physical and mechanical properties.

Drying usually takes place by means of hot flue gas from an external burner along a drying curve to temperatures of 350°C to 500°C.



We provide:

- > Drying of refractory linings of all thermal units,
- > Diagnostic check measurement of thermal operation of furnaces (temperature, pressure, volume, emissions).

Our company is ready to become your reliable partner whenever you need to solve thermal-technical problems of any industrial furnace in engineering, metallurgy, ceramics, glass and chemical industries as well as in the field of energy generation, particularly concerning boilers and incinerators.



