Mining & Metals

Your partner for Mining & Metals projects
Technip is a world leader in project management, engineering and construction for the oil and gas industry.

With a global footprint, our talents constantly offer the most innovative technologies and best solutions to our clients to optimize their investments and meet the world’s energy challenges.

Our mission is to deliver safe, sustainable and quality projects across the world.

We operate in three main businesses:

**Subsea**
In subsea hydrocarbon field development, Technip’s activities include the design, manufacture and installation of rigid and flexible subsea pipelines and umbilicals.
Thanks to our portfolio of technologies, industrial and operational assets on all continents and a state-of-the-art fleet, we offer a unique vertically integrated model in the industry.

**Offshore**
In the Offshore business, our activities include engineering, procurement, construction (EPC) and installation of fixed and floating platforms.
We use a complete range of technological solutions to answer the challenges faced by our clients.
We are leveraging our expertise in full-range of offshore facilities, as well as our strong know-how with added-value process skills and proprietary platform design.

**Onshore**
In the Onshore business, we deliver to our clients all the experience we have acquired for almost 60 years, combined with a large technology solutions portfolio. We are working on onshore facilities that the energy sector needs, in particular for oil and gas industry players.
Technip is one of the global leaders for the refining business and petrochemical units. We also reinforced our position on project management consultancy (PMC) activities, by leveraging our expertise in the management of complex projects.
Technip’s Mining & Metals Business Unit has implemented several major projects in the fields of nickel, uranium, alumina/aluminium, iron ore and other metals and minerals. For many of these applications, we hold several proprietary technologies including Krebs mixer-settler and Dorr Oliver FluoSolids® technology. We offer an integrated approach and expertise all across the mineral value chain, from mining to processing.

Fields of activity
- Preliminary Economic Assessment
- Pre-Feasibility Studies
- Bankable Feasibility Studies
- Mining design (open pit and underground mines)
- Process development
- Process engineering and plant detailed design
- Procurement, inspection of third party equipment
- Proprietary and non-proprietary equipment design, fabrication and construction
- Construction, pre-commissioning, and commissioning management
- Personnel training
- Plant start-up management
- Continuous technical support such as optimisation studies and process audits
- Third party due diligence
In the framework of its proactive commitment for technology and know-how, Technip has a strong expertise in mining and ore beneficiation established for more than 50 years.

Technip is active from conceptual studies to mine process design and technical assistance, in most minerals/metals and in particular gold, uranium, base metals, phosphate, potash, iron ore and coal.

Moreover, Technip has a solid experience in mining engineering / resources & reserves evaluation and vocational training services especially but not restrictive to French speaking African areas and the Middle East.

Our consultancy services include:

- Geological evaluation and NI43-101 reserves certification
- Metallurgical test work
- Design of beneficiation plants
- Scoping and Pre-Feasibility Studies
- Mine surface infrastructure
- Consulting services including due diligence studies and audits

Technip's expertise is often employed in the interpretation of test-work results followed by the development of suitable process designs for each individual project. This stage is closely supervised by our highly skilled process engineers to ensure that the entire procedure, from sample generation to test-work and process selection, is optimal for the project. In addition we actively assist our clients in reviewing resource data for the selection of test-work sample to represent an ore body.

Technip has forged close links with many well-respected metallurgical laboratories. We often develop innovative test-work programs on behalf of the client, and place emphasis on the preparation of practical data, which ultimately provide the basis of plant design. This assists in the application of accurate process design and offers comprehensive plant performance guarantees to our clients.
With a proven track record of over 50 years, a team of skilled professionals, Technip undertakes small, medium and large scale minerals processing projects on a local global basis.

Our global team of more than 40 experts is one of the most experienced and trusted in the industry with wide-ranging operational and technical expertise across commodities, continents and mining methods. Our experts are internationally respected for their depth and breadth of experience and as a result, are the go-to independent advisors for many of the world’s largest mining operators, financial institutions and investors.

The team includes mining engineers, geologists, process engineers, geostatisticians who specialise in adding value at every level of our clients’ business, for the lifecycle of their asset. We draw upon our own internal resources for design and engineering work in order to maintain and develop the skills, know-how and competitiveness essential to our development and to meeting our Clients’ needs.

Geological evaluation and Ni43-101 reserves certification
- Ity gold project (La Mancha/Ivory Coast)
- Jabal Sayid copper project (Barrick/ Kingdom of Saudi Arabia)

Metallurgical test work
- Kovdor mining (phosphate & iron) project (Eurochem/Russia)
- Guelb El Aouj iron project (SNIM/Mauritania)
- Iron ore (Votorantim/Peru)

Design of beneficiation plants
- Evate phosphate project (Vale/Mozambique)
- Tangaroa iron ore project (TTR/New Zealand)
- Putu iron ore project (Severstal/Liberia)

Scoping and Pre-Feasibility Studies
- Zanaga iron ore project (Xstrata/Republic of Congo)
- Tchirozerine coal mining project (Sonichar/Niger)
- Bemolanga bitumen deposit (Total/Madagascar)

Mine surface infrastructure
- Imouraren uranium project (Areva/Niger)
- Djebel Mellah salt project (Chloral/Algeria)
- Zanaga iron ore project (GlencoreXstrata/Republic of Congo)

Consulting services including due diligence studies and audits
- Due Diligence: Paddington gold site (BNP/Australia)
- Audit: Goro Nickel site (Vale/New Caledonia)
- Arbitration: PhosBoucrâ mining site (KPMG/OCP/Marocco)
- Strategic Mining Plan (KSA/Ministry of Mines)
We contribute to the technical, financial and implementation challenges of worldwide Mining & Metals projects at all stages of their development. We implement major projects all over the world with strong references in base metals, uranium, iron ore and industrial minerals.

### Koniambo
- **Client:** GlencoreXstrata
- **Country:** New Caledonia
- **Scope:** from BFS to EPCM (Prime Contractor)

Koniambo is one of the world’s largest and highest-grade undeveloped nickel deposits. In New Caledonia, Technip is implementing an opencast mine, ore transportation and storage, a pyrometallurgical plant constructed of modules and all the associated utilities and infrastructure.

### Weda Bay
- **Client:** Eramet
- **Country:** Halmahera Island, East Indonesia
- **Scope:** from PFS to EPCM (Prime Contractor)

Located on the Halmahera Island (East Indonesia), the Weda Bay project includes the Realisation of a nickel hydrometallurgical plant and all the associated utilities and infrastructure including a deepwater harbour.

### Zanaga
- **Client:** Xstrata
- **Country:** Republic of Congo
- **Scope:** pre-feasibility study

The project’s perimeter covers:
- Mine infrastructures
- Beneficiation plant to produce 30 Mtpa pellet feed
- 350 km slurry piping transportation between the mine and port sites
- Deep sea port
- Road corridor
- Power generation and distribution
Our fields of competencies cover the entire Mining & Metals industrial chain, from mine design to extractive metallurgy facilities and associated infrastructure.

**Imouraren**
- Client: AREVA
- Country: Niger
- Scope: from BFS to EPCM

The Imouraren project consists in implementing a new mining complex, including an open-pit mine, a uranium ore treatment plant to produce “yellow cake” and associated facilities and infrastructure in Niger. In parallel, Technip delivered the Somair Heap Leaching Expansion Project in 2009 in Niger.

In 2008, Technip and SGN (Areva) created a JV called TSU Projects, dedicated to Areva’s uranium ore processing greenfield and brownfield projects.

**Phosphate**

**Evate**
- Client: VALE
- Country: Mozambique
- Scope: scoping study

The Evate project consists in a scoping study for a phosphate beneficiation plant and a complete fertilizer complex (PAP, MAP/DAP, TSP, gypsum disposal, SAP with a co-generation power plant, water treatment with desalination, ammonia with coal gasification, and general infrastructure).

**Potash**

**Volgakaliy**
- Client: Eurochem
- Country: Russia
- Scope: Basic Engineering

The Volgakaliy project consists in implementing a potash beneficiation plant using a dissolution-crystallization technology in parallel of an existing flotation plant.

**Main services:**
- ROM characterization and orientation tests
- Preliminary Process Design
- Crystallization design competition based on pilot tests
- Optimized Basic Design
For decades Technip has been a key partner as an engineering company for the Mining & Metals industry.

Technip offers its clients a unique combination of experience and expertise based on extensive knowledge of their marketing and technical expectations, whatever the production conditions. Technip has a long track record in the Mining & Metals field whether implementing its own technologies (Dorr Oliver FluoSolids® roasting technology or Technip-KREBS mixer-settler for solvent extraction) or leading licensed technologies. The company’s services range from technical consulting and feasibility studies to complete turnkey facilities.

Technip covers the complete range of the Mining & Metals downstream industry. Other Technip core sectors of activity are basic chemicals and specialty chemicals, including fertilisers.

Dorr Oliver FluoSolids® roasting technology

The Dorr-Oliver FluoSolids® technology makes Technip a leading provider of fluid bed systems, with nearly 1,000 references. The technology was developed over a 60-year period with a wide range of applications in the metallurgical, chemical, and waste disposal industries. Technip can provide a range of heat treatment processes involving chemical and physical transformations to recover metals after incineration. There are several pyrometallurgy categories, including roasting, calcination and melting.

For more details, please refer to the Dorr-Oliver FluoSolids® brochure.

Technip (ex-KREBS) mixer-settler

Technip can provide a range of processes and techniques for extracting metals from a raw or concentrated material, by dissolving in a liquid phase. Technip as a long track record for solvent extraction applications of metals such as nickel, iron, cobalt, copper, zinc, gold, rare earths and uranium.

The KREBS SX system provides significant benefits:

1. The unit size is significantly smaller than conventional units of the same capacity, and including savings in construction, transportation, erection and installation costs and on building heating or ventilation costs.
2. The design of the SX unit enables the positioning of the mixers to be juxtaposed in the plant lay-out, i.e. units are arranged head-to-head, and not head-to-toe as in a conventional SX unit plant.

This allows for:

- Reducing pipe runs and electrical and instrumentation cable runs.
- Elimination of pipe trenches, or elevated units.
- Improved operator supervision as feed and product streams are visible from the same end of the unit.
- Flexibility is improved as it is easier to achieve with a head-to-head arrangement.

Sulfuric Acid technology

Longstanding relationships with other major companies allow Technip access to a wide range of proprietary process technologies. We are a licensee of Dupont (ex-MECS) for sulfuric acid plant. We have developed a mature experience in the design and construction of sulphuric acid plants. The first plant was built by Technip during the 1960’s and since that time we designed and built over 150 plants in more than 40 countries.

DuPont is recognized worldwide as an industry leader in chemical manufacturing. DuPont has been involved in the sulfuric acid business since 1865. The DuPont sulphuric acid process is the most widely used all over the world; approximately two thirds of the plants -sulphur burning as well as metallurgical or spent acid plants- are designed using the DuPont process. For the sulphur burning plants only, the proportion of plants built under the DuPont process reaches 80%. DuPont is currently performing the design of the largest plant ever built; the capacity of this metallurgical acid plant is 5,700 MTPD.
Dorr-Oliver FluoSolids® technology

Technip has a vast experience in roasting and calcining plants. Recent references involving Technip’s Dorr-Oliver FluoSolids® technology include:

- **Vale – Copper Cliff Smelter, Ontario, Canada**: new Nickel matte roaster (engineering in progress, start-up 2014)
- **Koniambo Nickel (GlencoreXstrata) – Koniambo Metallurgical Plant, New Caledonia**: 2 x 3,850 MTPD Nickel ore reduction roasters (Roaster no. 1 commissioned 2013, Roaster no. 2 commissioning on-going/2014)
- **Aura Minerals – Aranzazu, Mexico**: 200 MTPD Copper Concentrate partial roaster for Arsenic removal (engineering in progress, start-up 2015)
- **MMG – Sepon Primary Gold Project, Laos**: pre-feasibility study for 3,000 MTPD two-stage gold ore roaster and exhaust gas scrubbing system (2013)
- **Altynalmas Gold – Altynalmas Project, Kazakhstan**: pre-feasibility and Basic Engineering for 4,600 MTPD two-stage reduction-oxidation roaster system (2011)

KREBS mixer-settler

Recent references for Technip’s KREBS Mixer-Settler technology and solvent extraction (SX) process expertise include:

- **Sumitomo Metal Mining – Harima, Japan**: design of 17 mixers-settlers and delivery of the corresponding 17 conical pumps for new SX unit in to produce Cobalt Chloride and Nickel Sulfate (2012)
- **Areva Resources – McClean Lake, Saskatchewan, Canada**: basic engineering (2012) and detailed engineering and procurement services (2013) of a new SX unit to produce a rich pregnant uranium solution
- **CAMECO – Key Lake, Saskatchewan, Canada**: upgrades to existing KREBS mixer-settlers (2012)

Sulfuric Acid technology

Recent references for Sulfuric Acid technology include:

- **Tifert Fertiliser project (Tunisia)**: 3,600 MTPD (plant commissioned in 2013)
- **Imouraren (Niger)**: 1,500 TPD with heat recovery system (plant to be commissioned in 2015)
- **Eramet Weda Bay Nickel project (Indonesia)**: 2 x 3,750 MTPD (feasibility study done in 2012)
- **Vale Evate Phosphate project (Mozambique)**: 2 x 4,000 MTPD (pre-feasibility study done in 2011)
Since 2005, we have been devoting significant effort to research and development in this new mining domain. Because the Subsea Mining activity calls upon the broad industrial and offshore assets developed by Technip over the last 30 years for subsea oil and gas fields, we are at the forefront of this emerging area of mining.
Committed to Sustainability

We consider Sustainability as a true part of our business. Sustainability represents a means of ensuring long-term growth and value creation through an effective involvement with all its stakeholders. The nature of our business and the range and complexity of our activities have always required us to pay serious attention to social and environmental factors when executing projects.