STRATEGIC BUSINESS PLAN

ISO/TC 82 MINING

EXECUTIVE SUMMARY

Mining is a fundamental basis for human civilization and considering the mineral resource distribution a truly global activity. Mining, beginning as an archaic technique 40.000 years ago with the first flint stone mines, has seen an enormous development in terms of production, employment, safety and technology. Especially safety and environmental impacts of any mining project are constantly under focus.

Mining is necessary to satisfy the needs of growing world population with the required raw materials. These include mainly oil and gas, metals, coal, non-metallic materials namely salts for fertilizers and quarry products for construction material. In 2016 the global mining sectors employed several million people and had a turnover of probably more than 2.9 trillion US$, only the production of mineral fuels, iron ore, coal and non-ferrous metals exceeded 16.9 billion tons in 2016. Several nations' economies are heavily based on mining activities.

Arguably the 16th century published " De re metallica libri XII " by Georgius Agricola could be viewed as the first attempt to summarize the then state of the art technology in mining and metallurgy and helped with early communization across the scattered mining industries for many years.

Modern standardization in the mining industry has a history of more than 100 years. Whereas in the beginning mainly worker's tools, as pickaxes, shovels and hammers have been standardized, today the market requires safety standards on complex machines, as shearer loaders or excavators, standards for autonomous mining machines and environment related standards for a sustainable mining.

ISO/TC 82 was established in 1955 to address such needs of mining and mining machinery industries globally. After a period of in-activity the TC was re-activated in 2013 to especially consider the growing internationalization of the sectors to reduce given complexity and cost while improving safety and comfort.
46 standards have been published so far.

The scope of ISO/TC 82 considers specifications for:

- specifications relating to specialized mining machinery and equipment used in opencast mines (e.g. conveyors, high wall miners, rock drill rigs and continuous surface miners) and all underground mining machinery and equipment for the extraction of solid mineral substances [e.g. road headers, continuous miners, rock drill rigs, raise boring machines, high wall miners, LHDs, mining auger boring machines, RMDSs (rapid mine development systems)]
- recommended practice in the presentation of plans and drawings used in mine surveying
- methods of calculation of mineral reserves
- mine reclamation management
- design of structures for mining industry.
- special refuge/rescue chambers
- shaft boring machines.

Excluded:

- foundation machines [e.g. piling, diaphragm walling, earth boring, jetting, grouting, drill rigs for soil and rock mixture (ISO/TC 195)]
- aggregate processing machines (e.g. screening, crushing)
- equipment and protective systems to be used in explosive atmospheres (IEC/TC 31)
- hand-held rock drills (ISO/TC 118)
- earth-moving machinery (by ISO/TC 127)
- geotechnics (ISO/TC 182)
- tunnel boring machines (TBMs) and associated machines and equipment (ISO/TC 195).

Main objectives and priorities have been identified for ISO/TC 82:

1.) Safety

Mining, especially underground mining continues to be a hard and dangerous business. Risks may come from rock fall and burst, harmful gases, explosions, heat, dust, light and heavy equipment. Safety is of concern regardless the level of mechanization, the size or type.
Unfortunately, numerous mine disasters with many fatalities have proven in the past and today how dangerous mining can be. Such mining accidents have often been the motivation for improving mine safety by research projects and, as a

consequence, by related regulations and standards. Coupled with the fast pace of improving technological capability, there is an opportunity to apply and leverage integration methods, automation, and autonomy so mining companies can make incremental and potentially step change improvements to safety, productivity, and costs.

2.) Environment

Mining has nearly always an impact on the environment. The environmental impact includes erosion, formation of sinkholes, loss of biodiversity and contamination of soil, groundwater, surface water by chemicals from mining processes. Erosion of exposed hillsides, mine dumps, tailings dams and resultant siltation of drainages, creeks and rivers can significantly impact surrounding areas. Therefore, in some countries environmental and reclamation codes exist, ensuring the area mined is returned to close to its original state.

However, in many countries such regulations do not exist and therefore, mine reclamation management has been included in the scope of ISO/TC 82 and for its importance, ISO/TC 82 has set up an own subcommittee dealing with this matter.

3.) Advanced Automation

Automation will enable step change improvement in the mining sector in terms of safety, productivity, and cost as related to the adoption and use of advanced and autonomous mining processes, technologies, equipment, and systems.

Standards and reference frameworks are needed to guide and support all the industry stakeholders that participate in the development of solutions for the integrated mining system.

This will help in the development and application of operational excellence, integration, automation, and autonomy via enabling systems and technology. Given the current commodity downturn there is an imperative need for mining operators to focus on operational excellence.

As more and more topics on automation come up the ISO/TC 82 set up a subcommittee “Advanced automated mining systems”.

1. INTRODUCTION

1.1 ISO technical committees and business planning

The extension of formal business planning to ISO Technical Committees (ISO/TCs) is an important measure which forms part of a major review of business. The aim is to align the ISO work programme with expressed business environment needs and trends and to allow ISO/TCs to prioritize among different projects, to identify the benefits expected from the availability of International Standards, and to ensure adequate resources for projects throughout their development.

1.2 International standardization and the role of ISO

The foremost aim of international standardization is to facilitate the exchange of goods and services through the elimination of technical barriers to trade.

Three bodies are responsible for the planning, development and adoption of International Standards: ISO (International Organization for Standardization) is responsible for all sectors excluding Electrotechnical, which is the responsibility of IEC (International Electrotechnical Committee), and most of the Telecommunications Technologies, which are largely the responsibility of ITU (International Telecommunication Union).

ISO is a legal association, the members of which are the National Standards Bodies (NSBs) of some 164 countries (organizations representing social and economic interests at the international level), supported by a Central Secretariat based in Geneva, Switzerland.

The principal deliverable of ISO is the International Standard.

An International Standard embodies the essential principles of global openness and transparency, consensus and technical coherence. These are safeguarded through its development in an ISO Technical Committee (ISO/TC), representative of all interested parties, supported by a public comment phase (the ISO Technical Enquiry). ISO and its Technical Committees are also able to offer the ISO Technical Specification (ISO/TS), the ISO Public Available Specification (ISO/PAS) and the ISO Technical Report (ISO/TR) as solutions to market needs. These ISO products represent lower levels of consensus and have therefore not the same status as an International Standard.

ISO offers also the International Workshop Agreement (IWA) as a deliverable which aims to bridge the gap between the activities of consortia and the formal process of standardization represented by ISO and its national members. An important distinction is that the IWA is developed by ISO workshops and fora, comprising only participants with direct interest, and so it is not accorded the status of an International Standard.

2. BUSINESS ENVIRONMENT OF THE ISO/TC

2.1 Description of the Business Environment

The following political, economic, technical, regulatory, legal and social dynamics describe the business environment of the industry sector, products, materials, disciplines or practices related to the scope of this ISO/TC, and they may significantly influence how the relevant standards development processes are conducted and the content of the resulting standards:

Mining is the extraction of valuable minerals or other geological materials from the earth, sea and off shelf from an orebody, lode, vein, seam, or reef, which form the mineralized package of economic interest to the miner.

Ores recovered by mining include metals, coal, oil shale and sands, gemstones, limestone, dimension stone, rock salt, potash, gravel, and clay.
Mining is required to obtain any material that cannot be grown through agricultural processes or created artificially in a laboratory or factory. Mining in a wider sense includes extraction of any non-renewable resource such as petroleum, natural gas, or even water. Additionally, re-storing of resources such as natural gas (energy storage) or even CO2 (pollution control) back into suitable country rock might be considered as a mining activity.

Modern mining processes involve

- prospecting for ore bodies,
- analysis of the profit potential of a proposed mine,
- extraction of the desired materials, and
- final reclamation of the land after the mine is closed.

Mining techniques can be divided into three major common excavation types:

- surface mining
- underground mining
- borehole mining.

While from an academic point of view mining is well understood each mine has to deal with a set of site-specific conditions. Accordingly, rules and regulations have been developed on a national or even regional basis. While this makes perfect sense locally, it hinders communication between mining engineers and metallurgists working in other regions and it complicates efforts by equipment suppliers to provide the right equipment to the right location.

With all of the mining regulations **worldwide** it seems that identifying common ground and establishing global standards would be a simple approach. That assumption, however, is incorrect: Some countries, such as Australia, have several large mining districts and they do not have a common standard for the entire nation. Even mines within the same mining house follow different sets of standards. Many countries have really high standards in one area that relate historically to geological conditions or tragedies. Others have been exposed to more environmental and technological changes, such as autonomous operations, larger equipment and specific mine reclamation activities. Hence we are far away to have real global standards.

The mining equipment manufacturers strive to provide the best equipment and services to the mining industry. As new equipment suppliers emerge from developing countries, they will hopefully aspire to a similar level of quality for the sake of miner's safety.

Safety has long been and is still a concern in the mining industry. Unfortunately, mining accidents continue worldwide, including accidents causing many of fatalities at a time such as the 2007 Ulyanovskaya Mine disaster in Russia, the 2009 Heilongjiang mine explosion in China, the 2010 Upper Big Branch Mine disaster in the United States, the 2014 Soma mine disaster in Turkey**, tragedies at Sibanye-Stillwater, RSA and CSM Karvina, Czech Republic in 2018. 2019 already experienced at least three tailings dam collapses killing several hundreds of people in Brazil, Myanmar and Indonesia.**

Most of the annual fatalities however are those with one or two persons involved mainly caused by machine/human interaction. Therefore, it must be considered as a main task for ISO/TC 82 to evaluate research and modern practices, to include this in standards to be applied worldwide and to help to improve safety in mines significantly. People proximity detection systems are one tool, but finally fully automated applications will be the target. Beside the huge economic impact of so called Smart Mining or Mining 4.0 or Digital Mining etc. initiatives the benefit will be a much safer and attractive working environment.
For this purpose, ISO/TC 82's new SC8 is in place to address those topics covering not only the equipment but processes and communication protocols as well.
Mechanization and autonomous operations technology will grow further improving safety, efficiency and sustainability. A recent statement by a global platinum mining company, true for the entire industry, summed the situation up as follows: "Mechanize or die!"
Standards have to be developed continuously to set the frame for this scenario.

The nature of mining processes creates a potentially negative impact on the environment both during the mining operations and for years after the mine is closed. This impact has led most of the world's nations to adopt regulations designed to moderate such potentially negative effects of mining operations.

Mine reclamation is a very wide field; generally, it is the on-going and subsequent re-integration of the mining affected areas into the environment during and after the end of mining activities.
Many topics have to be considered and - very important - have to be considered long term such as hydrology, contamination levels of water, tailings and soil, soil and slope stability, subsidence, deconstruction of buildings etc.
Whilst in many countries good local standards are in place a global approach is missing so far. Managing a reclamation activity is very complex starting already long before any mining commences and does not stop for years after the last ore/coal has been mined.
New mining projects usually are very critically looked at and a reclamation plan is compulsory but a common global standard on how to manage this is not available.
Additionally, almost every country experience issues with either recently or long time ago closed mines or - probably most publicly known - collapsing slime/tailings dams.
In many cases no local subject matter expert is available anymore.

ISO/TC 82 /SC7 are addressing those gaps globally. At first a review of as many as possible existing national, regional and local standard is planned, and then new standards will be defined.

Periodically, all mines are facing severe cost issues, in the last years the whole mining industry and their OEMs suffered, some mining houses were able to compensate lower prices with higher production to keep profit levels. In early 2017 the conditions improved caused by higher demands leading to higher commodity prices. The cycle has happened before and will continue, supply/demand and of course politics specifically current trade sanctions do influence the industry at large. Flexibility is needed by all players to re-act quicker in both down and up turns.

Several global trends are relying on mining now and in future:
Growth of global population, urbanization, demand for higher quality food, energy increase etc. all these need base resources: coal, oil, gas, ore, minerals, potash, aggregates, rare earths.

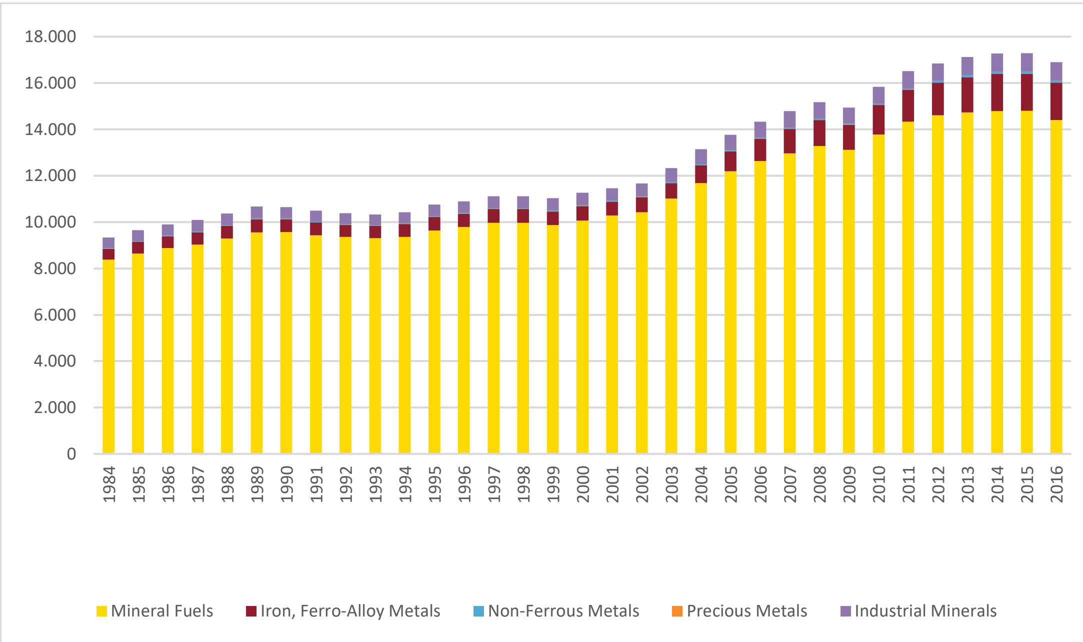
The ongoing work and dedication of ISO/TC 82 continue to assist the industry at large for a safe and profitable future which includes gender specific considerations. The image of being a dark, dirty and dangerous sector hence not attractive to in particular female talent has to change quickly.

2.2 Quantitative Indicators of the Business Environment

The following charts are showing the increasing mining production in the world which has nearly been doubled in the last 30 years (from 1984 to 2016). In 2016, the value of the world mining production corresponds to 2.932.710 million US $.[1]

The sales volume of the production of mining machines in 2016 corresponds to about 22,64 billion US $.[2]

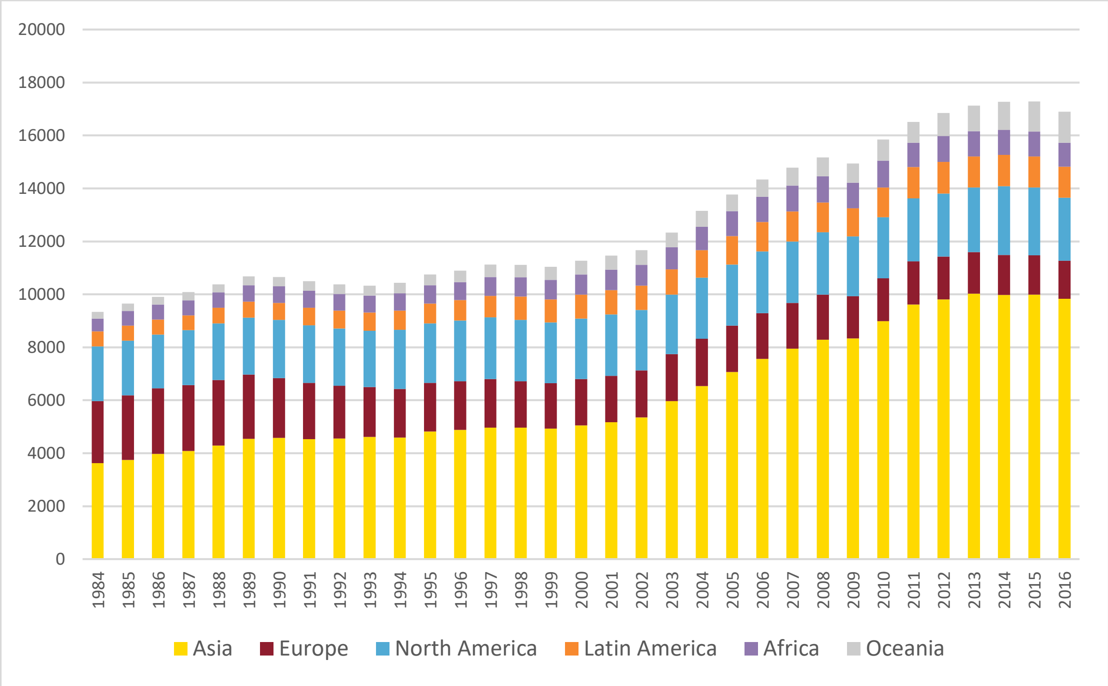
For the shaft sinking business, no detailed statistics are available. About 70 % of the world's minerals are currently extracted by opencast mining methods. However, it must be assumed that much of this production will soon move to the underground mining sector. A study of Rio Tinto predicts that by 2018 about 50 % of all ore extraction will be produced by underground mining methods. In 2014, more than 70 shaft sinking projects are at the construction or planning stage.



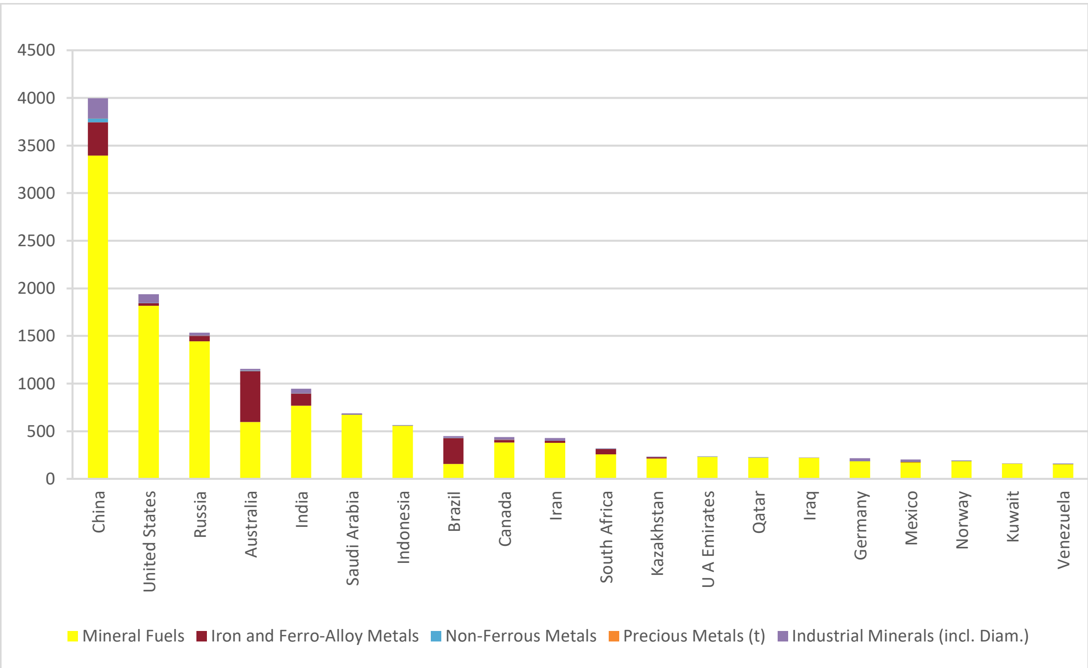
World mining production 1984 - 2016 by groups of minerals (without construction minerals, in Million metr. t)

[1] World mining data, Volume 33, Minerals production, Vienna 2018

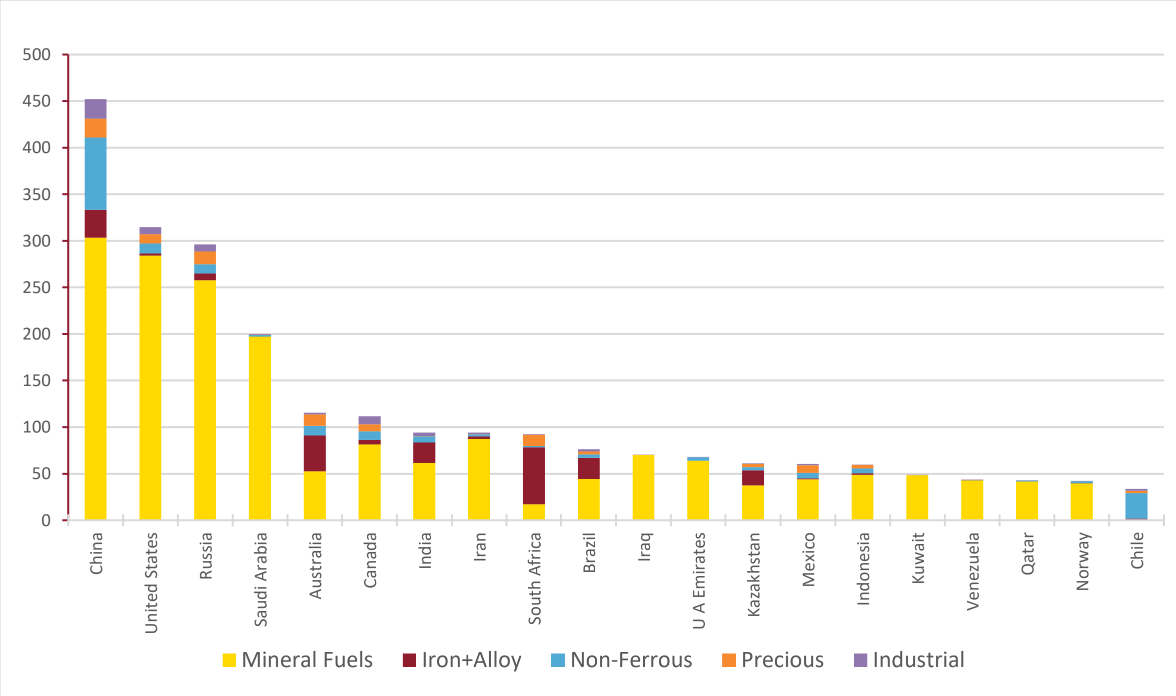
[2] VDMA (Verband Deutscher Maschinen- und Anlagenbau, German Engineering Association)



World mining production 1984 - 2016 by continents (without construction minerals, in Million metr. t)



20 largest producer countries 2016 (without construction minerals, in Million metr. t)



20 largest producer countries 2016 (without construction minerals, in billion US$)

3. BENEFITS EXPECTED FROM THE WORK OF THE ISO/TC

Several benefits are expected from the work ongoing and to be commenced in future as global harmonized standards will improve safety, reduce trade barriers and accelerate full scale trade.

Those projects under way currently will assist

- to set up global standards where none or only regional ones exist,
- to define standards in the first place as new technology developed or has been adapted from other areas and no common formal approach is given and
- to link and adapt efforts of other TCs into ISO/TC 82 activity and vice versa.

Standards act as a universal translator and common denominator enabling better communication between stakeholders in the industry.

Especially in mining where big national variances exist in maturity of technologies and processes ISO/TC 82 will close potential gaps. This is predominantly important for the introduction of new technologies such as autonomous operation of equipment but also for missing management tools e.g. in reclamation.

End users will benefit due to standardized high level of safety, functionality and comfort.
Manufactures/suppliers will benefit as global standard designs offer significant cost reduction of product development and allow access to more markets.

Particularly the work started on mine reclamation management will give benefit to those users who have no or limited access to existing regional or national knowledge of processes and procedures.
The sub-committee SC7 will globally review historical and existing standards, processes and activities in place identifying best practices, linking them with other relevant standards e.g., ground water quality and soil mechanics.
The work is going to formulize a state of the art mine reclamation management tool which will serve as a normative reference around the globe. This way many safety and environmental concerns of closed and active mine reclamation will be addressed.

Another area of focus will be advanced automated mining operations.
Whereas several industries employed certain automation technology already, mining has limited experience so far. Low grade deposits in remote and expensive areas can only be exploited cost effective with super large machinery and high mechanization levels. Several mining companies, equipment suppliers and software experts run pilot projects in selected open cast mines each following own standards,
The technical complexity is high, many barriers mainly safety related have to be coped with and very individual expensive and non-compatible solutions are developed.

Harmonized global standards would benefit immensely removing technical barriers; enhance safety and reducing cost of this relatively low volume production hence open more markets to further increase usage finally resulting in lower cost per ton.

4. REPRESENTATION AND PARTICIPATION IN THE ISO/TC

4.1 Membership

Participating members (23)	Observer members (23)
Australia (SA)	Austria (ASI)
Canada (SCC)	Bulgaria (BDS)
Chile (INN)	Croatia (HZN)
China (SAC)	Cuba (NC)
Finland (SFS)	Czech Republic (UNMZ)
France (AFNOR)	Egypt (EOS)
Germany (DIN)	Estonia (EVS)
India (BIS)	Greece (NQIS ELOT)
Iran, Islamic Republic of (ISIRI)	Hong Kong (ITCHKSAR)
Korea, Republic of (KATS)	Indonesia (BSN)
Malawi (MBS)	Japan (JISC)
Portugal (IPQ)	Moldova, Republic of (ISM)
Russian Federation (GOST R)	Mongolia (MASM)
Rwanda (RSB)	Pakistan (PSQCA)
South Africa (SABS)	Peru (INACAL)
Spain (UNE)	Poland (PKN)
Sudan (SSMO)	Romania (ASRO)
Sweden (SIS)	Serbia (ISS)
Switzerland (SNV)	Thailand (TISI)
Tanzania, United Republic of (TBS)	Tunisia (INNORPI)
United Kingdom (BSI)	Turkey (TSE)
United States (ANSI)	Ukraine (DSTU)
Zambia (ZABS)	Zimbabwe (SAZ)

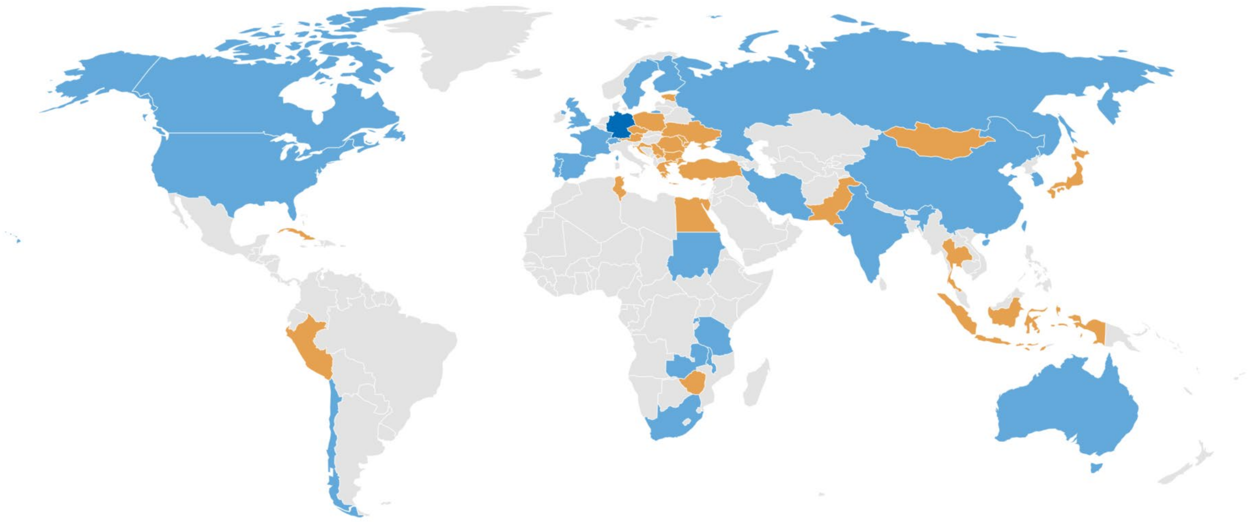
4.2 Analysis of the participation

Considering that the committee has been re-activated since a short time only, the representation of countries in ISO/TC 82 has to be evaluated as good. Since re-activation, eight important mining countries could be gained as new P-members.

A comparison of the leading producers in the mining industry[3] with the current members of ISO/TC 82 shows a high grade of congruence.

[3] World Mining Production 2008 – 2016.

Membership ISO/TC 82



ISO/TC 82 is working with South Africa, Zambia and Chile more recently. Russia is becoming more active again. One of the goals of the committee is to increase participation from Africa and Latin America, especially from Brazil and Colombia.

As mining is a very variegated activity and affects many other technical fields or is vice versa influenced by them, ISO/TC 82 extensively liaise with other related TCs especially in the machinery area, as “ISO/TC 127 Earth-moving machinery” or ISO/TC 195 “Building construction machinery and equipment”. In addition to that, common working groups have been established to not only exchange findings but agree on next steps and finally where possible a common interdisciplinary standard.

Furthermore, ISO/TC 82 is in close contact to the industry. This is why an external liaison with with Global Mining Guidelines Group (GMG) has been created. GMG is a group consisting of more than 75 mining companies and mining equipment manufacturers with the aim to collaborate globally on solutions to common industry problems, needs and technology through standards, guidelines and best practices.

5. OBJECTIVES OF THE ISO/TC AND STRATEGIES FOR THEIR ACHIEVEMENT

5.1 Defined objectives of the ISO/TC

The key objective of the ISO TC 82 is to provide relevant standards to the stakeholders in the mining industry improving safety and handling, reducing complexity and enabling global trade.

Such standards should then serve as base for mining machinery industries and governments for their development processes and regulations respectively.

While the majority of efforts focus on machinery (safety, comfort, performance) ISO/TC 82 with the SC7 Mine Reclamation Management added a new topic to the portfolio. This work will ensure environmental aspects are taken care of before, during and after mining activities as a global standard. SC 8 Advanced Automated Mining Systems starts their work. The purpose of the sub-committee is to develop standards to support the design, development, and utilization of advanced automated and autonomous processes, technologies, equipment, and systems in the mining sector. This will enable step change improvement in the mining sector in terms of safety, productivity, and cost as related to the adoption and use of advanced and autonomous mining processes, technologies, equipment, and systems.

ISO/TC 82 will develop standards as listed in section 7.2

Finally, ISO/TC 82 has to address the shifting of global mining and mining machinery manufacturing activities. Most mining is happening in non-European countries where as many mining machinery suppliers are still located in Europe mainly Sweden, Germany, Finland.
Besides the long time established industry and mining nations USA, Canada, Australia, Germany, Sweden important new players like the BRICS and to a lesser extend MINT countries not only localize machinery manufacturing but also develop own technology for local and export use. Common standards are very important to be successful globally.

5.2 Identified strategies to achieve the ISO/TC's defined objectives

After the long dormant stage of the ISO/TC 82 activity has re-started in 2013 with a first priority in gathering existing members and getting new members on board.
This has been successful as three ISO/TC 82 meetings have taken place to review the structure and ongoing work with more O (now 23) and P (was 10 now 22) members especially of those countries recognized as big mining nations (USA, Canada, Australia…).

Periodic review of standards has started again and will form regular work now.
Systematic reviews have taken place in

First published standards are ISO 19224; ISO 19225; ISO 19296; ISO 19426 series, ISO 18758 series and ISO 19434.

In 2013 ISO/TC 82 dissolved in total four sub-committees due to long time in-activity.

ISO/TC 82 has got clear priorities defined:

- Safety
- Mine reclamation management
- Advanced Automated Mining Systems

The ISO/TC 82 structure is organized in two Subcommittees (SC 7 and SC 8) and 6 WG (4 WG and 2 JWG) all of which meet regularly and accelerate the ongoing activities.

ISO/TC 82 exchange regularly information with other TCs and their SC/WG via liaisons and invite them to the meeting where appropriate. Namely very close co-operations happen with TC 127 and TC 195. For the coordination in the field of Advanced Automated Mining Systems a coordination group is formed.

During the development of standards synchronization with e.g. CEN standards is always aimed at. A close liaison is with the CEN/TC 196 "Mining machinery and equipment-Safety". The aim of this liaison is to develop harmonized international standards through the Vienna agreement.

With alternating the annual meeting venues ISO/TC 82 recognize the importance of physically getting key members involved in the procedures. Since 2013 ISO/TC 82 met in Germany, South Africa, South Korea, United States, Finland, Chile and China and plans the next meeting in Sweden later in 2019.
Beside the physical meetings the most common tool of correspondence is livelink and more increasingly web conferencing.

Chairman and secretary meet at least once a quarter. Their main role is to manage and co-ordinate the ongoing technical activities, approve new work items and maintain public relations (press, associations, government bodies).

6. FACTORS AFFECTING COMPLETION AND IMPLEMENTATION OF THE ISO/TC WORK PROGRAMME

The Secretariat of ISO/TC 82 Mining has been appointed to Germany due to the long mining tradition, in underground as well as in open cast mining especially of hard coal, lignite, iron ore, metal ores, potash and salt. In addition, a considerably large industry of mining machine manufacturers and shaft sinking companies has been developed there.

The Secretariat of ISO/TC 82/SC 7 Mine reclamation management has been appointed to Republic of Korea. Korea has taken an enormous economic boom in the last few decades and has realized that sustainable mining is the only way how mining can be carried out in a modern society. Therefore, Korea has issued the necessary laws and the correspondent public-private organization to guarantee an efficient mine reclamation. Korea has therefore experience and manpower to maintain the secretariat of ISO/TC 82/SC 7.

The Secretariat of ISO/TC 82/SC8 Advanced Automation has been appointed to Canada. This new subcommittee will concentrate standards development, knowledge, research, and best practices pertaining to the use and application of advanced and automated systems, technologies and practices specific to the mining sector. The new subcommittee has received strong support and input from the major mining countries, mining OTMs, and mine operators. Currently there are 9 countries participating on this subcommittee (Australia (SA); Canada (SCC); Chile (INN); China (SAC); Finland (SFS); Germany (DIN); South Africa (SABS); Sweden (SIS); Russia (GOST-R)).

At the moment, all leading positions in ISO/TC 82 are occupied by excellent experts (Section 7.1).

However, some Working Groups are still lacking experts. This is one area of concern and will be addressed. Currently, scope of work is redefined and where applicable liaisons and JWG are established to continue the work.

The decline in availability of untapped high-quality ore deposit is a major challenge facing the mining industry today. The immediate result of this is a reduction in ore quality and miners having to go deeper beneath the land. This report from the World Economic Forum in 2017 states that over a period of 15 years, the average cost of producing copper has increased by over 300% but grade has dropped by 30%.
The challenge for the mine operators is to run the mines more efficient.
One way to achieve this is by studying other industries that have successfully adopted lean techniques and process automation without necessarily jeopardizing quality and safety. Modern manufacturing companies, for instance, can offer some ideas in this regard. In addition, they could explore areas to minimize operational inefficiency whether in energy consumption, workforce engagement, by reusing materials and resources, etc. Now the important issues are to optimize the processes and develop new concepts to extract minerals. This could lead to a fully automated mine with additional positive effects on environmental challenges. These technologies could be helpful also for the efforts concerning ergonomic and gender specific solutions.

7. STRUCTURE, CURRENT PROJECTS AND PUBLICATIONS OF THE ISO/TC

7.1 Structure

ISO/TC 82 Mining Chairman: Reinhard Reinartz, Germany Secretary: Jörn Lehmann, DIN			
Title		**Secretariat**	**Chairman/Convenor**
SC 7	Mine closure and reclamation management	Mr. Soondong Kwon, KATS	Mr. Christoph Diddier
SC 8	Advanced automated mining systems	Mr. Paul Steenhof, SCC	Mr Tim Skinner
TF2	Tailings	SCC	Mr Lawrence Charlebois
JWG 1	Joint ISO/TC 82 - ISO/TC 127 WG: Rock drill rigs	SIS	Mr Erik Elster
WG 2	Continuous surface miners	DIN	Mr Georg Piller
WG 3	Shearer loaders and plough systems	DIN	Mr Thomas Hürmann
WG 4	Structures for mine shafts	SABS	Mr Geoff Krige
(J)WG 5	Joint ISO/TC 82 - ISO/TC127 WG: Safety of mining and earthmoving mobile machines working underground	ANSI	Mr Daniel Roley
WG 6	Classification of mine accidents	ISIRI	Mr Seyed Reza Hosseini
WG 8	Terminology	ISRI	Mr Seyed Reza Hosseini
WG 9	Operator enclosures	ANSI	Mr. Jeff Moredock

7.2 Work programme

7.2.1 Active work items

Standard and/or project	stage
ISO 19225:2017 / FDAmd 1 Underground mining machines - Mobile extracting machines at the face - Safety requirements for shearer loaders and plough systems – Amendment 1	50.20
ISO/DIS 22932-1 Mining -- Terminology -- Part 1: Planning and surveying	40.60
ISO/DIS 22932-2 Mining -- Terminology -- Part 2: Geology	40.99
ISO/NP 19426-6 Structures for mine shafts -- Part 6: Design of shaft lining	10.99
ISO/NP 19426-7 Structures for mine shafts -- Part 7: Design of rope guides	10.99
ISO/NP 23872 Underground structures -- Part 8: Design	10.99
ISO/NP 24451-1 Rock mechanics – Part 1: Terminology	10.20
ISO/TC 82 / SC 7	
ISO/CD 20305 Mine reclamation management terminology	30.99
ISO/CD 21795 Mine closure and reclamation management planning	30.99

7.2.2 Preliminary work items

Standard and/or project	Stage
ISO/PWI 23875 Mining -- Operator enclosures -- Air quality control systems and air quality performance testing	00.00
ISO/TC 82/ SC 8	
ISO/PWI 23725 FMS interface to autonomous haulage	00.00
ISO/PWI 23724 Emergency remote stop of mining equipment	00.00

7.3 Published standards

ISO 19434:2017/Amd 1:2019 Mining - Classification of mine accidents

ISO 19296:2018 Mining -- Mobile machines working underground -- Machine safety

ISO 19426-1:2018 Structures for mine shafts - Part 1: Head frames

ISO 19426-2:2018 Structures for mine shafts - Part 2: Sinking platforms

ISO 19426-3:2018 Structures for mine shafts - Part 3: Conveyances

ISO 19426-4:2018 Structures for mine shafts - Part 4: Underground mine shaft structures

ISO 18758-1:2018 Mining and earth-moving machinery - Rock drill and rock support rigs - Part 1: Vocabulary

ISO 18758-2:2018 Mining and earth-moving machinery - Rock drill and rock support rigs - Part 2: Safety requirements

ISO 19224:2017 Continuous surface miner (CSM) - Safety

ISO 19225:2017 Underground mining machines - Mobile extracting machines at the face - Safety requirements for shearer loaders and plough systems

ISO 19434:2017 Mining - Classification of mine accidents

Rock drilling equipment

ISO 721:1991-01 Rock drilling equipment - Integral stems

ISO 722:1991-02 Rock drilling equipment - Hollow drill steels in bar form, hexagonal and round

ISO 723:1991-02 Rock drilling equipment - Forged collared shanks and corresponding chuck bushings for hollow hexagonal drill steels

ISO 1717:1974-06 Rock drilling - Rotary drill-rods and rotary drill-bits for dry drilling – Connecting dimensions

ISO 1718:1991-01 Rock drilling equipment - Drill rods with tapered connection for percussive drilling

ISO 1721:1974-08 Rock drilling - Extension drill-steel equipment for percussive long-hole drilling - Reverse-buttress-threaded equipment 1 1/16 and 1 1/14 (27 and 32 mm)

ISO 1722:1974-09 Rock drilling - Extension drill-steel equipment for percussive lang-hole drilling - Reverse-buttress-threaded equipment 1 1/2 to 2 1/2 in (38 to 64 mm)

ISO 10207:1991-02 Rock drilling equipment - Rope threaded drill steel equipment for percussive drilling, nominal sizes 22 mm to 38 mm

ISO 10208:1991-02 Rock drilling equipment - Left-hand rope threads

Geological and petrographic symbols

ISO 710-1:1974-09 Graphical symbols for use on detailed maps, plans and geological crosssections - Part 1: General rules of representation

ISO 710-2:1974-09 Graphical symbols for use on detailed maps, plans and geological crosssections - Part 2: Representation of sedimentary rocks

ISO 710-3:1974-09 Graphical symbols for use on detailed maps, plans and geological crosssections - Part 3: Representation of magmatic rocks

ISO 710-4:1982-04 Graphical symbols for use on detailed maps, plans and geological crosssections - Part 4: Representation of metamorphic rocks

ISO 710-5:1989-07 Graphical symbols for use on detailed maps, plans and geological crosssections - Part 5: Representation of minerals

ISO 710-6:1984-06 Graphical symbols for use on detailed maps, plans and geological crosssections - Part 6: Representation of contact rocks and rocks which have undergone metasomatic, pneumatolytic or hydrothermal transformation or transformation by weathering

ISO 710-7:1984-08 Graphical symbols for use on detailed maps, plans and geological crosssections - Part 7: Tectonic symbols

Components of coalface machinery using high-tensile round link chains

ISO 610:1990-08 High-tensile steel chains (round link) for chain conveyors and coal ploughs

ISO 1082:1990-08 Mining - Shackle type connector units for chain conveyors

ISO 5612:1990-08 Mining - Scraper bars for chain conveyors

ISO 5613:1984-06 Mining - Drive sprocket assemblies for chain conveyors

Mining ropes

ISO 3154:1988-06 Stranded wire ropes for mine hoisting - Technical delivery requirements

ISO 3155:1976-04 Stranded wire ropes for mine hoisting - Fibre components - Characteristics and tests

ISO 3156:1976-07 Stranded wire ropes for mine hoisting - Impregnating compounds, lubricants and service dressings - Characteristics and tests

ISO 5614:1988-06 Locked coil wire ropes for mine hoisting - Technical delivery requirements

Diamond core drilling equipment

ISO 3551-1:1992-07 Rotary core diamond drilling equipment - System A - Part 1: Metric units

ISO 3551-2:1992-07 Rotary core diamond drilling equipment - System A - Part 2: Inch units

ISO 3552-1:1992-07 Rotary core diamond drilling equipment - System B - Part 3: Metric units

ISO 3552-2:1992-07 Rotary core diamond drilling equipment - System B - Part 4: Inch units

ISO 8866:1991-05 Rotary core diamond drilling equipment - System C

ISO 10097-1:1999-10 Wireline diamond core drilling equipment - System A - Part 1: Metric units

ISO 10097-2:1999-10 Wireline diamond core drilling equipment - System A - Part 2: Inch units

ISO 10098:1992-10 Wireline diamond core drilling equipment - System CSSK

Information on ISO online

The link below is to the TC's page on ISO's website:
ISO/TC 82 on ISO Online

Reference information

Glossary of terms and abbreviations used in ISO/TC Business Plans

General information on the principles of ISO's technical work