METAL AND MINING

Team

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- Indroduction
- Overview
- Terminology

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- Client
- Consulting Firms
- Project

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- Software And Tools
- Process Of Implementation

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- Software And Tools
- Process Of Implementation

INTRODUCTION

Welcome to this presentation on metal and mining . The Metal and Mining sector is the industry dedicated to the location and extraction of metal and mineral reserves the world.

Global reserve of metals and minerals are mined for profit and then used in jewelry-making , industrial applications , and investments. The sector has a significant number of companies located internationally and operates with large revenues.

Metal include precious metals such as gold, platinum, and silver while industrial metals include steel, copper and aluminum.

INTRODUCTION

WHAT IS MINING ?

Mining is the process of extraction of valuable geological materials from earth and other astronomical objects.Ores recovered by mining includes metal, coal, oil shale, gemstones(diamonds), limestone, chalk, rock salt, gravel and clay.

Mining in a wider sense include extraction of any Non-renewable resources such as petroleum, natural gas, or even water.

INTRODUCTION

TYPES OF MINING

1) Surface Mining: Surface mining is the extraction of minerals from the surface of the earth. This method is used when the mineral deposit is close to the surface and can be extracted by removing the overlying soil and rock. The three types of surface mining are open-pit mining, strip mining, and quarrying.

INTRODUCTION

TYPES OF MINING

2) Underground Mining: Underground mining is the extraction of minerals from underground. This method is used when the mineral deposit is located deep beneath the surface of the earth. The two main types of underground mining are hard rock mining and soft rock mining.

INTRODUCTION

TYPES OF MINING

3) Placer Mining: Placer mining is the extraction of minerals from alluvial deposits, such as rivers, streams, and beaches. This method involves using a pan or sluice box to extract the minerals from the water or soil .

INTRODUCTION

TYPES OF MINING

4) In-situ Mining: In-situ mining is the extraction of minerals without removing the overlying soil and rock. This method is used for minerals that are too deep to be extracted by surface mining or too expensive to extract using traditional methods.

INTRODUCTION

TYPES OF MINING

5) Solution Mining: Solution mining is the extraction of minerals by injecting a solution into the mineral deposit. This method is used to extract minerals such as salt, potash, and uranium.

INTRODUCTION

OTHER TYPES OF MINING

6) Mountain Top Removal
7) Block Caving
8) Drift Mining

INTRODUCTION

FACTS ABOUT MINING

1) Mining industry in India is one of the core industries of the economy . It provides basic raw materials to many important industries .
2) The mining industries is a major contributor to the Indian economy, accounting for around 2.6% of India's GDP.
3) GDP contribution of the mining industry varies from 2.2% to 2.5% only but going by the GDP of the total industrial sector it contributes around 10% to 11%. Even mining done on small scale contributes 6% to the entire cost of mineral production.
4) India is the world's 2nd-largest coal producer , the 5th largest country in terms of coal deposits and India was 4th largest producer of Iron ore.

INTRODUCTION

FACTS ABOUT MINING

5) The Indian mining industry employs over 700,000 individuals.

6) The Indian government has been promoting sustainable mining practices and the adoption of new technologies to reduce the environmental impact of mining operations.

7) The introduction of the National Mineral Policy in 2019 aims to streamline the licensing and regulatory processes and improve the ease of doing business in the mining sector.

INTRODUCTION

FACTS ABOUT MINING

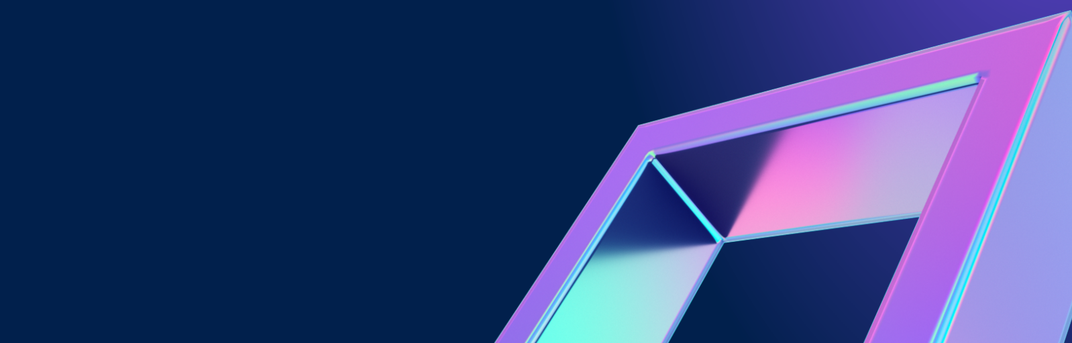
8) The Indian government has been actively promoting the exploration and extraction of rare earth elements, which are essential for high-tech industries like electric vehicles and renewable energy.

11) The Indian mining industry has been affected by the COVID-19 pandemic, with disruptions to mining operations and a decline in demand for minerals.

12) Despite the challenges posed by the pandemic, the Indian government has been focusing on the development of the mining sector as a key driver of economic growth, plans to invest in infrastructure and increase exploration activities.

OVERVIEW OF METAL AND MINING

The metal and mining industry plays a crucial role in the global economy and provides the raw materials needed for a variety of products, from construction materials to electronic devices. The industry encompasses a wide range of activities, from exploration and development of mineral deposits to extraction, processing, and distribution of metals and minerals. As a result, it is a complex and highly regulated industry that faces a number of challenges, including volatile commodity prices, increasing demand for sustainable and responsible practices, and the need to adapt to new technologies.



OVERVIEW OF METAL AND MINING

Some of the key areas that we focused on in this project which include

- Analyzed the different metal and mining companies and top consultancy firm who mostly handle the projects and challenges of top most mining companies.
- Use Framework to analyse the problems and challenges in order to find solution and to reach on valuable conclusion.
- Tools and technique used by mining industries as well as consulting firms.
- Case study taken from consulting firm named EY where we'll see the detailed analysis about problem and challenges faced by mining industries and their solutions.

By this project we tried to navigate the challenges and opportunities of the dynamic and complex industry.

TERMINOLOGY

To better understand the metal and mining industry, it’s important to be familiar with key terminology. Here are a few terms you may encounter:

1. ***Ore*** : Rock that contains minerals of economic value.
2. ***Concentrate*** : A product of the milling process that contains high concentrations of valuable minerals.
3. ***Tailing*** : The waste material that remains after the milling process.
4. ***Smelting*** : The process of heating ore to extract the valuable metal.
5. ***Deposit*** : A deposit is a naturally occurring concentration of minerals or metals within the earth's crust that can be economically extracted

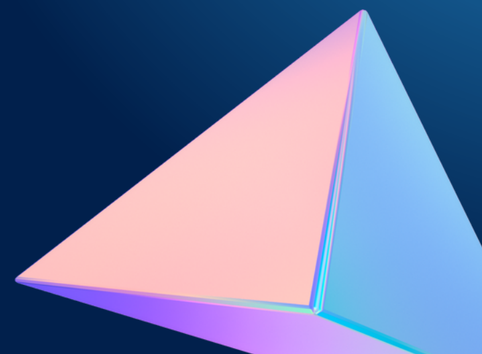
TERMINOLOGY

4. ***Mineral Reserve*** : A mineral reserve is the portion of a mineral deposit that can be economically extracted at the time of determination. Mineral reserves are typically determined through geological exploration and economic feasibility studies.

5. ***Grade*** : The grade of an ore deposit is a measure of the concentration of valuable metals or minerals in the deposit. It is usually expressed as a percentage or a weight per unit volume.

6. ***Mining*** : Mining is the process of extracting minerals or metals from the earth. It can involve various techniques such as surface mining, underground mining, and in-situ mining.

7) Refining: Refining is the process of purifying a metal after it has been extracted from its ore. This process involves removing impurities and adjusting the composition of the metal to meet specific standards.



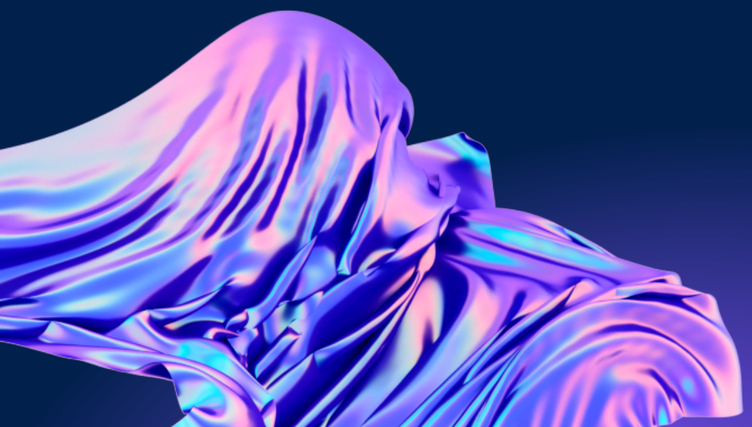
TERMINOLOGY

8) *Tailings* : Tailings are the waste materials produced after the valuable metals or minerals have been extracted from the ore. Tailings can contain harmful chemicals and need to be stored in a safe and environmentally responsible manner.

9) *Acid Mine Drainage* : Acid mine drainage is the outflow of acidic water from a mining site. This occurs when sulfur-bearing minerals are exposed to air and water, forming sulfuric acid. Acid mine drainage can be harmful to the environment and can damage water resources.

10) *Reclamation* : Reclamation is the process of restoring land that has been disturbed by mining activities to its original or a suitable state for future use. This can involve replacing topsoil, planting vegetation, and creating water resources. Reclamation is an important part of responsible mining practices to minimize the environmental impact of mining activities.

TOP MINING & METAL COMPANIES

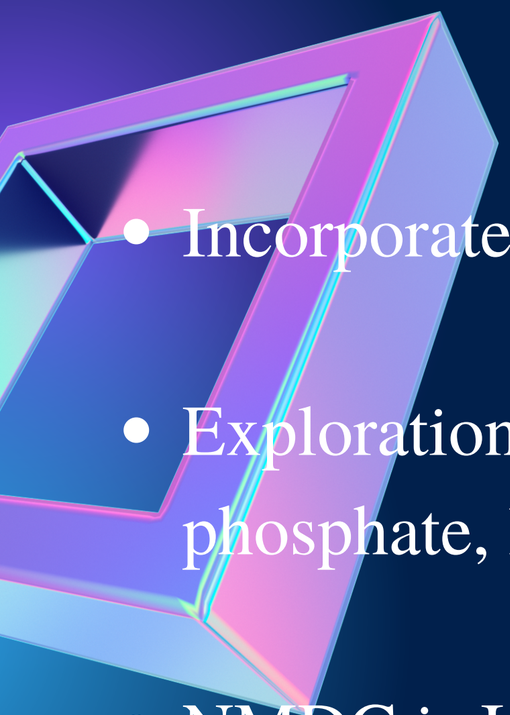



MSMC
UCIL
एनटीपीसी
NTPC
A Maharatna Company
Engineering India
Mining Building Nation
Coal India
INDIA
KUDREMUKH
TOP MINING COMPANIES IN INDIA
एन एम डी सी
NALCO
NMDC
JINDAL
STEEL & POWER
vedanta
transforming elements
balco
सेल SAIL
TATA
TYA BIRLA
HINDALCO
HZ
HINDUSTAN ZINC LIMITED
LAFARGE
GMDC
OMDC

METAL COMPANIES

MINING &METAL COMPANIES

1. NMDC LTD



- Incorporated in 1958 as GOI owned public enterprise
- Exploration of wide range of minerals including iron ore, copper, rock phosphate, limestone etc.
- NMDC is India's single largest iron ore producer, producing about 32 MT of iron ore from three fully mechanized mines.

MINING &METAL COMPANIES

2. HINDALCO INDUSTRIES LTD

- Metals flagship company of the Aditya Birla Group.
- Industry leader in aluminium and copper. World’s largest aluminum rolling company .
- Copper smelter is among the world’s largest custom smelters at a single location.

3. VEDANTA

- A vedanta group company.
- Company’s main businesses focus on zinc, lead, silver, aluminium, copper, iron ore, oil & gas, and commercial power.

4. COAL INDIA

- State-owned coal mining corporation which came into existence in November 1975.

- CIL circulated through 83 mining areas, seven full-owned coal producer subsidiaries and one mining scheme and consulting company spread across eight provincial states of India

5.TATA STEEL

- Indian multinational steel making company, based in Jamshedpur , Jharkhand and headquartered in Mumbai, Maharashtra.

- TATA Steel, along with SAIL and jindal steel and power are the only 3 Indian steel companies that have captive iron-ore mines.

6. JINDAL STEEL

- Indian steel company based in New Delhi.

- Company manufactures and sells sponge iron, mild steel slabs, rails, mild steel, structural, hot rolled plates, iron ore pellets and coils.

7. HINDUSTAN COPPER

- It is a central public sector undertaking under the ownership of Ministry of mines, Government of India.
- Engaged in a wide spectrum of activities ranging from mining ,smelting, refining etc.
- Also produces gold silver, nickel sulphate, selenium, tellurium and fertiliser as by products.

TOP CONSULTING FIRMS

PROJECTS TAKEN BY FIRMS

- MINING COMPANY’S AI TRANSFORMATION
- CHALLENGES OF DIGITAL TECHNOLOGIES
- RISING DEMAND FOR ELECTRIC VEHICLES
- BATTERY COMPANIES INVESTING IN MINES

TOOLS & SOFTWARE

Some of the tools like

- SWOT
- Porter’s 5 forces
- Porter’s value chain analysis
- McKinsey horizon model
- Lean Methodology
- Mine planning and design framework
- HSE framework
- McKinsey 7S framework

SWOT

- To identify the strength weakness opportunity and threats of the clint in negotiable with current market share to expand or starting up the new business.

- To evaluate the companies competitive position in market .

Porters 5 forces

- Helps to make decision about entering in market and developing new strategy.
- To understand their industry and competitions.
- It breakdown the **industries and market** and by analysing through 5 forces:

Porters value chain analysis

- How does the core activity create value to their consumer while adding support to the non-core activity.

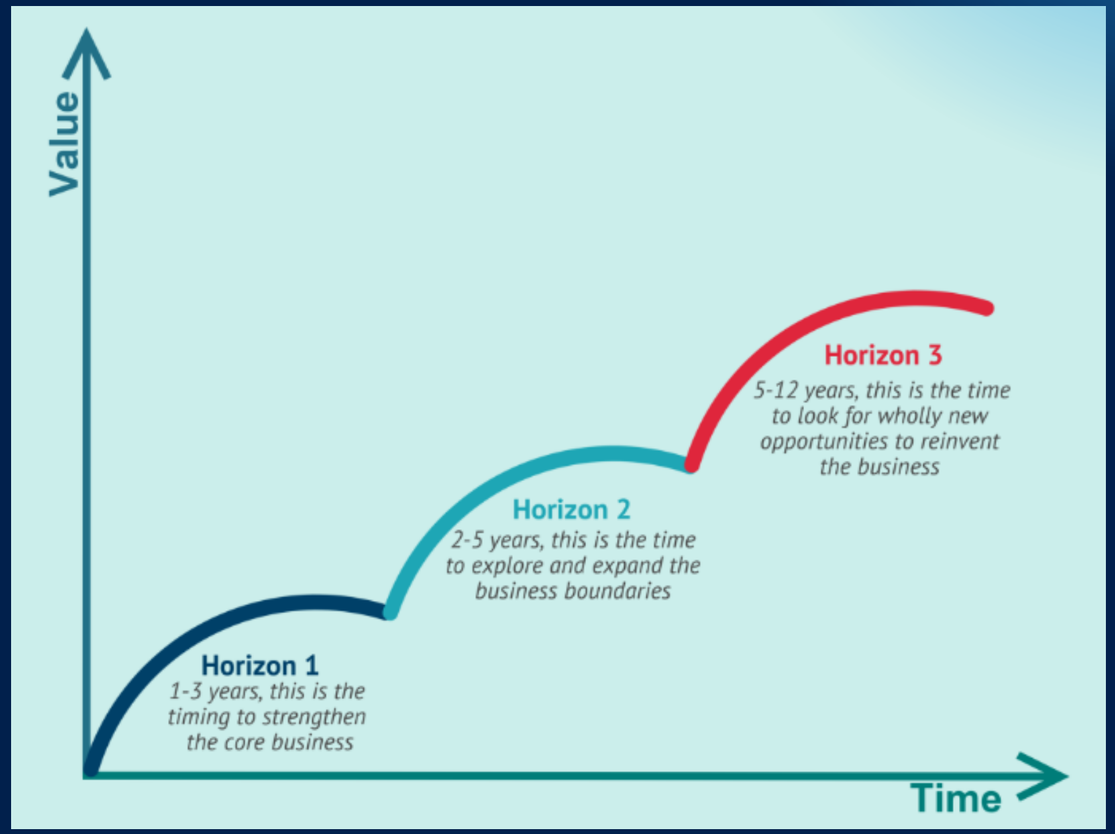
- Directly liked to competitive advantage
- Basically from extracting raw material to manufactures final good and sell to the customer.

- With support of necessary activites

Mines exploration Extraction of ore Separation and finished goods Storage and inventory handling			
Marketing and sales	Human Resource	Civil infrastructure	Data analytics

McKinsey Horizon model

- Helps in business innovation and growth
- 3 broad categorical horizon
- Horizon 1: 1-3 year strengthen the core business
- Horizon 2: 2-5 year expand and explore core values
- Horizon 3: 5-12 year reinvent the opportunity



Lean process

- Improve the quality of the operation and company more efficient.
- Aim: get a job done with appropriate amount of resources and man power.
- It fosters a mindset that aims for continuous improvement and increase the profitability.

Mine planning and design framework

- Mining operation and metal extraction planning
- Analysis of geological and geotechnical analysis.
- Demand and market of the Mining metals
- Geological modelling, mine design, and feasibility study

HSE framework

- Health, Safety, Environment
- Health related risk on operation
- Safety of the organization and their reputation
- Environmental pollution and harmanes to the organisms.
- Risk assessed, risk register, prevention of risk, Environmental impact assessment, risk mitigation planning.

Software Used in mining industries

- Geographic Information System (GIS): Analysing geological data.
- Datamine: Mining planning and designing.
- Oracle database: Data base management software for client and geological data
- Excel & CFI: Finance analysis and modelling software.
- ArcGIS & QGIS: Environmental impact assessment
- ENVI: remote sensing satellite image
- ERP: Procurement, supply chain and many more

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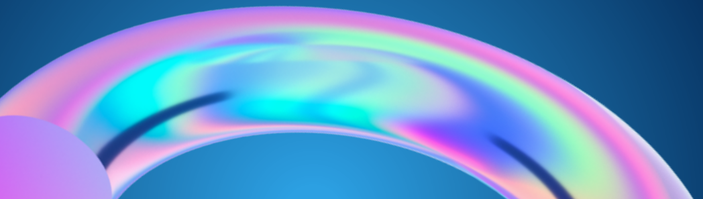
CASE STUDY



CASE STUDY

How an Indian steel company is adding more mettle to its business with digital

An Indian steel company leveraged digital technologies such as AI/ML to transform its procurement and production value chain, enhance productivity and boost margins.

How can digital help balance cost and quality productivity improvements with consistent

Problem Statement

An Indian steel company wanted to unlock efficiencies through business transformation under mounting debt pressure

• The client was looking to address these internal and external challenges and leverage digital to turn around its business operations through:

• Effective sourcing of input raw materials

• Optimizing consumption through right material blends

• Maximizing throughput and capacity utilization

• Maintaining consistent quality

Apart from internal challenges, there were sectoral and structural challenges as well .The Indian steel industry was facing both demand and supply.The challenges were further accentuated by sub-optimal logistics infrastructure and ballooning debt servicing costs, resulting in balance sheet stress to all companies in the industry.

•EY built tailormade digital solutions for the company’s integrated production set up, including sourcing models and assisted decision-making tools for the procurement function, and blending/ recipe mix models for coke ovens, sinter plants, blast furnaces, and steel melting shops. EY undertook a rigorous approach, incorporating multiple aspects for diagnostics and solutioning:

• EY developed and deployed the following solutions to help address the client’s sourcing needs:

• Source Mix Optimization : A solution which considers myriad of potential sources for fuel and raw material with different quality profiles to achieve the optimal sourcemix at least possible cost without compromising quality and throughput

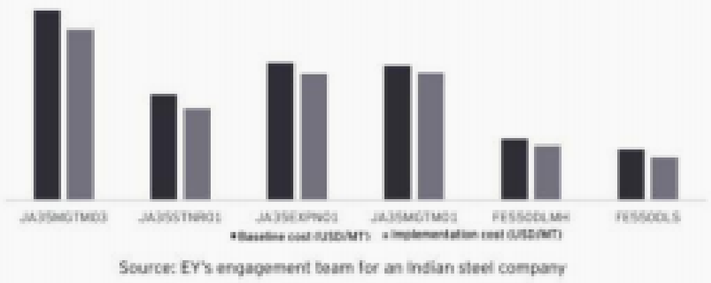
• Bidding Auction Tool : An auction decision support tool which helps find the optimal quality and quantity of coal at desired prices thereby resulting in lower procurement cost

• Once sourcing needs were addressed, it was important to optimize consumption without compromising quality and productivity to drive maximum value realization. For this, the EY team developed a digital twin solution for different aspects of the production value chain, leveraging AI/ML techniques of genetic algorithms, neural networks and feature selection algorithms for relationship establishment and prediction and linear as well as non-linear programming concepts for optimization and prescriptive insights.

- 1.Digital Twin for coke Oven
- 2.Digital Twin for Sinter Plant
- 3.Digital Twin for Blast Furnace
- 4.Ferro-Alloy Consumption Optimization
- 5.Power Plant Control Tower .

Digital twin for ladle refining furnace – consumption optimization of ferro-alloys

Reduction in grade-wise specific cost across grades in production



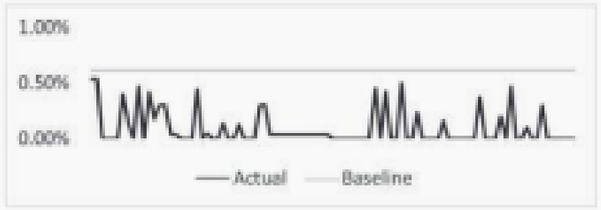
Source: EY's engagement team for an Indian steel company

Major KPIs

1. Reduction in opening chemistry variability
2. Reduction in killing - recovery variability
3. Increase in usage of cheaper ferro-alloys

Digital twin for blast furnace – consumption optimization of burden mix

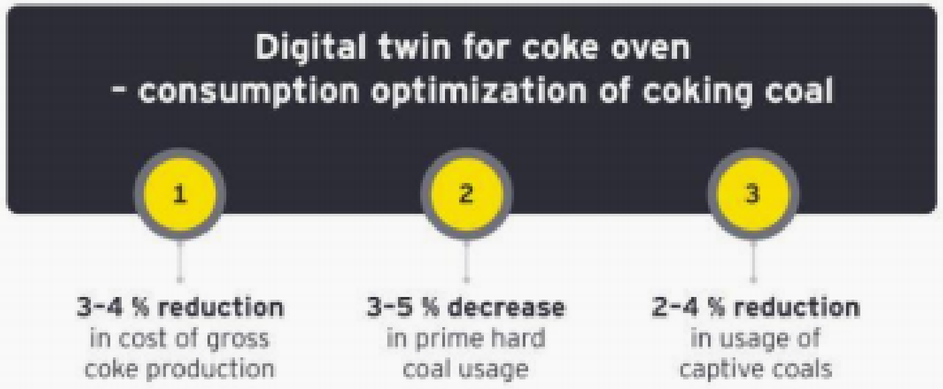
Reduction in monthly deviation between the actual cost and optimal cost



Major KPIs

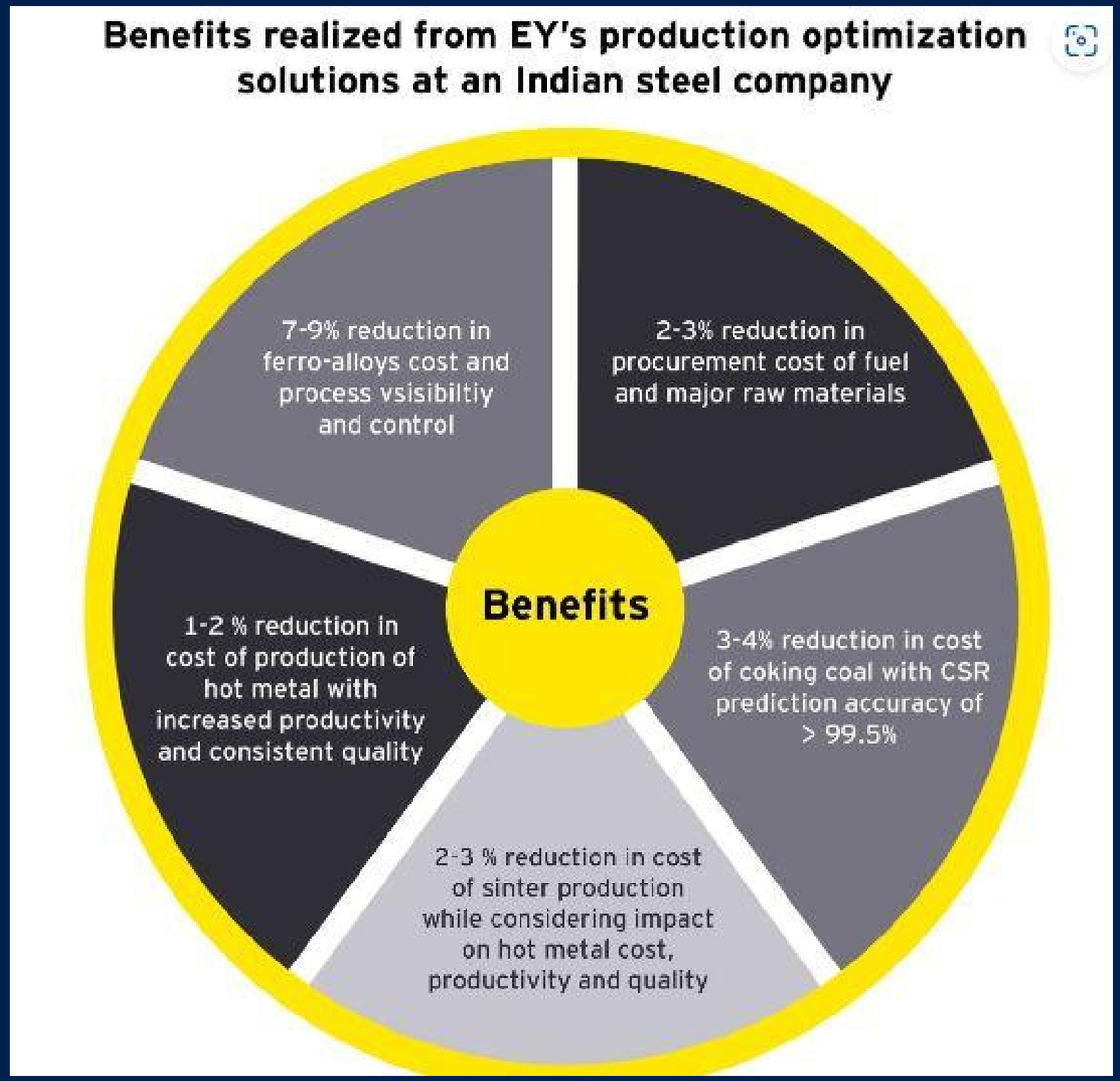
1. 1 - 2 % reduction in HM cost pthm
2. 0.5 - 1 % increase in sinter usage

Digital twin for coke oven – consumption optimization of coking coal



•The individual solutions delivered cost savings at their respective deployment sites and were integrated into the “Digital Twin” tool to leverage the synergies across solutions and to develop end- to-end process visibility and control along with process and parameter optimization.

•The digital transformation was rooted in strong business and technical understanding and leveraged advanced AI/ML to establish relationships between technical parameters and optimize consumption and enhance productivity to deliver tangible cost savings at various production units without compromising productivity or quality.



CONCLUSION

• In addition to the tangible benefits, the deployment of digital solutions spanning the value chain transformed operations and delivered additional intangible benefits through enhancement of people's skillsets and productivity, KPI driven performance management, focus on root cause analysis and outcome driven daily meetings and stronger governance.

• Source :How an Indian steel company is adding more mettle to its business with digital

URL : https://www.ey.com/en_in/mining-metals/how-an-indian-steel-company-is-adding-more-mettle-to-its-business-with-digital