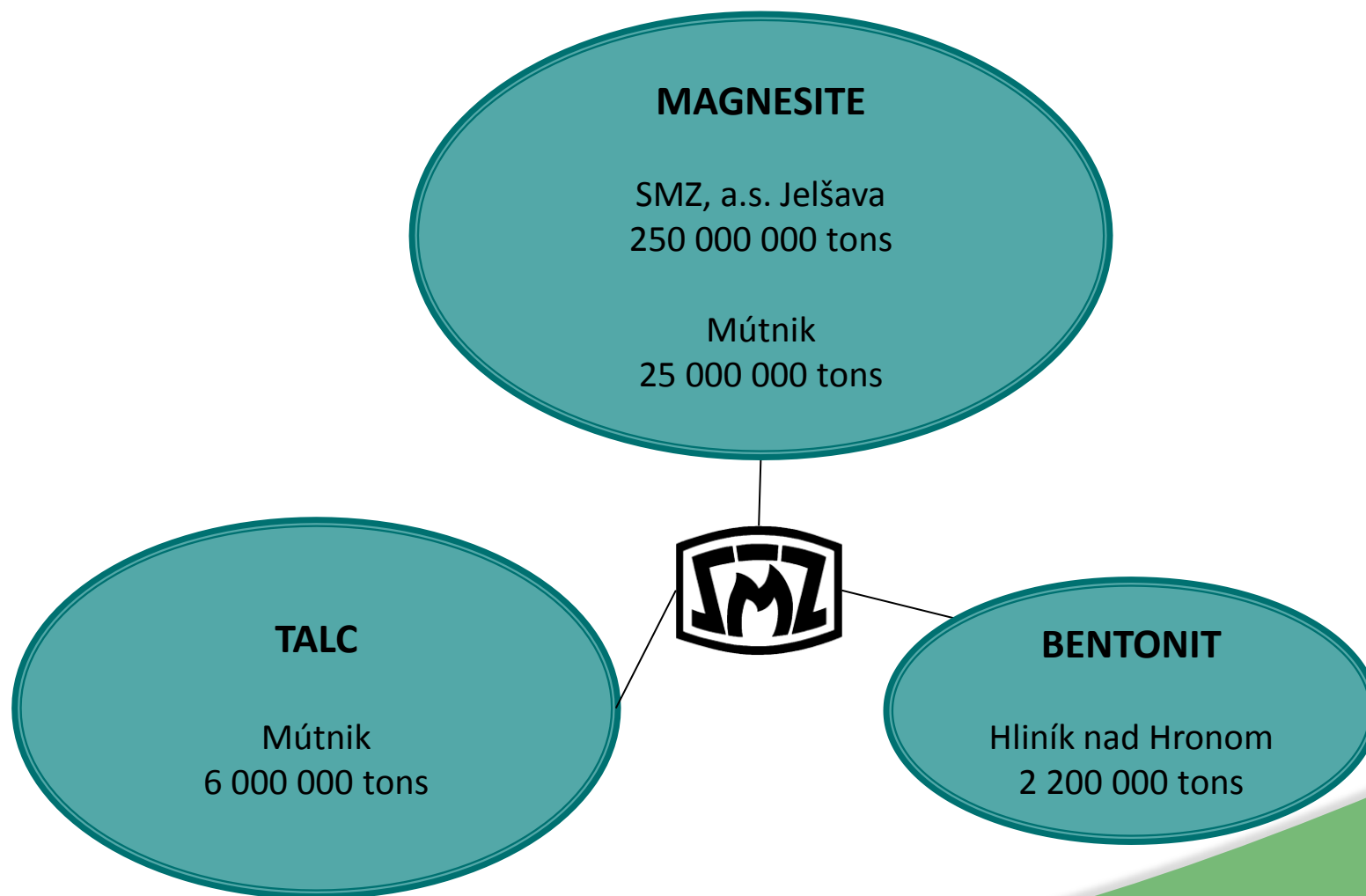


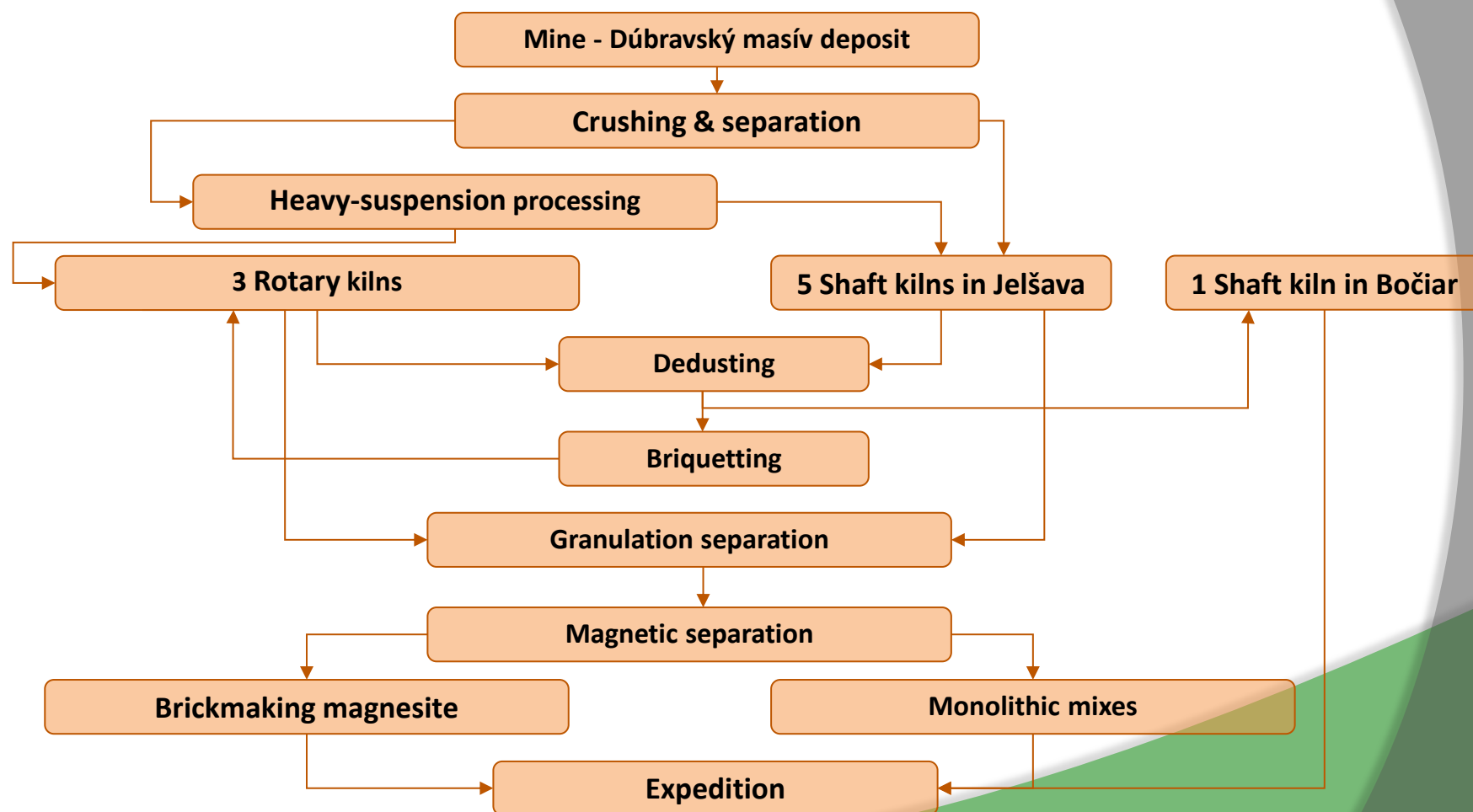


Environmental aspects of magnesite mining in SMZ a.s., Jelšava

Raw material base



SMZ a.s., Jelšava - Production process



SMZ a.s., Jelšava - Mine



Extraction of raw magnesite (MgCO_3) is carried out by in-depth mining in one of the world's biggest deposits - Dúbravský masív. The key extraction method is the overhand stoping with filling extraction.

This method enables selective extraction.



Regular mines



Dúbravský masív deposit mine in Jelšava

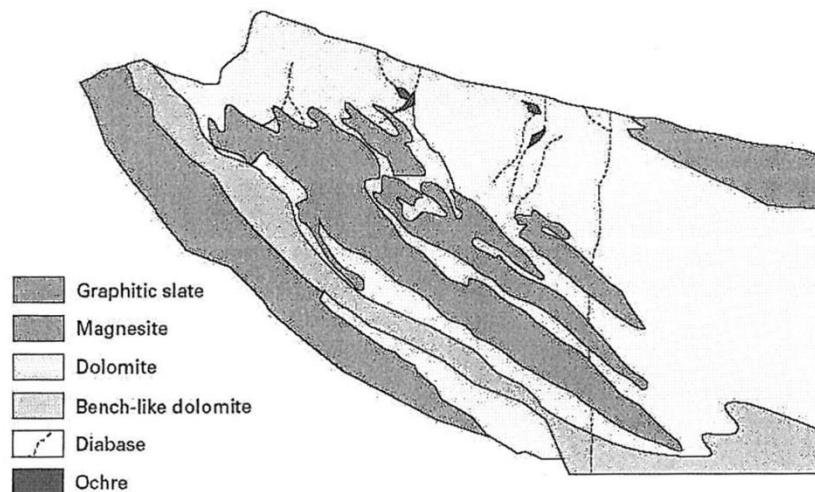


Magnesite deposit characteristics

A large magnesite deposit stretches across the south east part of Slovakia over a length of 150 km.

The deposit called Dúbravský masív in Jelšava has the dominant position and is the largest in Europe.

Deposit cross-section

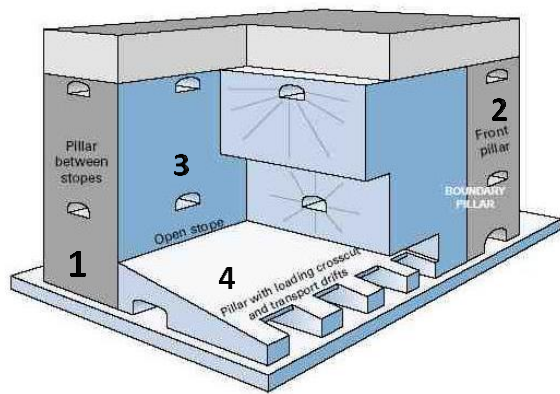


Basic problems in a field of Safety a Environment in the past

- lower mining safety connected to the mining method (open stope) in connection with the waste material accumulation on stockpiles
- high volume of solid emissions leading to a “moon country” creation
- high volume of CO₂, SO₂ emissions
- high industrial water consumption
- fine fraction deposition into a settling pit

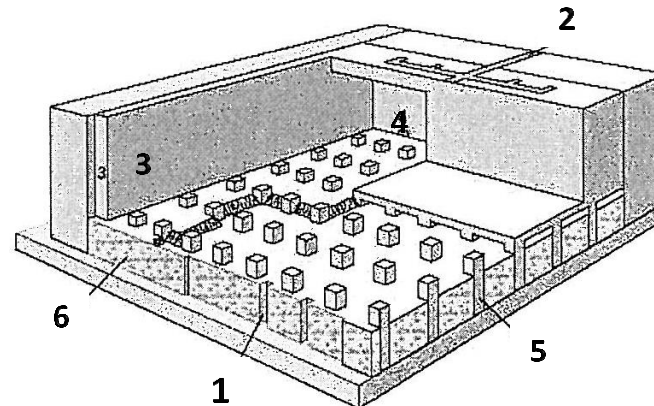
Improvement of the mining method and safety

Open stope



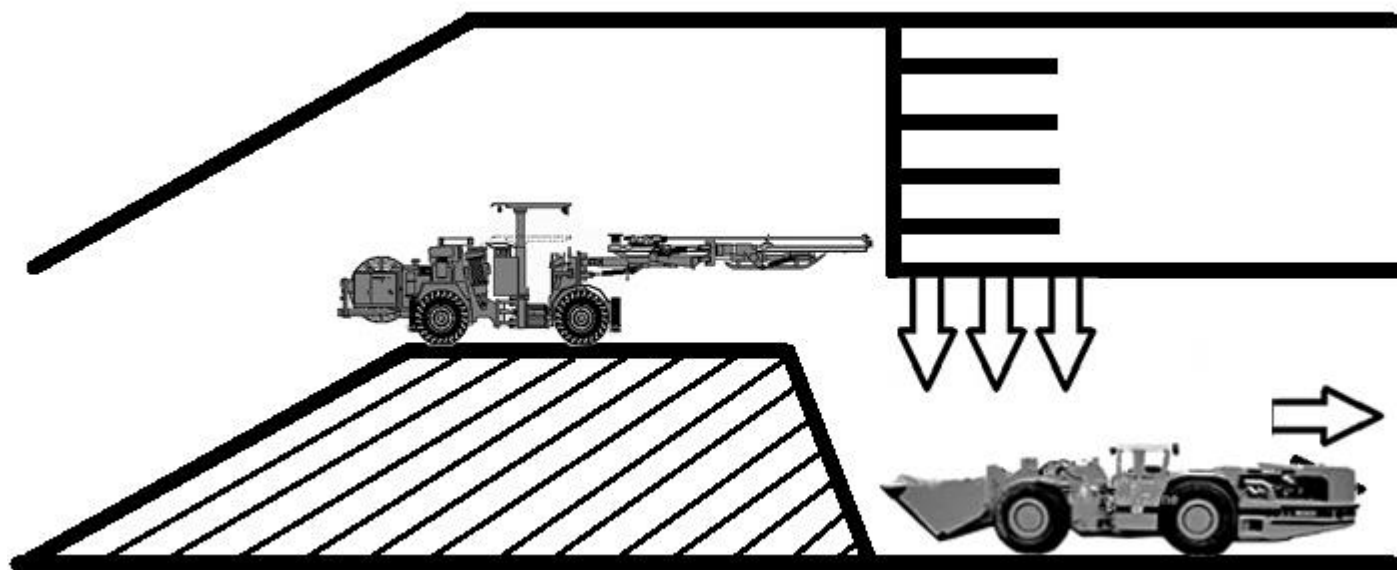
- 1 – pillar between stopes
- 2 – front pillar
- 3 – open stope
- 4 – pillar with loading crosscut and transport drifts

Overhand stoping with filling



- 1 - retraction chimney
- 2 - upcast
- 3 - extraction area
- 4 - back-filling chimney
- 5 - intrablock pillar
- 6 - back-filling

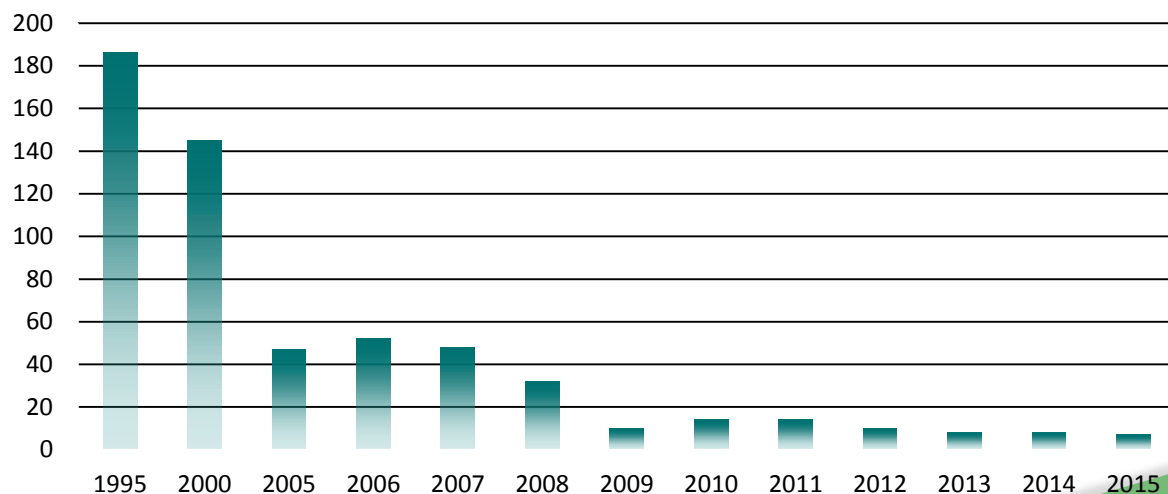
Overhand stoping with filling



Reduction of solid emissions

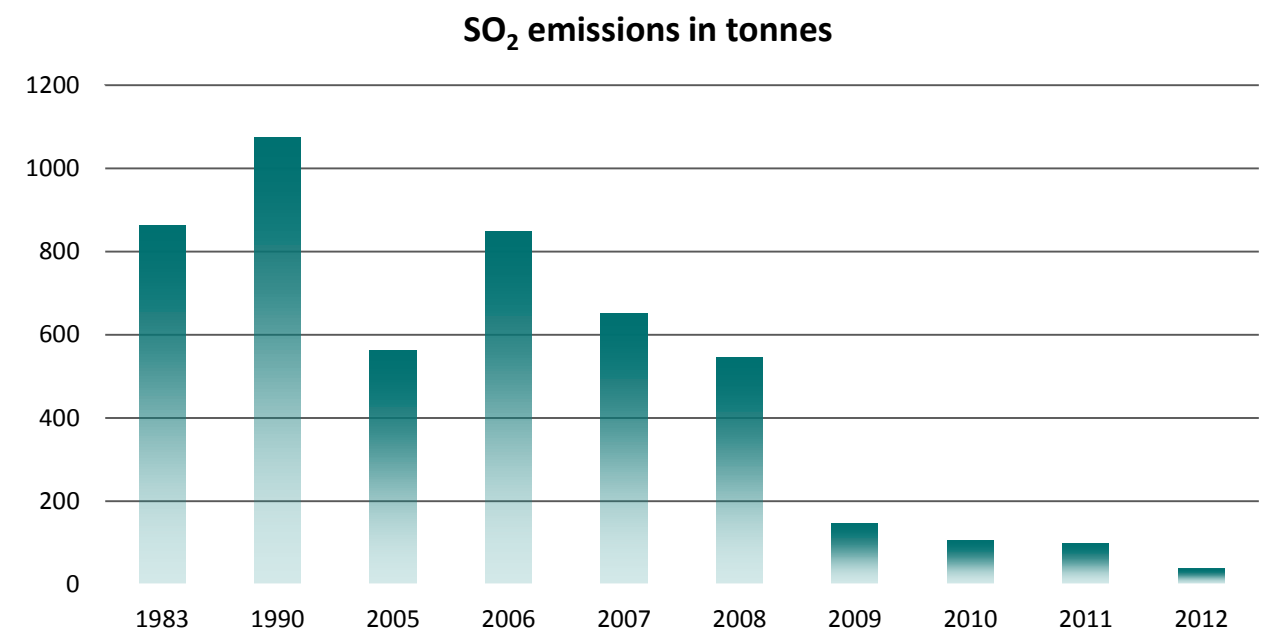
- “Moon country” creation in the 1970s
- Amertherm system installation in 1995
- Filtration system optimisation in 2005 and further improvements in 2008

Solid emissions in tonnes



Reduction of gaseous SO₂ and CO₂ emissions

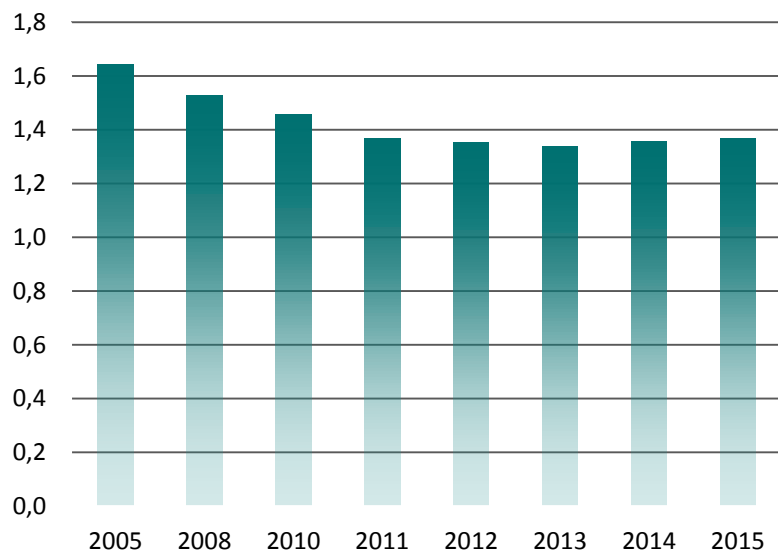
- heavy fuel oil substitution in 2009



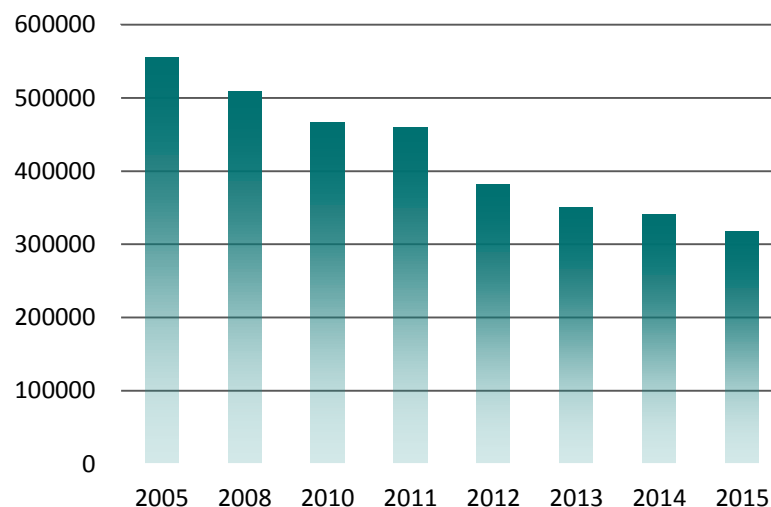
Years	1983	1990	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
SO ₂	863	1074	561	849	651	545	147	105	97	37	32	38	31

Reduction of gaseous SO₂ and CO₂ emissions

CO₂ per 1 t of magnesia produced



CO₂ emissions amounts in tonnes per year

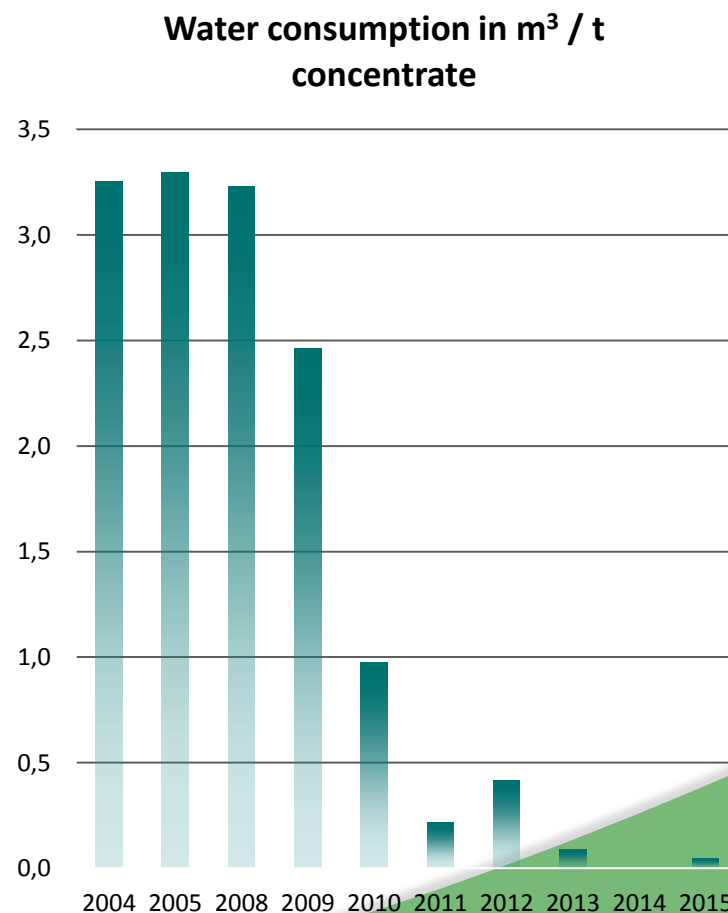


Year	2005	2008	2010	2011	2012	2013	2014	2015
CO ₂ amount per Y	555 444	508 331	465 869	459 655	382 128	350 457	340 404	317 274
Clinker production in t	337 972	332 661	319 488	335 680	282 877	262 303	250 650	232 290
CO ₂ / t clinker	1,643	1,528	1,458	1,369	1,351	1,336	1,358	1,366

Reduction of industrial water consumption

- Flocculation implemented in 2010

Year	Consumption in m ³	Monolithics production	m ³ / t Mmixes
2004	1 177 190	362 010,45	3,25
2005	1 108 079	336 030,00	3,30
2008	1 011 729	313 285,00	3,23
2009	513 086	208 507,00	2,46
2010	284 247	290 837,00	0,98
2011	64 326	298 827,80	0,22
2012	104 080	249 211,12	0,42
2013	20 570	234 211,00	0,09
2014	0	218 468,00	0,00
2015	9 639	210 240,00	0,05



Elimination of fine fraction siltation into the settling pit

- Sludge drainage line built in 2015



Measures resulting from tightened legislation in recent years and other measures

- NO_x emissions in the mining environment
 - purchase of mining machines meeting the strict emission limits
 - a new mining fan
 - more sensitive measuring probes
- With regards to increased standards of NO_x concentration in the mining environment electro-hydraulic drilling machines and usage of trucks and loaders using urea for NO_x reduction were implemented.
- New measurement probes were purchased and the result is that currently measured values are under 1,5 ppm for NO and under 0,5 ppm for NO_2 .

Measures resulting from tightened legislation in recent years and other measures

- CO emissions in clinker production in heat aggregates
 - modification of the shaft furnace burner systems (2 versions)
 - continuous measuring of emissions in optimising the burner systems
 - resulting in CO emission reduction by 75%
- Limit values of CO in magnesia production will be binding for Slovak magnesia producers from the second quarter of 2017. Even though a similar technology in a relatively close industry has a 40 times higher limit value the management has accepted the implementation of the 1000 mg of CO/Nm³ limit value as a great challenge.
- It is an interesting fact that this emission limit is an issue only in case of shaft kilns, which energy requirement is only 65% of the energy requirements of rotary kilns, where this issue does not exist.
- Collaboration with VRP BERG faculty of Technical university Košice on a technological solution will result in emissions volume very close to the limit values

Measures resulting from tightened legislation in recent years and other measures

- Measures to improve appearance of the company surrounding



Certifications

- Quality management system - since 1994
- Environmental management system - since 2012
- Production of feed ingredients - since 2013



since 1994



7th of December 2012



8th of May 2013



Q & A



Thank you