

Engineering
En

Performance
Pe



Company Presentation

TUV NORD GROUP

TUV NORD GROUP

Agenda



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DMT AT A GLANCE

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MARKETS & PROJECTS

03

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04

INNOVATION

01**DMT AT A GLANCE**

- DMT as part of the TÜV NORD GROUP
- History
- Our Attitude
- Engineering Performance
- Facts & Figures
- Business Units
- Proof of our Performance
- Locations and Availability
- Associations and Networks
- Selected Customers

DMT as part of the TÜV NORD GROUP

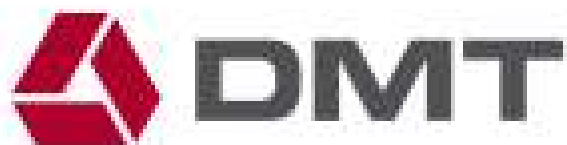


TÜV NORD GROUP

Headquarters in Hannover, Germany



Industrial Service,
Mobility, Education



Natural Resources



Aerospace



Information Technology

1700

2000

today

1737 - 1990

Various
predecessor
organisations

1990

Foundation of
DMT

2006

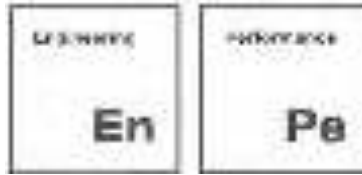
Acquisition of
IMC and
foundation of
DMT Czech
Republic

2007

DMT joins the
TUV NORD GROUP

2008 - today

Further inter-
national growth
by acquisition
and foundation
of 14 companies



Engineering Performance

If you have made it your business to create solutions since 1737, it is inevitable that you will develop substantially as a company.

The DMT Group's claim today is excellence, performance and innovation in everything we do – So that our clients are sustainably successful in everything they do.

ENGINEERING PERFORMANCE, DMT's core competency, is reflected in the wide range of technical challenges facing our markets.

It is no coincidence that DMT is involved in a large number of international innovation projects. We work with great passion on the digitization of existing and new business models, on services and products for ourselves and our clients.

We act responsibly, sustainably and ethically - helping to understand the world and create new values for the future.

The campaign “Engineering Performance”



“E-Mobility”

Dirk Harbecke, CEO Rock Tech Lithium



„Water“

Dr. Oliver Stoschek, Head of Hydrogeology & Water Management (DMT)



“Monitoring”

Prof. Dr. Manfred Joswig, Director of the Institute for Geophysics, University of Stuttgart



Facts and Figures



We create sustainable value for our customers through quality-assured, specialized and innovative services.



We provide independent services in engineering, consulting, exploration and geotechnics, as well as measuring and research.



DMT's **roots** date back to **1737**



Approx. **1,100 employees** mainly with academic background



DMT comprises **14 operational engineering and consulting companies** and more than **30 branches worldwide**



DMT's attitude is dedicated to **excellence, responsibility & innovation**



Approx. **€ 130 million turnover**



Today **DMT** is a **core brand** of TÜV NORD GROUP

Management Board: Dr. M. Tiedemann (Chair), J.-P. Lux

Geo Engineering & Exploration	Mining Consulting & Engineering	Industrial Engineering	Plant & Product Safety		
<ul style="list-style-type: none"> ▪ Geotechnics & Environmental Engineering ▪ Surveying & Geomonitoring ▪ Exploration & Engineering Geophysics ▪ Hydrogeology & Water Management ▪ Line Engineering & Engineering Geodesy ▪ DMT Middle East W.L.L 	<ul style="list-style-type: none"> ▪ International Mining Consulting ▪ Mining Engineering 	<ul style="list-style-type: none"> ▪ Coke Oven Gas Technology ▪ System Engineering ▪ Machine Diagnosis & Geoinstruments ▪ Flow Measuring Technology ▪ Cokemaking Services ▪ ENCOS GmbH & Co. KG 	<ul style="list-style-type: none"> ▪ Technical Building Safety ▪ Refrigeration & Air Quality ▪ Fire & Explosion Protection ▪ Fire Testing ▪ Component Safety 	<p>Seismic</p>	<p>EE Energy Engineers</p>

Proof of our Performance



Worldwide on site

30 German and international locations



>10,000 Projects

annually in more than 150 countries



Added Value

High customer satisfaction through engineering performance



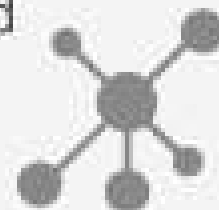
Practical experience and certification

- ISO 9001
- ISO 14001
- SCCP: 2011



Highly networked

in all relevant committees, associations and networks worldwide



360° Service

Cross-interface from analysis to approval



>40 

current research projects

Proof of our Performance – Certificates



- ✓ ISO 9001
- ✓ ISO 14001



- ✓ SCC^P: 2011

Furthermore, DMT group makes use of about 20 of its own accredited testing laboratories and expert bodies.

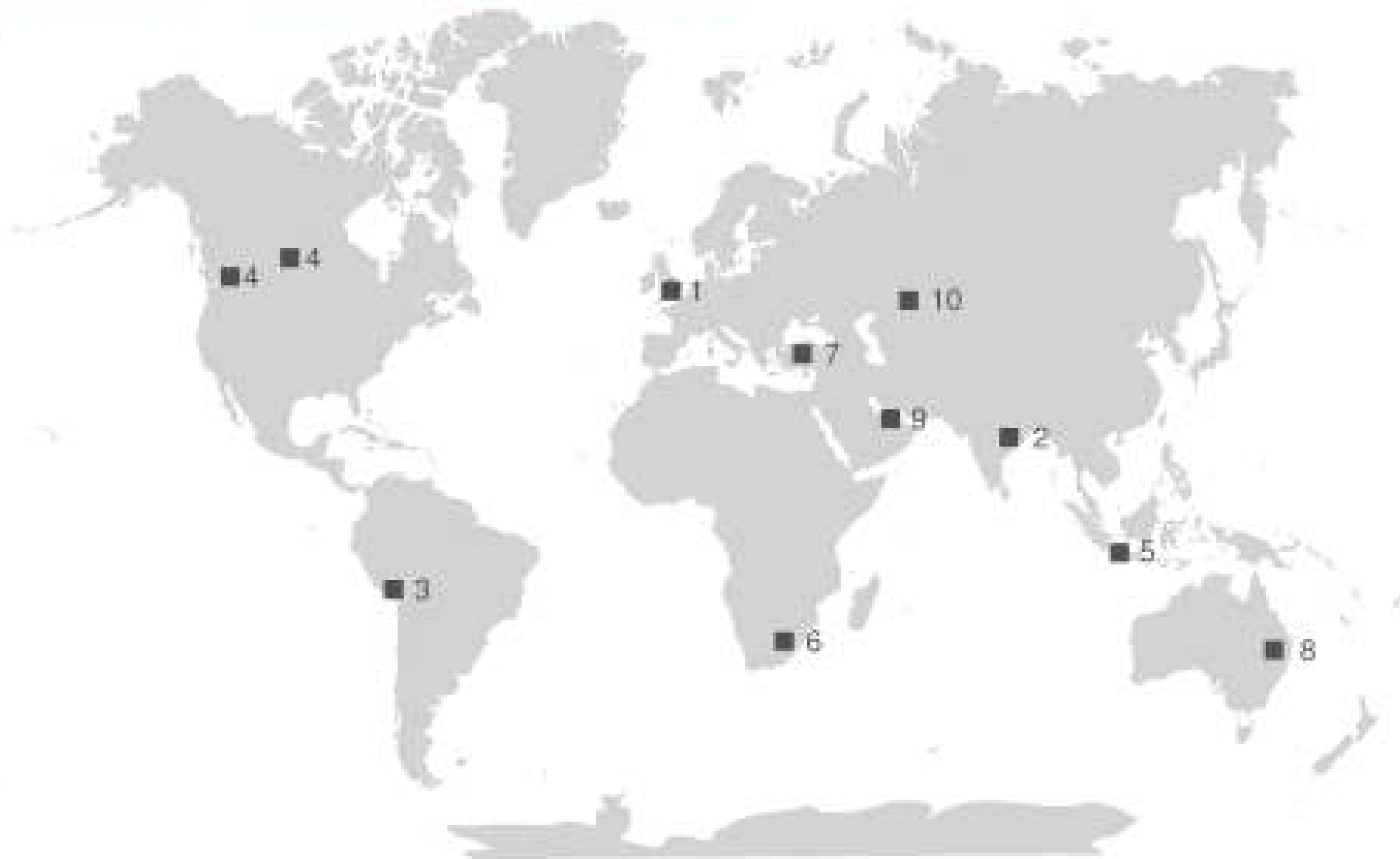
Locations and Availability – Branch Offices throughout Germany



Locations and Availability – International Presence

Local representations

1. UK
2. India
3. Peru
4. Canada
5. Indonesia
6. South Africa
7. Turkey
8. Australia
9. Middle East
10. Kazakhstan



Locations and Availability – M&A and Foundations



DMT Entity

Accession

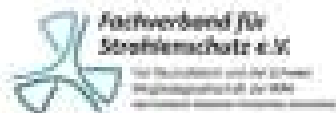
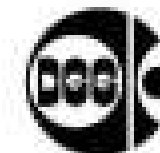
DMT Consulting Ltd., UK	2006
DMT Geosciences Ltd., Canada	2008
DMT Consulting Private Ltd., India	2009
DMT Petrologic GmbH, Germany	2011
Höntzsch GmbH, Waiblingen, Germany	2012
PT DMT, Indonesia	2013
DMT Kai Batla Proprietary Ltd., South Africa	2014
IMC Montan Ltd., UK	2014
DMT Engineering Surveying GmbH & Co. KG, Germany	2015
DMT GmbH & Co. KG Merkezi Almanya İstanbul Merkez Şubesi, Turkey	2016
DMT Middle East W.L.L., Bahrain	2018
EE Energy Engineers GmbH, Germany (A subsidiary company of TÜV NORD Systems GmbH & Co. KG)	2019
ENCOS GmbH, Germany (A subsidiary company of TÜV NORD NC GmbH & Co. KG)	2019
DMT Consulting Engineers Pty Ltd, Australia	2020
DMT Branch Office, Peru	2020

Projects all over the World

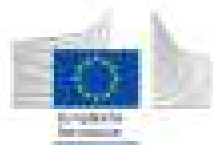


Thousands of projects in
> **150** countries

Associations and Networks (Excerpt)



Selected Customers



RWE



Eni



steag

TATA



HSBC



e-on



BOLIDEN



nagra aus verantwortung



RioTinto



SIEMENS



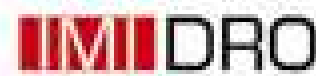
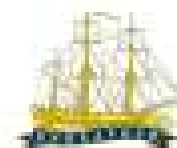
Selected Customers



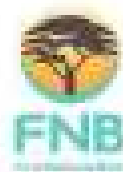
Selected Customers



J.P.Morgan



Selected Customers



02**MARKETS & PROJECTS**

- Focus Markets
- Civil Engineering & Infrastructure
- Mining
- Energy
- Plant Engineering & Process Engineering
- Cross Market Services: Plant & Product Safety

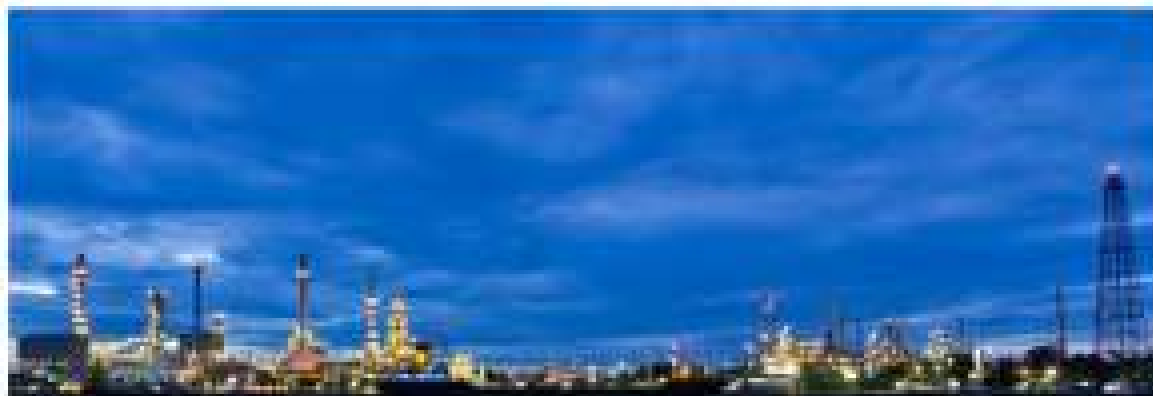
Focus Markets



Mining



Civil Engineering & Infrastructure



Plant Engineering & Process Engineering



Energy

The most important message first:
We have it covered.
From A to Z.

The Challenge

The mining business is complex, demanding, and requires great investments. As one of the leading mining service groups in the world, we have been passing on our experience in the consulting, financial, and engineering area since 1737.

Our Contribution

- Engineering and consulting along the whole life cycle of a mine
- Evaluation
- Deposit modelling
- Investment studies
- Greenfield development
- Mine planning
- Exploitation
- Closure

Strategic development of the mining program

Republic of South Africa / Department of Mineral Resources
South Africa

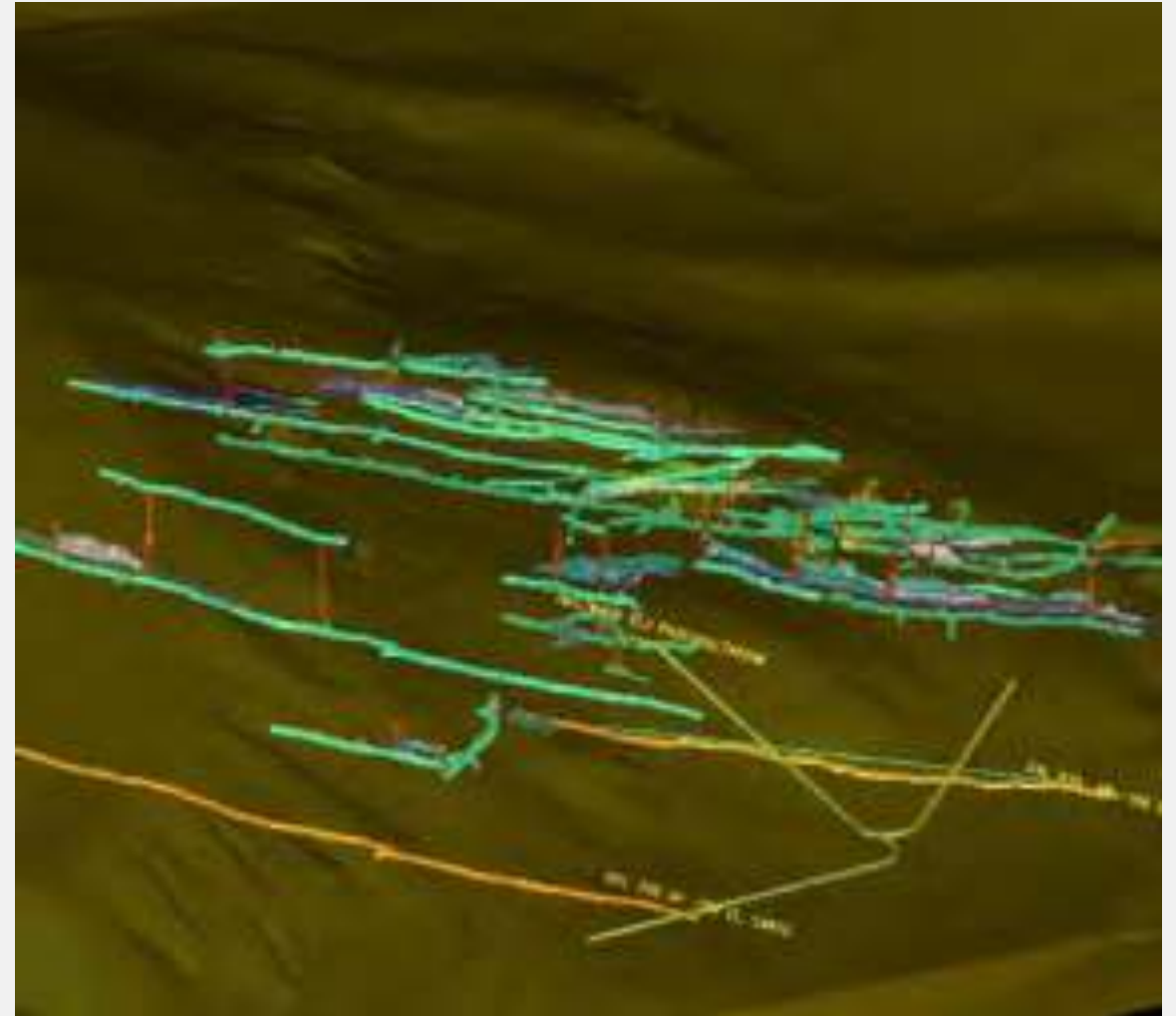
- Development and management of new mining projects
- Overall strategic orientation
- Networking and marketing of organizations
- Guideline development
- Support for political institutions in South Africa



El Santo Mining Project Due Diligence services

GoldPlata S.A.C
Peru

- Evaluation of the El Santo underground project status (El Diablo and El Angel).
- Status of exploration
- Resource reserve estimates, ore qualities,
- Mining activities carried out so far
- Metallurgical test work carried out so far
- Recommendations for grade controls

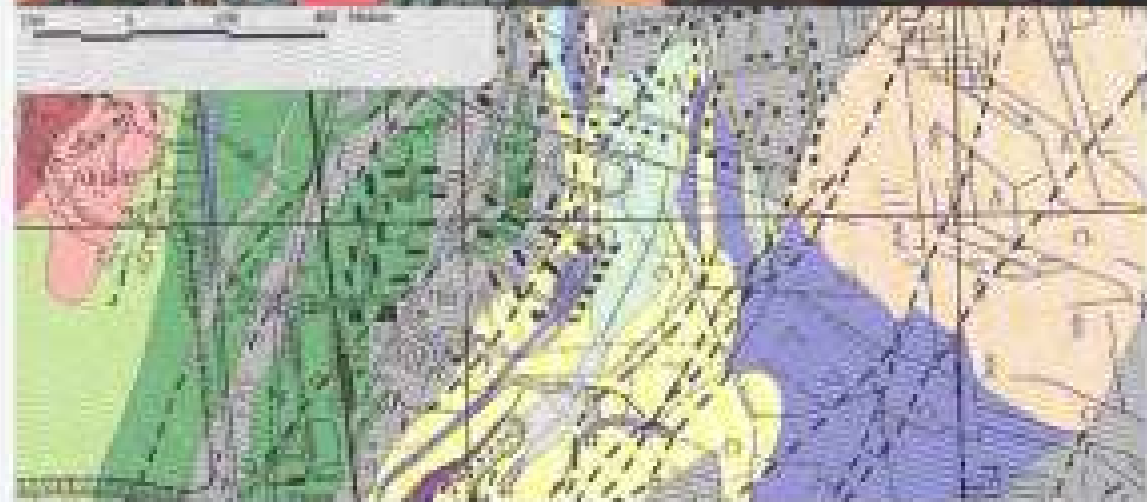
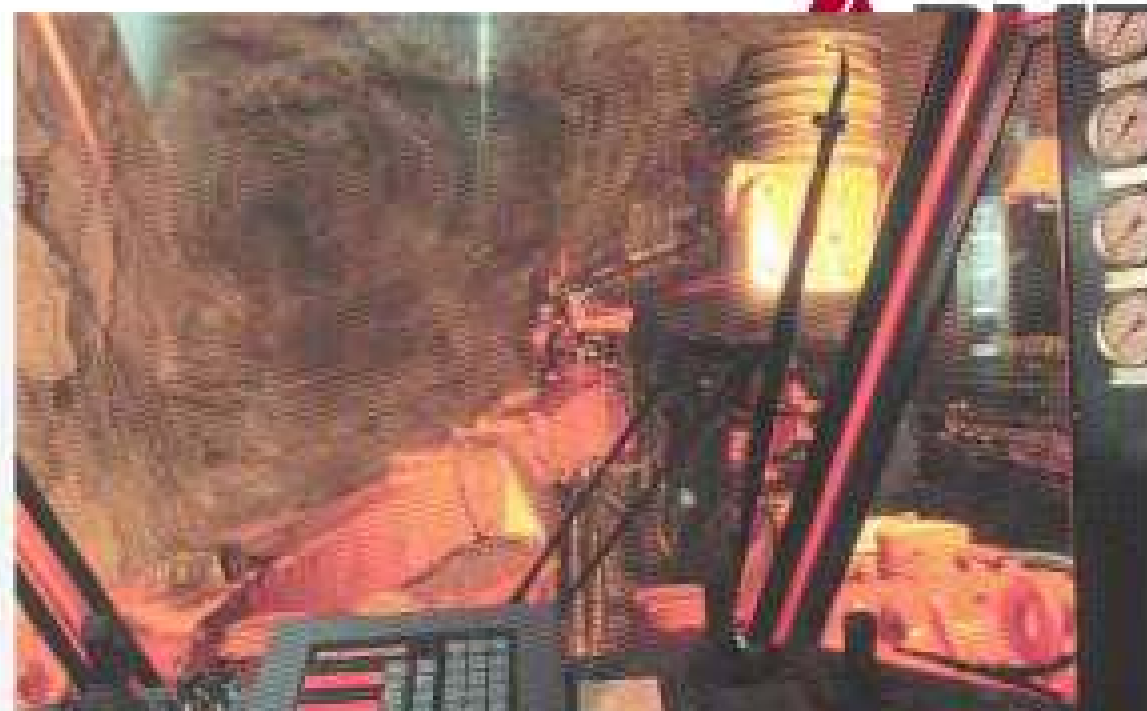


Mining

Due diligence of Pyhäsalmi Copper - Zinc - Pyrite underground mine

Inmet Mining
Finland

- General layout review
- Evaluation of Mining operations
- Future development planning
- Estimation of mine capital and operating costs



Independent Engineer for Aguablanca Project

Investec Bank (UK) Ltd
Spain

- Agua Blanca Ni / Cu / PGM Project located in Southern Spain consists of an open pit mine, crushing and flotation plant with a design capacity of 1.8 M tpy, tailings and waste rock storage facilities, water supply and ancillary facilities.
- DMT was appointed as Independent Technical Consultant and tasked on behalf of the banks:
- To monitor the progress of the project and control cost expenditures during construction and operation
- To carry out project's commissioning and completion tests.



Technical Review on the Expansion Project of the Gold and Silver Mine San Jose

Minera Santa Cruz S.A
Argentina

- Resources and reserves review
- Manpower requirements
- Processing results and the life-of-mine ("LOM") plans relating to productivity, production, operating costs, capital expenditures and revenues.



Independent Technical Review for Aguas Teñidas Copper-Zinc-Lead Mine

Investec Bank (UK) Ltd; PGM Ventures Corporation
Spain

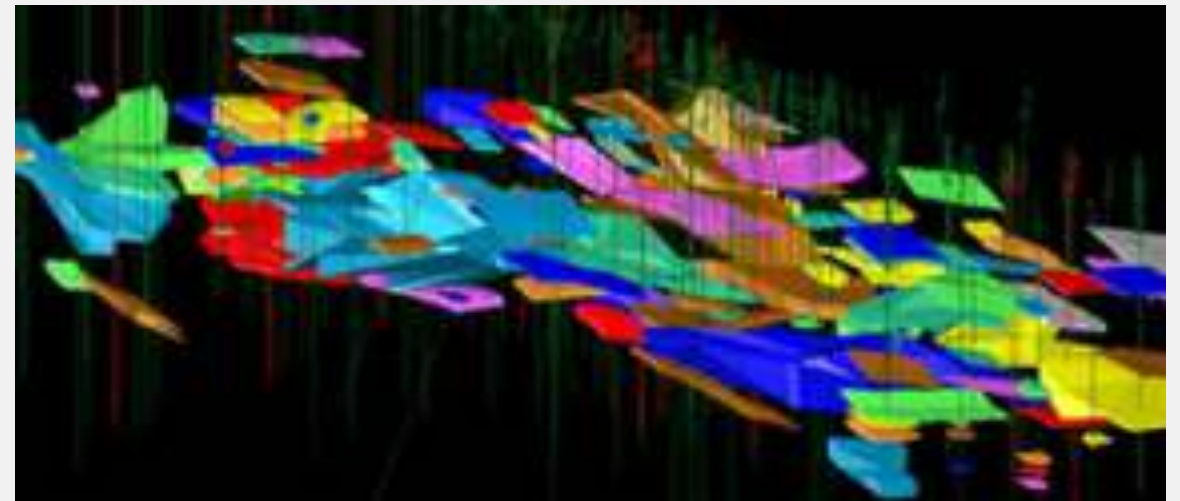
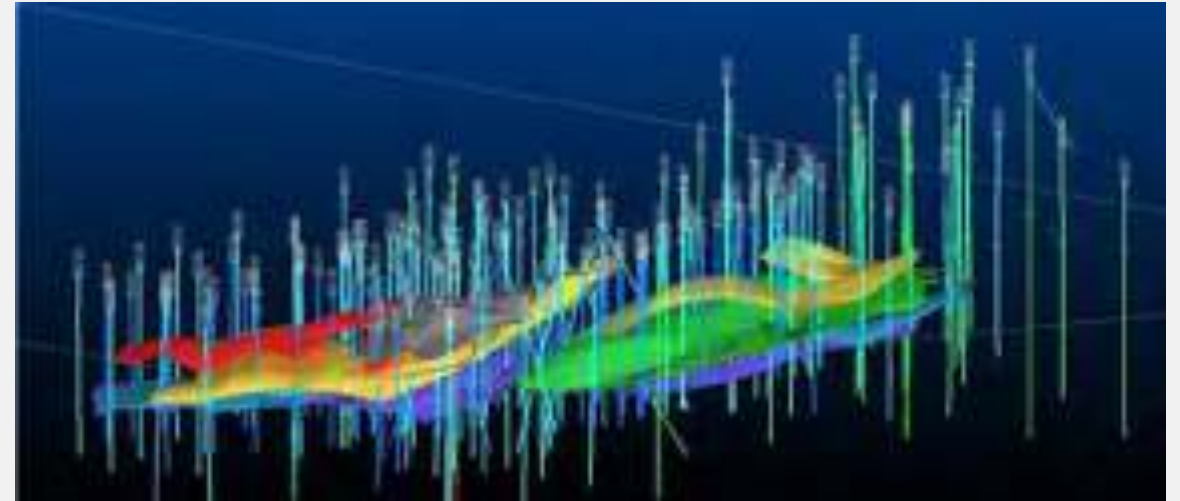
- Review of the Project's Feasibility Study
- Comment on risk profile
- Cash flow model validation of technical and economic inputs
- Review and comment on required additional funding
- Completion test drafts
- Project development advise
- Contact for potential lenders regarding technical aspects and assist in syndication of the facility
- Monitor project execution
- Validation of achievements
- Report on project cost overrun



Resource estimation and Feasibility Study of Kastamonu - Hanönü - Gökirmak Copper project

ASYA MADEN İŞLETMELERİ A.Ş.
Turkey

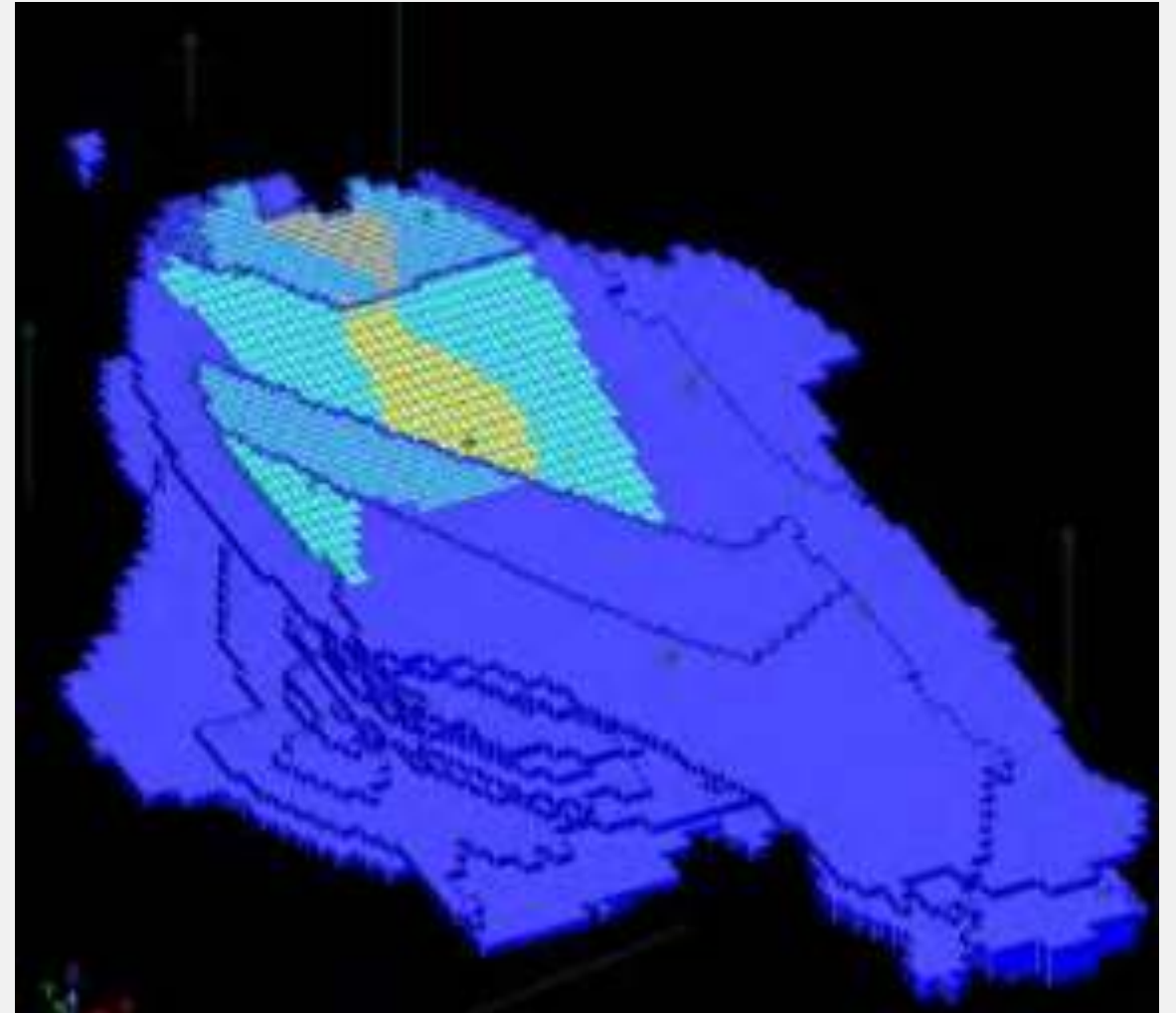
- Feasibility studies for appropriate mining method (underground or open pit).
- Resource estimation and Feasibility
- Exploration drilling program (50,000 m)
- Estimation of the deposit using geoscientific, hydrogeological and modelling techniques
- Mining study, process study, environmental study



Geological Modelling of Polymetallic Deposits in the CIS

Confidential Client
CIS Area

- Position, size and shape of the ore body
- Digitise ore envelopes and solid body modelling
- Creation of block model
- Grade distribution
- Estimate the volume of the orebody
- Create initial resource estimates
- Produce modelling report



Scoping Study for an underground silver mine

GeoProMining Russia

- Silver-containing polymetallic deposit development
- Including transport logistics
- Construction of infrastructure facilities
- Reserves accessibility and deposit development
- Marketing and risk analysis
- 20-year cash flow forecast
- Processing



Scoping and Pre-Feasibility Studies for Copper-Zinc Kyzyl-Dere project

Russian Copper Company
Russia

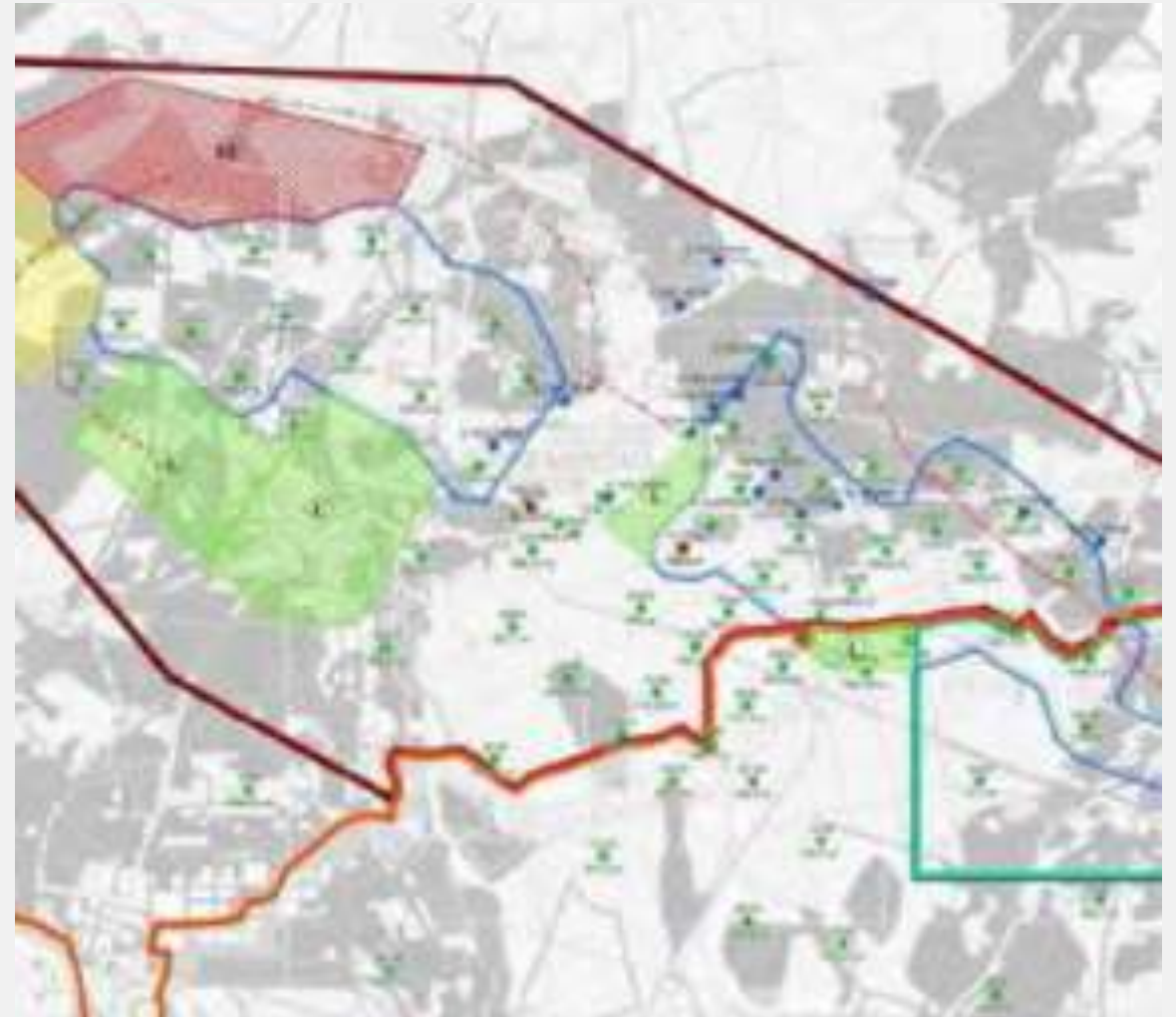
- Pre-Feasibility Study for the Kyzyl-Dere copper/zinc deposit using cut and fill mining.
- Geological Characteristics of the Deposit
- Mining Method selection
- Annual Mine Production Capacity calculation check
- Mine Access Scheme
- Environmental sensitive project design considerations



Pre-Feasibility Study for copper mine

Amec
Germany

- Risk assessment
- Comparison of different mining methods in terms of ventilation
- Air volume and pressure requirements
- Ventilation modelling
- Determination of duty points and main fan specifications
- Forecast of climate parameter
- Specifications of equipment



Feasibility Study for a Barite - Lead - Zinc Deposit

Bolan Mining Enterprises Pakistan

- Supervision of 2,100 m and additional 10,000 m infill drilling and sampling
- Geological and block model preparation based on available data including resource estimate
- Processing test work
- Pit optimization and detailed mine planning
- Cost estimation and financial evaluation



Feasibility Study for a new open cast mine of El Halassa of OCP for a phosphate production of 6 mtpy of phosphate (sec et marchée)

Office Chérifien des Phosphates (OCP)
Morocco

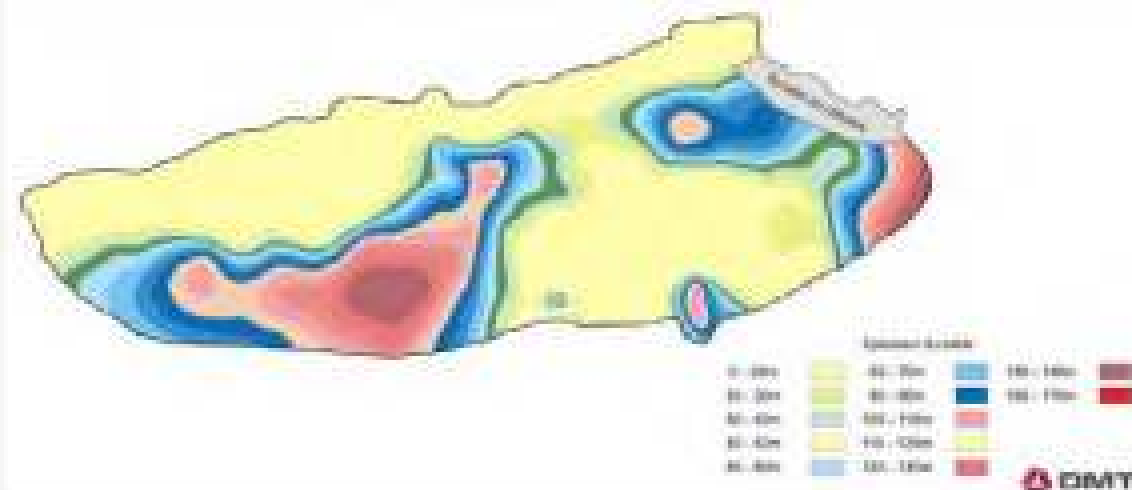
- Analysis of existing operations;
- Development of geological model based on DATA MINE software;
- Development of new mining method;
- Introduction of continuously running hauling equipment;
- Long term mine plan;
- Equipment specification;
- CAPEX and OPEX;
- Discounted cash flow model and financial analysis.



Feasibility Study for two Phosphate Deposits

Somiphos Algeria

- Two phosphate project developments including a greenfield project and a brownfield project following major exploration campaign carried out by the client.
- Target production of 4.0/6.0 mt of saleable product, involving a ROM ore production of 8.0/12.0 mtpy.
- Geological modeling
- Life of mine planning using MineSight
- Upgrade of the processing plant
- Geotechnical Study
- Hydrogeology and Environment
- Cash Flow modelling



Feasibility study for the expansion of an iron ore mine to double its capacity to 10 Mt/year iron ore concentrate

Shougang Hierro Perú S. A. A.
Peru

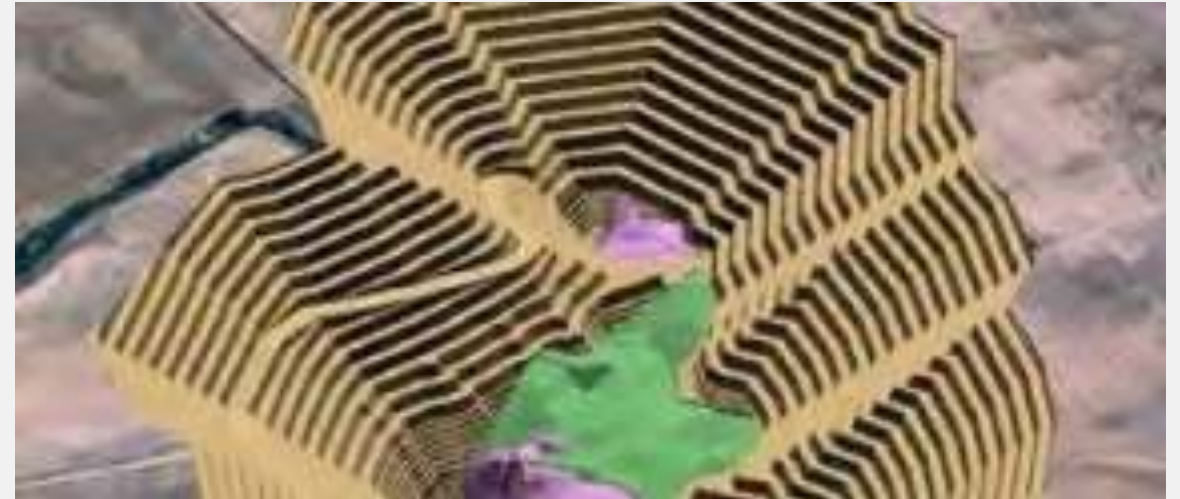
- Mine planning
- Incl. extraction planning, crushing plants, transport systems and tracks
- For an investment and feasibility study
- Project duration: 2 years



Feasibility Study for Las Cruces Copper Project

Cobre Las Cruces S.A
Spain

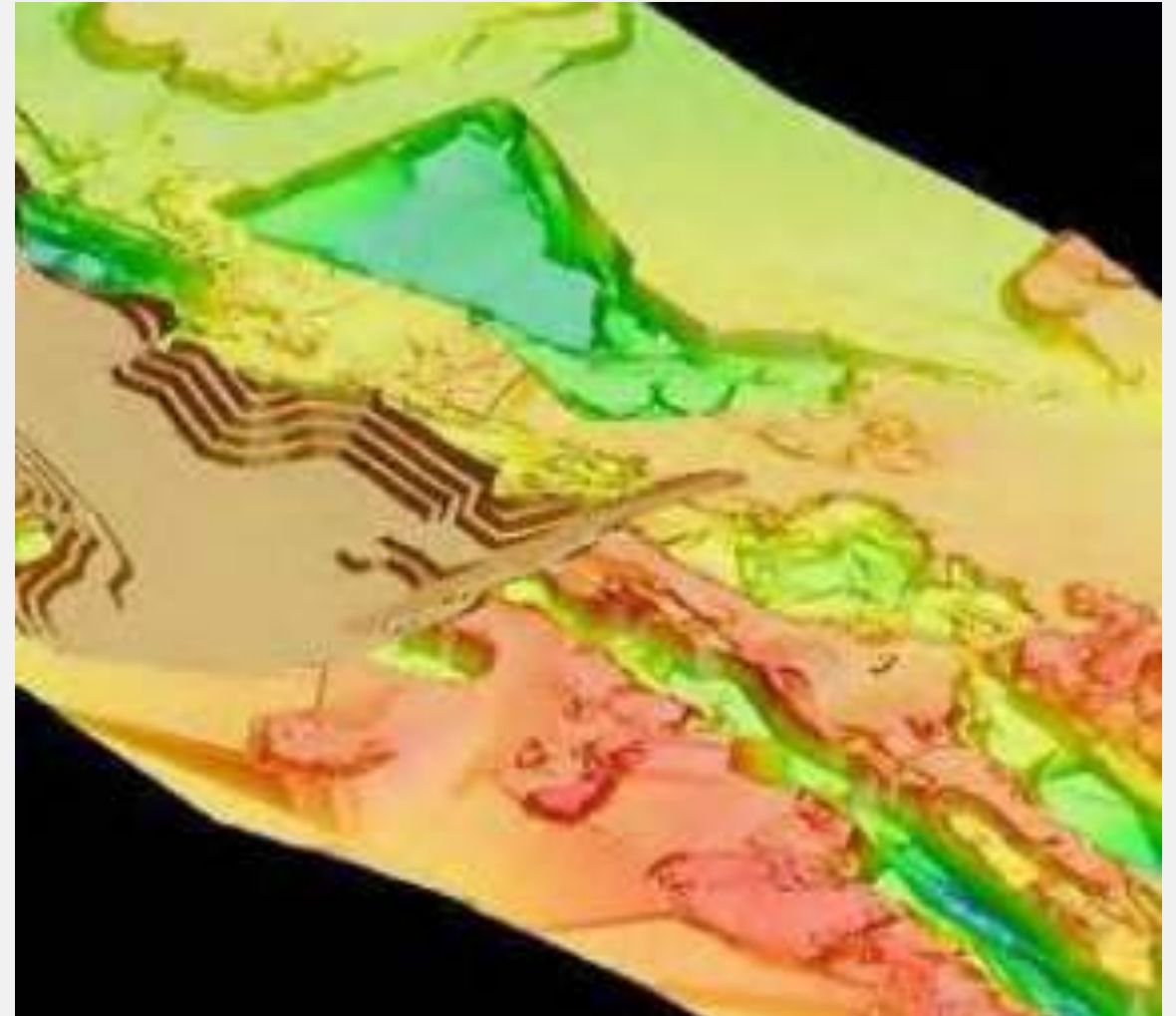
- Geology & Geotechnics
- Mining method and mining plan
- Surface and groundwater management
- Infrastructure, permits and land
- Environmental evaluation and restoration
- Tailings management
- Development schedule
- Capital and operating costs
- Marketing studies
- Metallurgy and Process Plant (by Lurgi / Outokumpu)



Bankable Feasibility Study for Etoile Copper-Cobalt Project

Chemaf SPRL
DR Congo

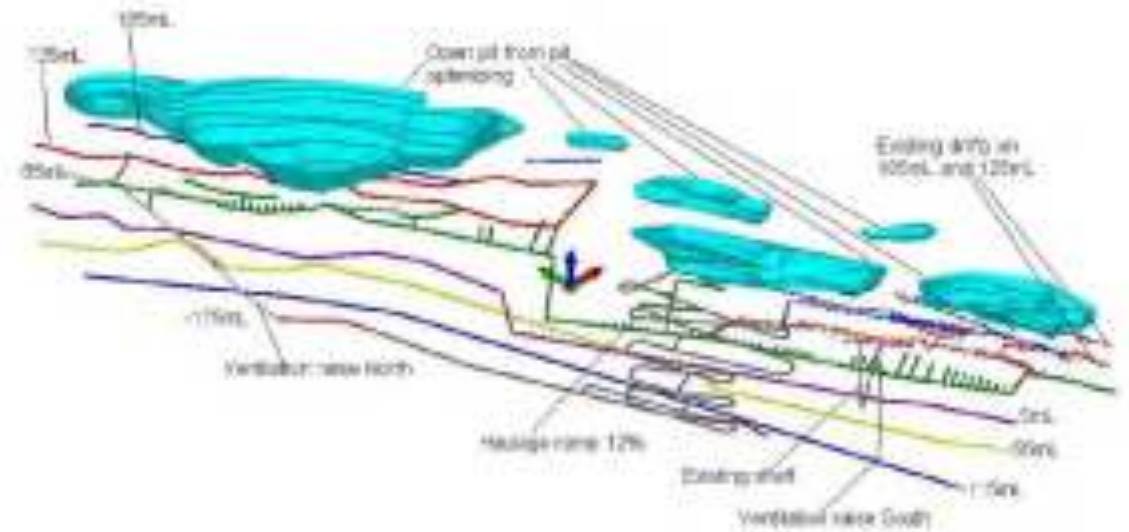
- Conducted BFS at the Etoile open pit copper/cobalt mine in the Katanga Province of DRC. Estimated ore reserves are:
 - for the oxides 6.2 Mt at 4.3% Cu and 0.8% Co, and
 - for the sulphides 5.17 Mt at 4.5% Cu and 0.6% Co.
- Initially oxide ore will be processed, with annual copper production of 30,000 t/y, producing LME Grade A cathode. Annual cobalt production will be around 4,000 t/y.
- Geological modelling
- Mineral resource and reserve estimate
- Mine and process plant designs
- Project financial appraisal
- Geological and assay model



Development of underground mining methods and mine access methods at Tochtar Gold project

Sary Kazna LLP
Kazakhstan

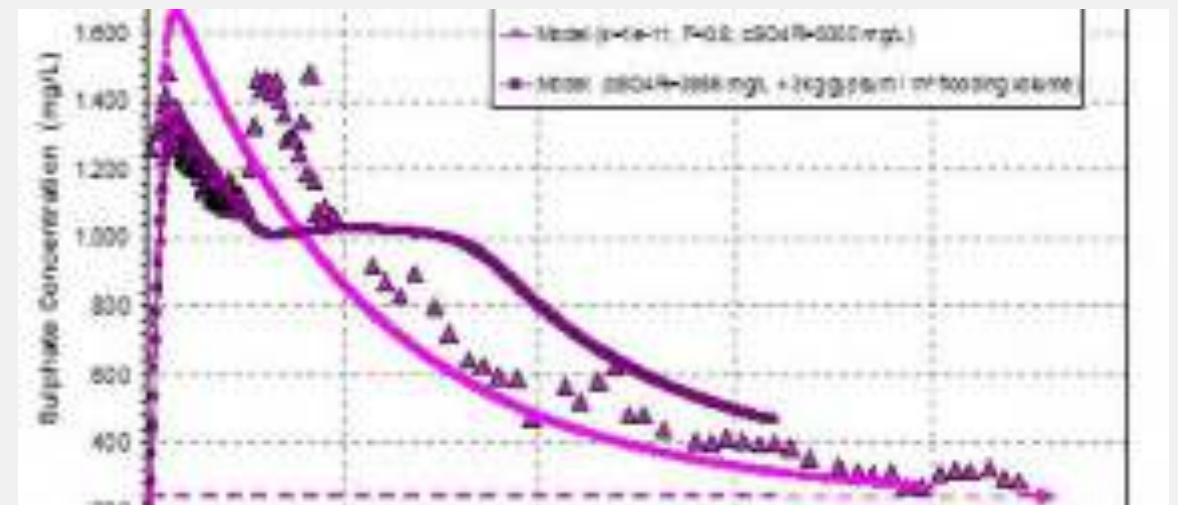
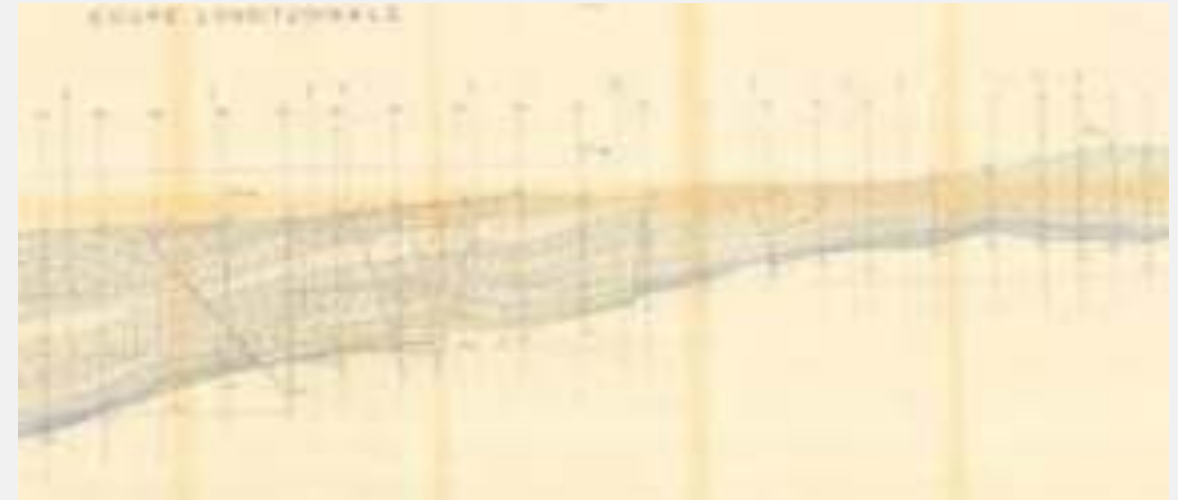
- Investigation of three alternatives for overall mining concepts:
- Different underground mine accesses and mining methods
- Main technology parameters
- Operating costs
- Capital expenditure of alternative concepts
- Proposed main development workings (shaft, ramp, inclined shaft, etc.) incl. location (out of pit, beside pit, etc.)
- Integration of existing mine workings
- Ore transport system
- General ventilation scheme
- Escape routes



Mine dewatering & restart studies for two Flooded Pb-Zn Mines: Chaabet el Hamra & Kherzet Youcef

ENOF
Algeria

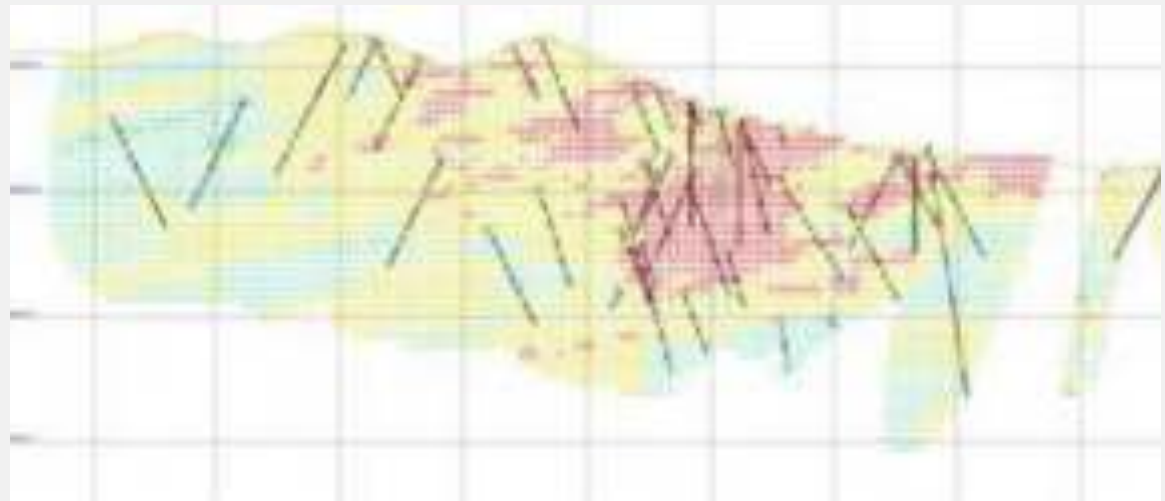
- Chaabet el Hamra and Kherzet Youcef mines were in flooded conditions. DMT carried out required mine dewatering studies to restart two Pb-Zn mining operations.
- Evaluation of available hydrogeological and mining information.
- Gap analysis of available information
- suggestion for detailed data collection
- Forecasting mine dewatering
- Technical analysis of hydrogeological situation in the underground mines with conclusions
- Modelling of the hydrogeological situation during future mining



Process Design for Tofo Iron Ore Project

Compania Minera del Pacifico
Chile

- Design of test work program
- Conducting of entire test work program
- Lab scale tests
- Bench scale tests
- Pilot Plant tests
- Detailed Flow Sheet Development
- Mass and Water Balances
- Equipment specs
- Capex and Opex estimates



Improvement of ventilation and gas management at Bulqiza Chromite Mine

Albchrome
Albania

- Basic conditions
 - H₂ emissions in u/g chromite mine
 - New ventilation and gas drainage system designed by Chinese contractor
- Work performed
 - Recommendations to manage emissions of H₂ and CH₄
 - Recommendations to improve ventilation, gas drainage and monitoring
 - Review of design report and implementation of Chinese contractor



Hydraulic backfilling for Kazakhstan Copper Corp.

Kazakhstan Copper Corporation
Kazakhstan

- Examination of the installed surface mixing plant
- Evaluation of the underground installation
- Proposals for completing the machinery
- Proposals to increase the throughput of the backfilling plant
- Presentation of different technologies to improve the quality of the build in stowing material by using steel-fibres



Recultivation of lignite mine and power plant dumps “From Brownfield back to Greenfield”

Various Clients (e.g. TATA Steel, Dunaferr, Arcelor Mittal, ...)

- Risk detection to minimize environmental risks e.g. regarding dust emission, land and water pollution and public safety
- Site investigation, drilling, sampling, analyzing
- Geo-mechanical measurements
- Establishing of environmental management plans
- Management and supervision of remediation works



Comprehensive environmental services for the former Graf Moltke colliery and coking plant

RAG Montan Immobilien
Germany

- Assessment of the history of coal piles
- Risk assessment of soil, air and groundwater
- Slope & groundwater monitoring / long-term protection
- Hydrogeological and hydro chemical modelling
- Landfill soil management
- Soil remediation



EPCM Services for Cerattepe Copper Project

Artvin Bakir Isletmeleri A.Ş.
Turkey

- First Quantum's subsidiary in Turkey appointed DMT to carry out Engineering, Procurement, Construction Management services until commercial operation, including:
- Small underground mine accessed via a portal,
- An aerial ropeway facility to move ore down and backfill aggregate, sand and cement up, and related surface facilities
- Project's Infrastructure.



Selected Mining Projects of Turkish Mining Companies



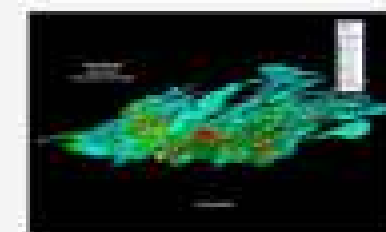
Resource Estimation and Preliminary Economic Assessment Study for Kırıkkale-Kesikköprü Fe Project
TVF Maden A.Ş., Turkey, 2020 - Ongoing



Resource Estimation and Preliminary Economic Assessment Study for Kayseri-Kovalı Fe Project
TVF Maden A.Ş., Turkey, 2020 – Ongoing



3D Modelling and Resource Estimation Update Study for Kastamonu-Hanönü Acacia Gökırmak Project
İzbir, Turkey, 2020



Comprehensive Due Diligence and Preliminary Economic and Technical Assessment Study for Angola Fe Project
Tosyalı Holding, Turkey, 2020 – 2021



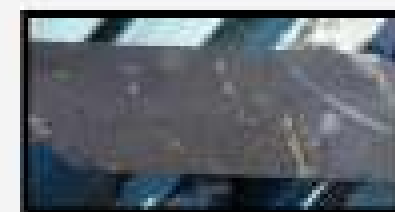
Selected Mining Projects of Turkish Mining Companies



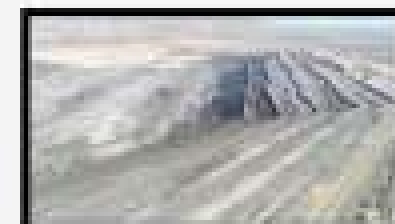
Resource Estimation and Preliminary Economic Assessment Study for Adana-Küpköy Cr Project
TVF Maden A.Ş., Turkey, 2020 - Ongoing



Resource Estimation and Preliminary Economic Assessment Study for Sivas-Karaağaçlı Fe Project
TVF Maden A.Ş., Turkey, 2020 - 2021



Afşin-Elbistan A, Technical Assistance for Opencast Mine - Mine Planning Study for Mine Capacity Expansion
Çelikler, Turkey, 2020 - Ongoing



Comprehensive Due Diligence Study for Çanakkale-Yenice-Arapuçan Pb, Zn, Cu, Au, Ag Project
GPM, Turkey, 2020 - Ongoing



Selected Mining Projects of Turkish Mining Companies



Eskişehir-Alpu Coal Exploration Supervision and Prefeasibility Study
EÜAŞ-TEMSAN, Turkey, 2019 - Ongoing



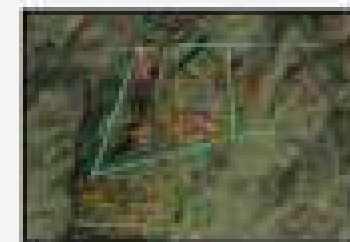
Mine and Plant Fire Prevention Study for Elazığ Chrome Mine Project
Eti Krom, Turkey, 2019 - 2020



Tekirdağ-Malkara Coal Exploration Supervision and Prefeasibility Study
EÜAŞ-TEMSAN, Turkey, 2018 - Ongoing



Çanakkale-Çan Limestone Exploration Supervision and Resource Estimation Study in accordance with JORC Code
EÜAŞ-TEMSAN, Turkey, 2018 - 2019



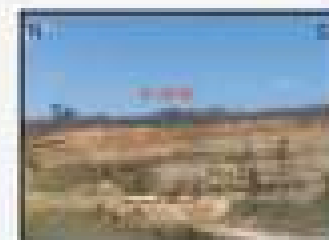
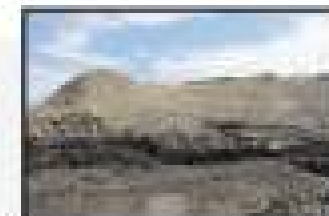
Selected Mining Projects of Turkish Mining Companies

Supervision for Edirne-Uzunköprü Lignite Field
BKİ A.Ş., Turkey, 2018 - Ongoing

Prefeasibility Study for Colombia Coal Project
Yıldırım Holding, Colombia, 2018 - Devam etmekte

3D Modelling and Resource Classification Study for Amasya-Suluova Lignite Field
PLT Madencilik, Turkey, 2017-2019

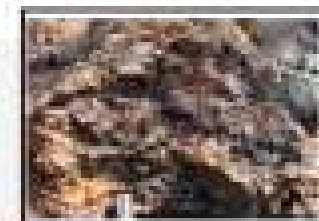
Tekirdağ-Malkara Lignite Project Comprehensive Site Visit Study
Bey Kömür, Turkey, 2018



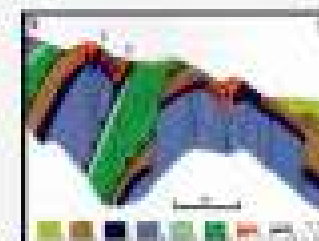
Selected Mining Projects of Turkish Mining Companies



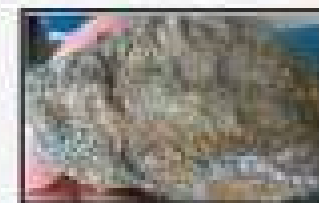
Comprehensive Site Visit Study for Balıkesir-Gönen Gold Field
Taşzemin, Turkey, 2017-2018



Comprehensive Site Visit Study for Uzbekistan-Cholcharatau Gold-Tungsten-Polymetal Project
Taşzemin, Turkey, 2017-2018



Exploration Project Preparation and Resource Estimation in accordance with JORC 3D Modelling for Çorum Copper Project
Avod & Hasat, Turkey, 2017-2018



Comprehensive Site Visit Study for Balıkesir-Gönen Lignite Field
Taşzemin, Turkey, 2017-2018



Selected Mining Projects of Turkish Mining Companies

Site Visit and Due Diligence Study for Mali Au Field
Taşyapı, Turkey, 2017-2018

Exploration Program Preparation and Resource Estimation Study for Muğla Chrome Project
Avod & Hasat, Turkey, 2017-2018

Comprehensive Due Diligence Study for Eskişehir-Alpu Coal Project
ESAN, Turkey, 2017

Exploration Program and Resource Estimation Study for Tekirdağ-Malkara Coal Project
Pullukçu Maden İşletmeleri, Turkey, 2016-2017



Selected Mining Projects of Turkish Mining Companies



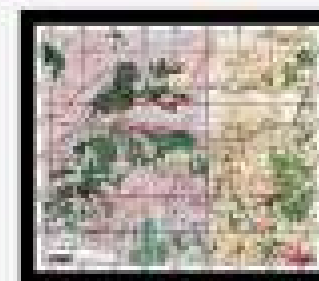
Exploration Program Preparation and Resource Estimation Study for Thrace Region Lignite Field
Deba Maden, Turkey, 2015-2016



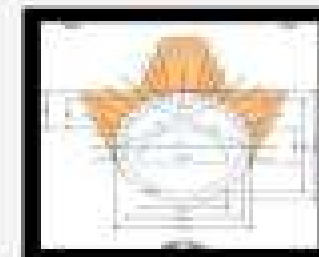
Detailed Exploration Program Study for Balıkesir Region Coal Licenses
İÇK-Ametist, Turkey, 2014-2015



Site Investigation, Exploration Study and Resource Evaluation for Adıyaman Chrome Field
Anadolu Madencilik A.Ş., Turkey, 2014-2015



Underground Sealing Dam Application Project for TTK Karadon Hard Coal Operation
Türkiye Taşkömürü Kurumu, Turkey, 2014



Selected Mining Projects of Turkish Mining Companies

Prefeasibility Study for Heavy Metal Project

Topkapı Mineral A.Ş., Turkey, 2014

Prefeasibility Study for Copper Field in Kastamonu-Hanönü Region

Asya Maden İşletmeleri A.Ş., Turkey, 2013-2016

Mine Ventilation and Gas Planning, Exploration and Well Drilling Control, Risk Assessment

Polyaz Eynek Madencilik, Turkey, 2013-2015

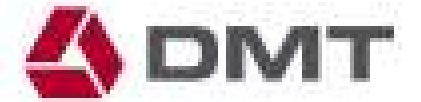
Exploration Program and JORC compliant Resource Estimation Study for Lead-Zinc Field in

Çanakkale-Kalkım Region

ÇVK Madencilik, Turkey, 2013-2014



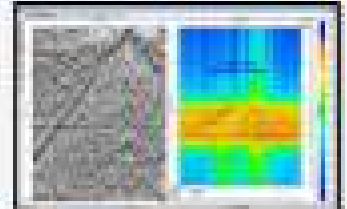
Selected Mining Projects of Turkish Mining Companies



Exploration Strategy Determination Study for Çanakkale-Çan Coal Field
Akar Maden, Turkey, 2013-2014



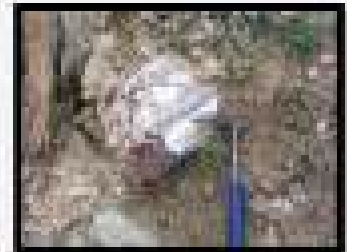
Exploration Strategy Determination, Design and Supervision of Seismic Measurement Lines for Uşak Coal License
Anadolu Madencilik, Turkey, 2013-2014



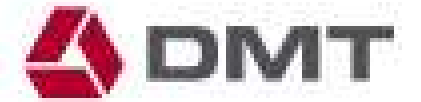
Exploration Management for Polat Underground Coal Mine Project
Fina Enerji Holding A.Ş., Turkey, 2013



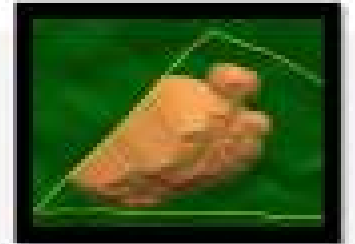
Resource and Reserve Declaration (JORC) for Gümüşhane Midi Gold Project
Yıldızlar SSS Holding A.Ş., Turkey, 2013



Selected Mining Projects of Turkish Mining Companies



Exploration and Prefeasibility Study for Çanakkale Lignite Mine
Taşzemin Madencilik, Turkey, 2012-2016



Ore Resource and Reserve Reporting for Eti Gümüş Silver Mine in accordance with the NI 43-101
Yıldızlar SSS Holding A.Ş., Turkey, 2012-2013



Field Study for Soma/Eynez Mine in Initial Planning Phase
Demir Export A.Ş., Turkey, 2012



Reporting Service for Lignite License of İhlas Madencilik in Elbistan
İhlas Madencilik, Turkey, 2010



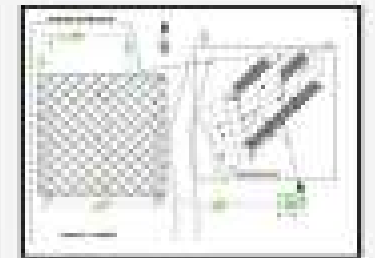
Selected Mining Projects of Turkish Mining Companies

Geological-Geotechnical Consultancy Service for Koyunağılı Coal Project
Adularya Enerji Elektrik Üretimi ve Madencilik A.Ş., Turkey, 2010

Bankable Feasibility Study for Lignite Mining and Thermal Power Plant in Saray
BAŞAT Elektrik, Turkey, 2007-2009

EPCM Services for Cerattepe Copper Project
Artvin Bakır İşletmeleri A.Ş., Turkey, 2006-2008

Development of Amasra-B Mining Complex
Hema Endüstri A.Ş., Turkey, 2005



Selected Mining Projects of Turkish Mining Companies



Evaluation of Çayeli Copper/Lead Mine Expansion
Çayeli Bakır İşletmeleri A.Ş., Turkey, 1999



The Goal

Understanding process dependencies at the highest technical level and ensuring the highest efficiency with maximum security

Our Way

- From consulting, testing and evaluation to planning, construction remediation and repair
- Highest efficiency with maximum security
- Supply of systems or core components
- Process engineering
- Basic and detail engineering
- Refurbishment concepts & studies
- Installation & commissioning
- Training of operating personnel

From design to launch,
you can build on
experience.

Construction of a coke oven gas desulphurization plant

ArcelorMittal
France

- The French coking plant Dunkerque had previously been operating without a facility for the desulphurization of coke oven gas.
- Basic engineering and plant construction of the desulphurization plant by DMT
- Resulting in enhanced environmental protection



Delivery of a gas treatment plant in cooperation with Paul Wurth

PT.Krakatau Posco
Indonesia

- Process Engineering
- Detail Engineering
- Delivery
- Commissioning and acceptance



Methane utilization from coal deposits and weather current

Among others RWE, Evonik, MAN
Worldwide

- Technical risk assessment of methane utilization
- Forecast of CH₄ inflows to generate CO₂ credits (Kyoto Protocol)
- Basic engineering for gas utilization
- Optimization of gas extraction and ventilation



Construction of two building material plants Asse II mine

Asse GmbH
Germany

- Planning, construction, erection and commissioning of building material plants for backfilling underground cavities
- Maintenance of building material plants



Installation and configuration of the online condition monitoring system WindSafe® for maintenance and repair of wind turbines

PNE Wind AG
Germany

- Pre-Engineering
- Configuration
- Commissioning
- Training
- Remote monitoring



Investment security is achieved by investing in security.

The Goal

Social progress begins with vision. In civil engineering and infrastructure, the realization of pioneering projects is a complex undertaking which must consider not only technical risks but also the interests of the many stakeholders.

Our Way

- Complex infrastructure development in urban areas or rehabilitation
- Comprehensive and tailor-made solutions
- Special civil engineering
- Geotechnics
- Civil & environmental engineering
- Surveying & Monitoring
- Engineering geophysics
- Hydrogeology

New Huysenquartier building in Essen, office and residential building complex

Real Estate Company Huysenallee
Essen, Germany

- Object and supporting structure planning for the excavation pit
- Dismantling and disposal concept for existing buildings
- Invitation to tender and award of contract for dismantling, excavation pit and pile foundation works
- Construction supervision for the dismantling, excavation pit and pile foundation works
- Exploration of old mines



Site Investigation of Jeddah Airport Al-Jazzar

Jeddah, Saudi Arabia

- Development of the King Abdulaziz International Airport (KAIA)
- Geophysical site investigation of a total of 58 km profile length for the new planned Jeddah Airport
- Identification and characterization of water bearing and geological structures
- High resolution seismic up to 500 m target depth
- Resistivity measurements

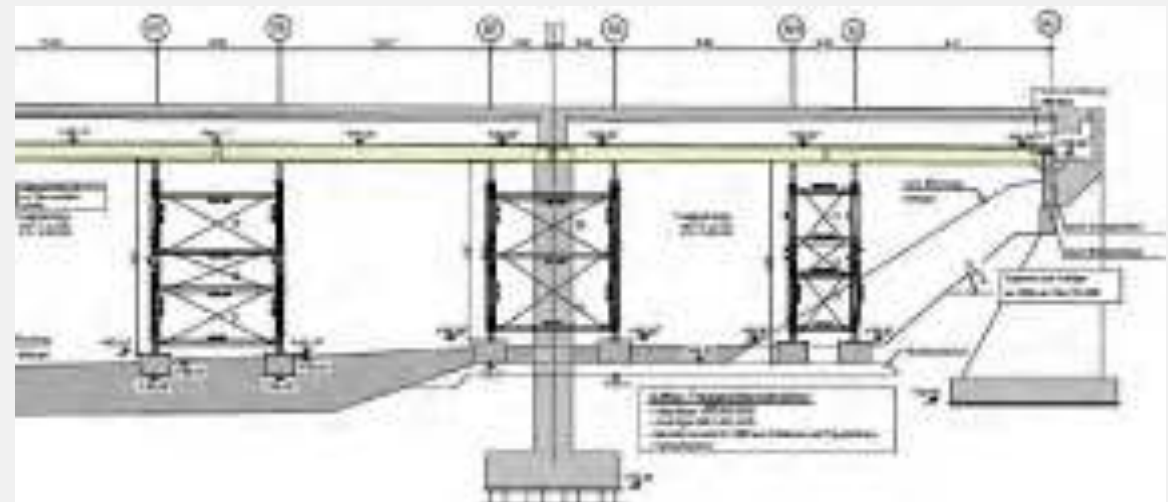


Monitoring of the shoring for the new construction of the Dütebrücke bridge on the A1

PORR AG

Osnabrück, Germany

- Metrological monitoring of the bridge structure with geodetic and geotechnical sensors
- Permanent monitoring of deformation and stability control
- Installation and operation of > 300 sensors: water level gauges, inclination sensors, extensometers, strain gauges, tachymeter measuring points
- Operation of DMT SAFEGUARD monitoring portal for integration of measurement data and alarming
- 3D laser scanning geometry recording



Site Exploration for a Deep Geological Repository

NAGRA

Switzerland

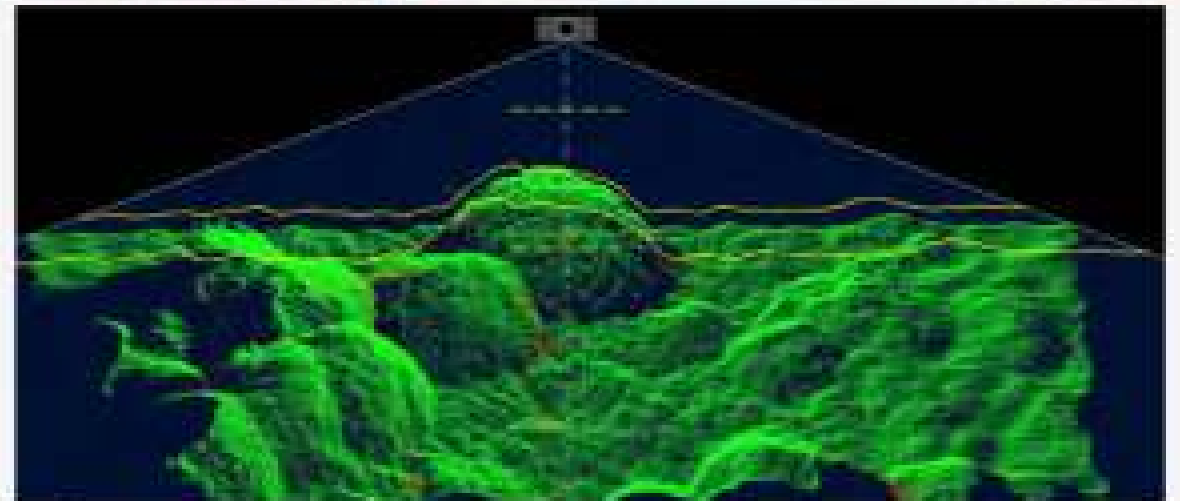
- Following an initial campaign to explore the site of a proposed deep repository, the survey area was expanded to include the „Nördlich Lägern“ site.
- The survey covered a total area of 90 km², including part of the approach path of Zürich airport. Due to this, some vibro measurements could only be carried out at night.



Highly accurate underwater measurement of a saltwater evaporation basin in the Dead Sea

Arab Potash Company
Jordan

- Proof of the stability of the dams of the evaporation basin and identification of unstable areas
- High-precision bathymetry measurement
- Data processing & interpretation
- Project management
- Final report



Examination of special federal buildings according to building regulations

STRABAG
Germany

- Verification of safety-relevant requirements for technical building systems of special buildings
- Expert testing of fire alarm systems, safety power supplies, ventilation systems, etc.
- Documentation and action planning
- Support in rectifying deficiencies



Our knowledge creates security
of supply in a new quality.

The Goal

Exploration and production of Oil & Gas is one of the biggest technical and environmental challenges

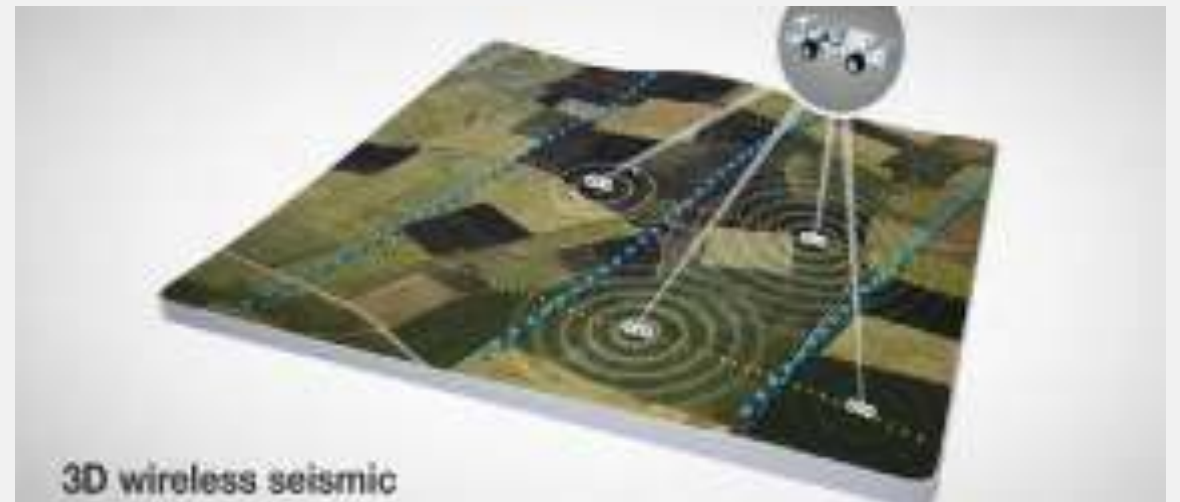
Our Way

- Experience through research and analyzation of geological data for decades
- Innovative methods and latest technologies
- Project planning
- Measurement design
- Legal assistance
- Data collection and processing
- Interpretation and modelling

3D seismic for the exploration of oil and gas deposits

OMV
Austria

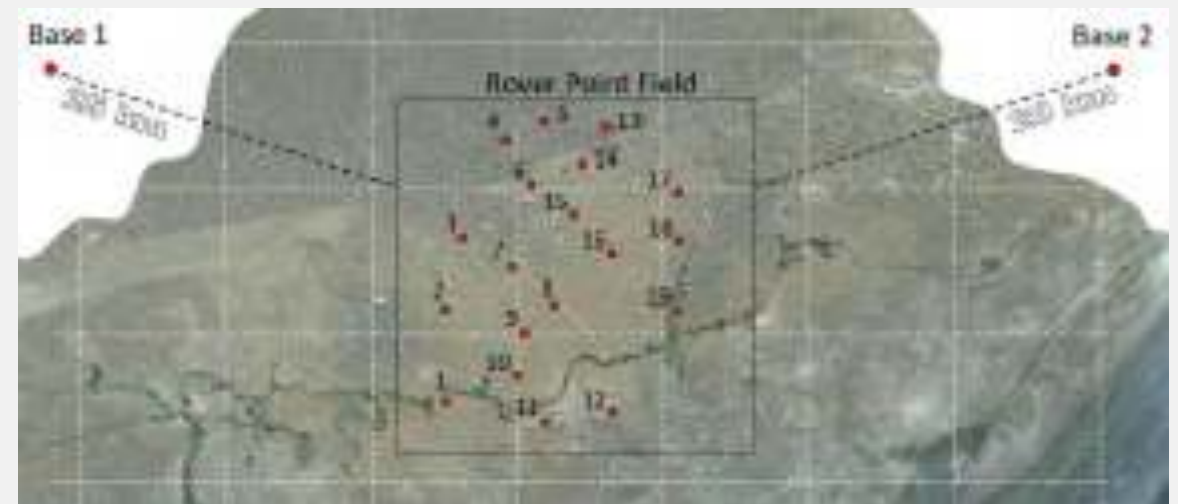
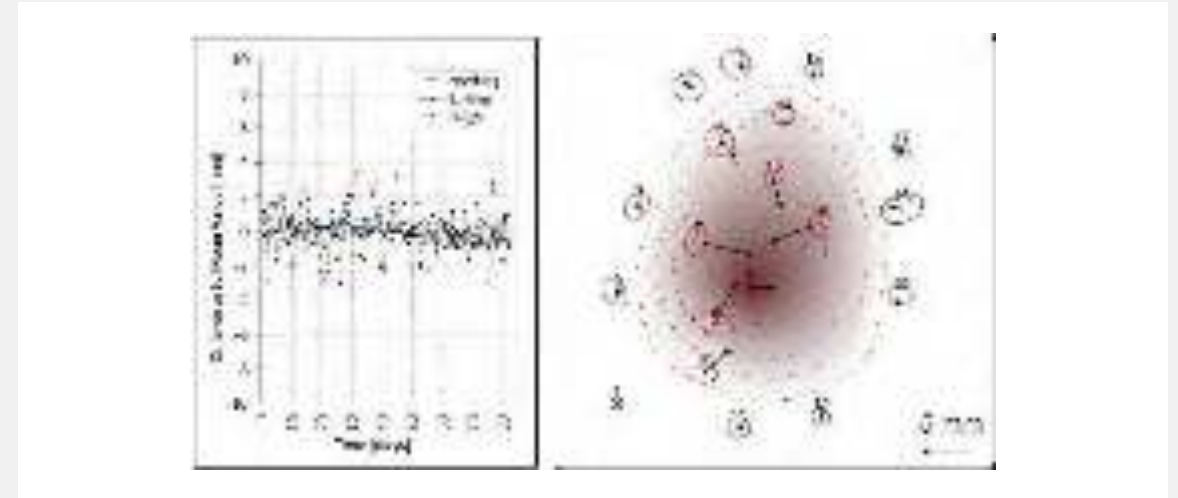
- Geological exploration with highly productive excitation technology for data acquisition
- 4 vehicle groups á 3 vibs in slip-sweep mode
- Approximately 1,000 vibration points/day
- More security through the use of wireless technology
- Digitalization of customer interface with DMT SurveyView App



Ground movement monitoring high-precision evaluation of GNSS/GPS data of an oil deposit

PDO
Oman

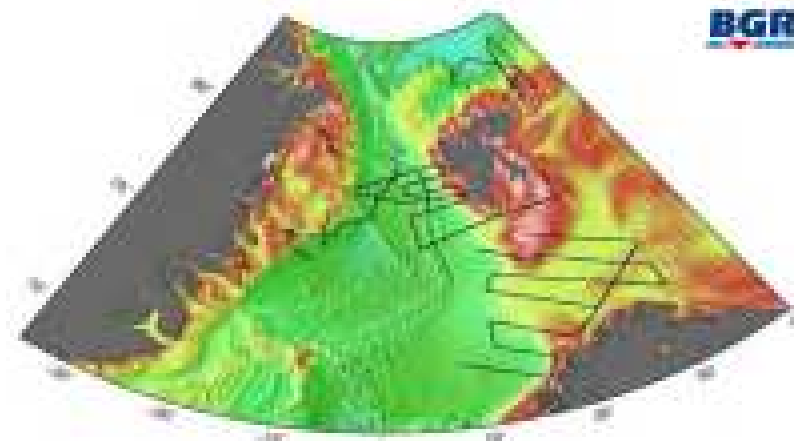
- Simulating ground movements and monitoring of deformations in order to protect the production plants and enhance production
- Processing GNSS data from 4 oil fields - 20 permanent GNSS stations each
- Evaluation of automated processes using DMT's own software
- Deposit modelling



Marine seismic data processing framework contract (re)processing marine seismic data (Barents Sea)

BGR
Germany

- Reprocessing for the imaging of geological structures without superimposition of multiple reflections
- Suppression of multiples
- Geophysical exploration in view of possible energy commodities
- Special processing
- Seismic data processing



Visual inspection of drilling ropes on 9 rigs in Saudi Arabia

Dalma Energy
Oman

- Ensuring safety standards and damage assessment after 2 rope cracks
- Rope testing on nine drilling rigs for oil/gas and exploration wells
- Development of a safety concept



Independent audits for safety, economic efficiency and sustainability

The Goal

The safety and quality of plants and products, real estate and processes are key success factors for businesses, and must be guaranteed.

Our Way

- We guide you through regulatory requirements and build bridges between safety and economy
- System testing of e.g. refrigeration plants, drinking water installations or extinguishing systems
- Product tests, e.g. fire tests, rope tests or transmission tests
- Consulting and expertise, e.g. in the field of operator duty management, tunnel safety or fire protection

03**PRODUCTS**

- Products of quality, functionality and practicality
- Selected products



Designed for maximum accuracy, data quality and robustness for industrial use

Our products are used by **external and internal customers** and thereby provide a **competitive advantage** and a **Unique Selling Proposition** for our services.

- **Geo Measuring Systems**
geodetic, geophysical and geotechnical systems
- **Condition Monitoring Systems**
infrastructure, energy, petrochemistry and mining
- **Flow Measuring Technology**
fluid mechanics and flow meter technology
- **Coking Technology**
sealing systems and emission treatment

DMT Safeguard

Automated real-time integrity monitoring



Monitoring of potential integrity deficits of any objects for safeguarding environment, health, investments and operations

Fields of application:

- Infrastructure
- Mining
- Plant
- Wind turbines
- Early detection of damage or defects

Test Dusts

Test and standard dusts for various applications



DMT offers test and standard dusts as reference material for the dust pollution of products

Fields of application:

- Ventilation of vehicle cabins
- Vacuum cleaner tests
- Determination of dust characteristics
- Development of special dusts

SlimBoreholeScanner

For structural and geotechnical analysis



SlimBoreholeScanner is a tool for optical inspection and documentation of slim boreholes

Fields of application:

- Structural analysis
- Geotechnical analysis
- Very narrow drill holes
- Inspection even of upward holes

Selected Products



DMT Gyromat

High precision surveying



World's most accurate fully automatic precision-surveying gyroscope for direction measurement.

Fields of application:

- Tunnelling
- Shipbuilding
- Military purposes
- Building control survey
- Mining

DMT Pilot 3D

Positioning, navigation & 3D documentation



Pilot 3D offers solutions for positioning, navigation and 3D documentation in enclosed environments.

Fields of application:

- Inspection of tunnels in the infrastructure sector
- Indoor route tracking in buildings
- Surveying of ship hulls
- 3D Documentation of mine workings

SUMMIT

Accurate monitoring & exploration



Our seismographs are used for monitoring and exploration of structures or surfaces of any kind.

Fields of application:

- Subsoil investigations for the infrastructure sector
- Reservoir exploration for geothermal projects
- Oil & gas exploration
- Monitoring of fracking activities

Flow Sensors

Design, development & production



Tailor-made measuring technology for flow rate, mass flow rate and flow velocity.

Fields of application:

- Aerospace
- Water management
- Landfill technology
- Nuclear power plants
- Chemical industry

IMAGER 5006EX

Fast and accurate 3D scans



World's first explosion-proof 3D laser scanner for fast and accurate 3D scans of the surroundings.

Fields of application:

- Safety inspections
- Accident & damage analysis
- Deformation analysis
- Geological rock face survey
- As-built documentation

DMT CoreScan®

Core Scanning, digitalization & analysis



CoreScan generates high resolution, full-circumference images of drill core samples.

Fields of application:

- Exploration drillings
- Sedimentological investigations
- Structural investigations
- Site investigations
- Geological investigations

BoreholeShuttle

Various logging tasks



Cable-less geophysical logging system for horizontal and deviated boreholes

Fields of application:

- Logging of unstable boreholes
- Optical imaging
- Ultrasonic ranging
- Drill rigs without depth measuring (flameproof odometer ROPEX)

RESECS

Simultaneous geotechnical measurements



PC-controlled DC resistivity meter system for research, tomography & monitoring applications

Fields of application:

- Simultaneous geoelectrical measurements
- High-resolution research
- Tomography and monitoring applications

MineSafe®

Monitoring in mining & infrastructure



DMT's machine diagnostic system specifically designed for use in mining

Fields of application:

- Mining industry
- Infrastructure
- Early detection of damage or defects
- Condition monitoring of conveyor belt systems or water pumps

PlantSafe®

Monitoring for plants & rotating equipment



DMT's machine diagnostic system specially designed for use in industrial plants

Fields of application:

- Industrial plants with a great number of monitored components
- Power plants
- Petrochemical industry
- Rolling Mills in the metal production

WindSafe®

Monitoring for wind turbines



DMT's machine diagnostic system specially designed for use in wind power plants

Fields of application:

- Wind power plants
- Damage detection
- Reporting of abnormalities
- Use in rugged environments

Tower Vibration Sensors

Vibration measurement



DMT's tower vibration sensors measure the vibrations of the wind turbine tower

Fields of application:

- Monitoring and recording of operating conditions
- For harsh environments
- In combination with WindSafe®

04**INNOVATION & PROJECTS**

- Fields of Innovation
- Selected Research and Development Projects
- Selected Mining Projects

Strategic Fields of Innovation



Geotechnics



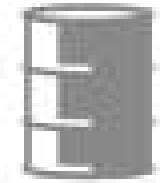
Energy



Reengineering



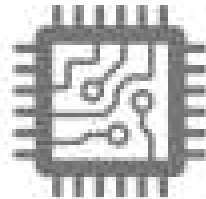
Nuclear disposal



Transparency



Intelligent sensors



Automation



Water



Selected Research and Development Projects



Multi-Sensor Drones for Mining Exploration and Post-Mining Surveying

MULSEDRO



Product:

- UAV system that can gather both hyperspectral and magnetic data (total system weight <5 kg).
- Integrated positioning system (IPS) based on a visual aided inertial measurement unit (IMU).

Result:

- Reduces cost for exploration drilling, post-mining surveying and environmental impact.
- Common frame and data-logger architecture compatible with various drone types (fixed-wing, multi-copter).
- Replace sensors with a "plug-in-plug-out" method.



Image: EIT RawMaterials MULSEDRO

Selected Research and Development Projects



Underwater Inspection & Monitoring

STAMS



Product:

- Ultrasonic underwater ROV for inspection of shaft stability, gas and water analysis and multi-functional monitoring of structures down to 150 m water depth.

Result:

- Underwater ROV-based multi-sensor geophysical magnetic and hyperspectral remote sensing solution for systematic surveying of flooded shafts, ship hulls, and oil & gas platforms (e.g. steel welding seams).
- Increased production time due to minimized downtime for shaft monitoring (near-real-time detection of shaft wall defects).
- Reduces cost for underwater inspection operations.



Selected Research and Development Projects



Mine Machine Maintenance

MaMMa

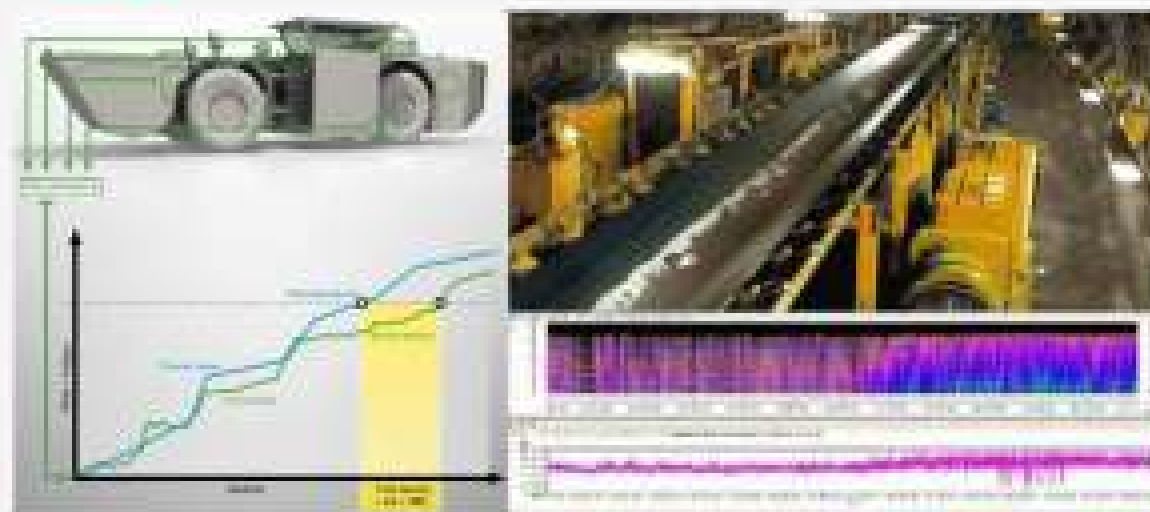


Product:

- Software for automated maintenance monitoring of mining machines for economic maintenance intervals.
- Updated DMT MyneGuard software with sensor geotags registered in maintenance database; compatible with IoT systems.

Result:

- Reduces cost for remote inspection mining technologies
- Validated in global coal industry applications (e.g. RAG, Longwall Caterpillar 2010-2015).
- No comparable system Ex-certified.
- Soon available as augmented reality (AR) visualization.



Selected Research and Development Projects



Automated Drill Core Scanning and Analysis

ANCORELOG



Product:

- Improved drill core scan technology add-on to the mobile CoreScan® instrument.
- Additional mineralogical and geochemical analytical technologies:
 - Hyperspectral visualisation of mineralogy contrast.
 - LIBS-RFA-RDA-MLA for geochemical major and trace element analysis and mapping of the drill core.

Result:

- Optimized automated DMT CoreScan® instrument for generating digital drill core libraries for exploration companies, geotechnical and geological surveys, and research institutes.



Selected Research and Development Projects



Mixed Reality Visualisation In Mining

HOLOMINE



Product:

- Mixed reality visualization tool for mine machine maintenance, automated shaft inspection, and fire inspection.
- This innovative system can visualize in 3D the technical details of mine machines for purposes of predictive maintenance, mine shaft infrastructure for stability inspection, fire safety systems, and ore deposits.

Result:

- Enhanced safety and cost-saving predictive maintenance as well as technical training in safe mixed-reality environments, tangible 3D ore deposit visualisation for better ore deposit understanding and optimized mine planning.



Selected Research and Development Projects



Tailings Monitoring System

i²MON

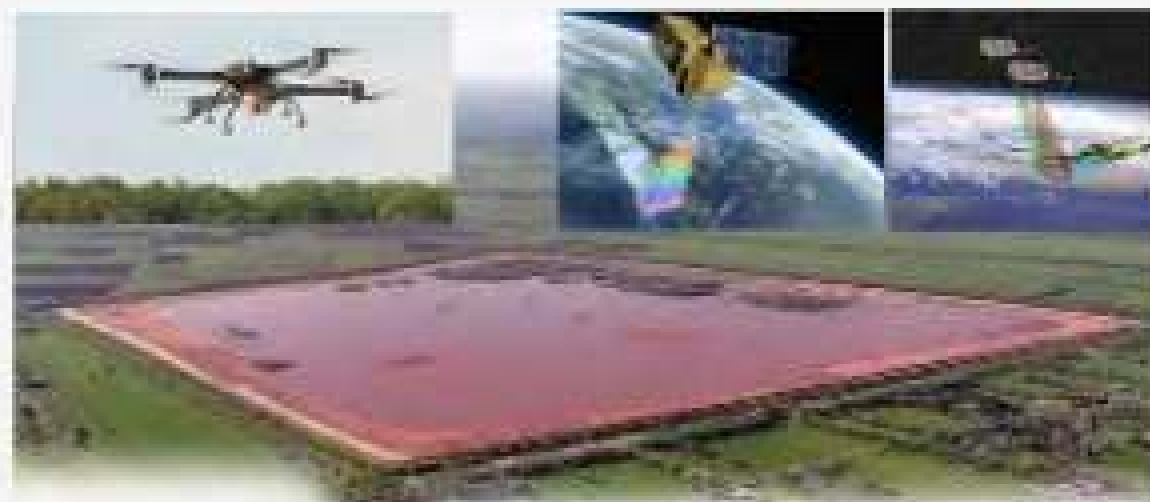


Product:

- Development of airborne and satellite-based DMT multisensor datalogger Safeguard GNSS for point-cloud data processing, deformation analysis from UAV laserscan (Riegl-RICOPTER) and radar satellite data (InSAR, Sentinel1A/1B, and TerraSAR-X/German-Eye-in-the-Sky),
- Improved tailings monitoring technology for mechanical and geochemical parameters of mine tailings through integration of near-surface and satellite-surveillance systems.

Result:

- Generating the most reliable information related to tailings stability, chemical and mineralogical content.
- Optimized risk management and safety standards related to mine tailings for improved environmental sustainability through an extended monitoring and early warning system.



Selected Research and Development Projects



Digital Construction Assistant

DeepSpaceBIM4.1



Product:

- Mixed reality visualisation tool for digitalization of the construction industry (BIM).
- Digital construction assistant for alignment of planned geodata vs. actual construction for 3 sample scenarios:
 - Re-Engineering of large infrastructures (e.g. Urban Tech Republic in Berlin (TXL)).
 - 8-lane construction, highway A89 near Munich.
 - Extension of highway Karlsruhe-Basel, Rastatt Tunnel.

Result:

- Alignment of planned construction geodata with actual on-site construction measurements of DMT Pilot3D device.
- Pilot 3D accuracy improvement from 10cm to 1cm.



Selected Research and Development Projects



Heap-leaching Optimisation Through Reactive Transport Modelling

SO₄ CONTROL



Product:

- Optimized hydrometallurgical sulphate extraction process (+ K-extraction as by-product) for heap-leaching at Finnish Minerals Group tailings (former Terrafame), Finland.
- Enhanced leaching design to create process solutions with a controlled amount of sulphate in the process water.
- Broader possibilities for additional byproduct recovery.

Result:

- Optimized process models for more efficient heap leaching of mine tailings in Arctic regions.
- Reactive transport model for sulphate- und K-extraction from Ni-Cu-Zn-Co mine tailings.



Selected Research and Development Projects



Radionuclide Classification & Automated Sorting for Phosphogypsum Materials Recycling

raPHOSafe



Product:

- Construction and calibration of DMT/Nukem patented automated conveyor belt classification system.

Result:

- Legal EU-radiation compliant classification (1Bq/g) and automated sorting of ^{226}Ra -rich phosphogypsum tailings material.
- Cost-saving process for radionuclide remediation of phosphogypsum tailings by minimising phosphogypsum material due for radiochemical remediation.
- Near-zero-waste recycling of gypsum material for the construction industry.
- Extraction of Ra for further processing to ^{223}Ra as sought-after resource for cancer medication.
- Potential for global application for radionuclide-bearing materials disposal with target capacity; >8 t/hr.



Selected Research and Development Projects



Real-Time Monitoring and Risk Assessment of Geotechnical hazards

GeoHazCoal



Bundesministerium
für Bildung
und Forschung

EUREKA 27
Innovation across borders

Canada 141

Product:

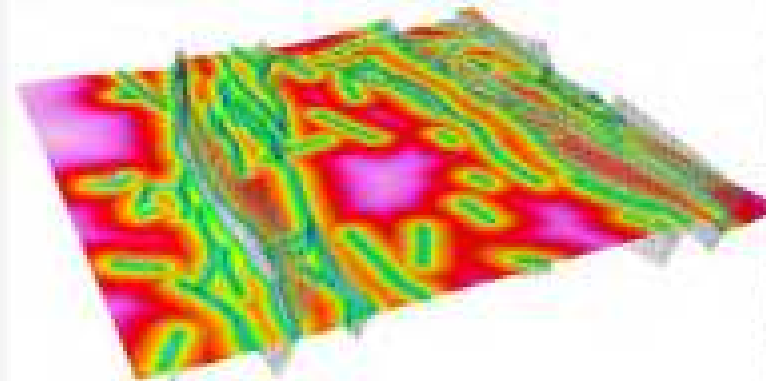
- GOCAD software module and Geoscience INTEGRATOR data management system for integrated geo-hazard assessment in coal mining, incl. machine learning, by fusion of heterogeneous data streams (incl. geometry of mine architecture, stress, seismicity, gas contents) into hazard probability assessment.

Result:

- Real-time monitoring and risk assessment of geotechnical hazards (e.g. gas outbursts, rockburst, rock falls) to improve safety and production in European and Asian Coal Mining.

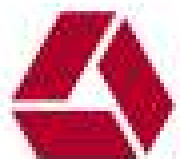


Mira Geoscience
...modelling the earth



Englisches
En

Portugiesisch
Pe



DMT

**Thank you for your
attention**

TDV NORD GROUP

