Agenda

1. Intro Tata Steel group
2. Tata Steel Digital Strategy
3. Digital Strategy; The what
4. Digital strategy; The How
5. IOT examples
6. Digital included in Tata Steel mission
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Tata Steel Group

One of the world’s most geographically-diversified steel producers

- 11th largest global steel producer
- Annual crude steel capacity of more than 28 million tonnes
- Around 75,000 employees
- Manufacturing operations in 26 countries across five continents
- Present in both mature and developing markets
- Turnover in 2015-16: approximately $ 17.7 billion (€15.5 billion)
- Fortune 500 company
Tata Steel Group

A global network serving demanding markets worldwide
Tata Steel: Europe’s second largest steel producer

Products and services that create advantage

Our advanced capabilities

- Comprehensive range of steel products and related services supplying into demanding markets
- Manufacturing sites in the UK and the Netherlands, Germany, France, Canada the US and Belgium. Presence in more than 35 countries
- 12.9mtpa crude steel capacity
- 2015-16: Turnover €8.66 billion
- 23,000 employees
Our key markets

Serving the most demanding markets worldwide
Our market-focused approach to innovation

Turning in-depth understanding into solutions that meet customers’ needs

Innovating for and with customers

- Continuous investment in world-class research and development
- Open innovation and collaborations with universities and research institutes worldwide
- Exploit new technologies to enhance our products and services
- Use latest methods in process analysis and design, product design, modelling/simulation and prototyping
- Large-scale test facilities for new product testing on an industrial scale
Agenda

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Digital Roadmap: Vision & Strategy

TSE wants to become a Digital Master and will drive an **AMBITIOUS DIGITAL & INDUSTRY 4.0 AGENDA**:

1. **Radical innovation** in all functional areas

2. **Digitizing existing processes**, such as:
   - Improving asset uptime through automated and real time production monitoring
   - Applying ‘predictive analytics’ to forecast market demand, and ‘artificial intelligence’ to better match customer needs

3. **Replacing current legacy systems**

Two risks emerge in the “Digital” era.

1. **Do too many little digital things without a clear vision and strategy**

2. **Act as a ‘Conservative’ moving too slow and being overtaken by competitors.**

*To counter both risks **STRONG TRANSFORMATION LEADERSHIP AND ACCELERATED INNOVATION & DELIVERY** of digital solutions, is indispensable*
Digital technologies provide significant potential for TSE

Impact of digitisation of manufacturing business models

Agile operating model
Key features: Decentralised, modular, flexible, boundless

Growth driver
Solutions
Smart products
Smart services
Sales
Customer & market analytics
Digital channel management
Innovation
Extended innovation
Connected lifecycle innovation
Supply chain
Agile collaboration networks
Connected supply chain
Efficiency driver
Manufacturing
Decentralised production control
Data-driven operational excellence

People leadership & change
Governance & processes

Digital infrastructure
Key features: Powerful, secure, reliable, scalable

Key technology enablers
Machine to machine communications
Cloud computing
Advanced analytics
Industrial automation
Mobile devices
Infrastructure
Communities
Agenda

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Strategic focus areas for targeted digital initiatives & investments
Current v.s. future state of TSE’s business capabilities, digitally empowered
Digital & IT Strategy
Roadmaps for all functional domains

1. Sales and Marketing
2. Downstream
3. Manufacturing
4. Supply Chain
5. Engineering
6. Data and reporting
7. Procurement
8. Finance
9. HR
10. IT platforms
Digital and IT Roadmap: Delivery modes

Our change to digital needs to be evolutionary, even if the impact is ultimately revolutionary

- This needs a multi-modal approach to change
  - Get the Basics and foundation right

- Deliver differentiating solutions to problems that will determine our competitive success in the long run

- Institutionalize an attitude and way-of-working to quickly try-out innovative concepts with, for example, software bots, blockchain, augmented reality, machine learning and AI
A new digital WORKFORCE on all levels

Digital **Will** impact the way TSE works and what happens with the types of jobs on all hierarchical levels.

<table>
<thead>
<tr>
<th>Level</th>
<th>Foundation</th>
<th>Differentiation</th>
<th>Innovation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leadership</td>
<td>• Command and control management style</td>
<td>• Leaders elicit feedback on management</td>
<td>• Leaders have a servant/facilitating leadership style</td>
</tr>
<tr>
<td></td>
<td>• • •</td>
<td>• Communication lines formed among IT &amp; BU's</td>
<td>• Internal alignment among IT &amp; other business units</td>
</tr>
<tr>
<td></td>
<td>• Fear of failure is pervasive</td>
<td>• Leadership retains power over programs &amp; projects</td>
<td>• Leadership is trained and/or experienced in working with Agile and is convinced of its efficacy</td>
</tr>
<tr>
<td></td>
<td>• PMO responsible for program management</td>
<td>• Projects seen as potential risks</td>
<td>• Change embraced as opportunity</td>
</tr>
<tr>
<td></td>
<td>• never end</td>
<td>• KPI's &amp; incentives stimulate continuous improvement</td>
<td>• KPI's set to stimulate teamwork and learning</td>
</tr>
<tr>
<td>Program &amp; Project Mngrs</td>
<td>• “Siloed” programs &amp; projects</td>
<td>• Agile &amp; control disciplines in siloes</td>
<td>• Understanding of program-level Agile frameworks (Scrum, Kanban, SAFe)</td>
</tr>
<tr>
<td></td>
<td>• Fear of failure is pervasive</td>
<td>• Failure is discouraged, learning encouraged</td>
<td>• Cross-functional teams (business analysts, design thinkers, developers, UX designers, Ops, etc.)</td>
</tr>
<tr>
<td></td>
<td>• PMO responsible for program management</td>
<td>• PMO responsible for program management</td>
<td>• Use co-creation strategies among team members</td>
</tr>
<tr>
<td>Teams</td>
<td>• Functionally homogenous teams using waterfall development methodologies</td>
<td>• Functional teams using mix of waterfall and Agile development methodologies</td>
<td>• Teams built on mutual trust, communication, adherence to agile principles &amp; transparency</td>
</tr>
<tr>
<td></td>
<td>• Use of sequential, isolated creation strategies across functional teams</td>
<td>• Use co-creation strategies across teams</td>
<td>• Ability to self-organize &amp; clearly defined shared vision of team members’ roles &amp; responsibilities</td>
</tr>
<tr>
<td></td>
<td>• Clearly defined project team member hierarchy</td>
<td>• Projects directed by Product Owners acting as project managers</td>
<td>• “T-shaped” employees with experience</td>
</tr>
<tr>
<td>Individuals</td>
<td>• Single-area experts</td>
<td>• Vague project team hierarchy and members’ roles</td>
<td>• Willing &amp; able to explore the unknown and take decisions even if outcomes are yet unclear</td>
</tr>
<tr>
<td></td>
<td>• Waterfall and Agile experience</td>
<td>• Ability to self-organize &amp; clearly defined shared vision of team members’ roles &amp; responsibilities</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Employee review performed by direct supervisor</td>
<td>• Clear vision of business value being created and ability to link that value to evolving customer needs</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Mix of single-area and broad-skilled employees</td>
<td>• Adherence to agile principles &amp; KPI’s</td>
<td>• Adherence to agile principles &amp; KPI’s</td>
</tr>
</tbody>
</table>
Accelerators to speed up the journey to Digital Mastery

Innovation & Decision Making Accelerators

1. Digital Mindset Training to stimulate creativity and new insights.

2. Innovation Center to increase the number and success rate of digital innovations.

3. Storytelling for Requirements to bring proof points to live faster and visually.

4. Business Capabilities & E2E Process Ownership to identify, focus the investments in & manage the competitive shifts in capabilities.

5. Professionalize Portfolio Management to speed up & substantiate decision making.

6. Accelerate IM Function creation with focused & agile business analysis & solution visioning.

7. Accelerated Solution Environment to fast track problem analysis, solution design and decision making with group genius.

8. Innovation Fund to rapidly fund early stage ideas and studies (like a venture capitalist).
Digital Innovation Centre with Fast Digital Approach

Description of Fast Digital to rapidly experiment with digital to create an innovative mindset & identify business issues that can be solved with digital.

- **1- EXPLORE AND DESIGN**: 14 weeks
  - > 75 digital use cases

- **2- EXPERIMENT AND LEARN**: 16 weeks
  - 10 – 20 proofs of concept

- **3- PREPARE RAPID SCALE-UP**: 4 weeks
  - 5 – 10 new business solutions
Use a structure to implement data-driven improvements (manufacturing)

- Connected Sensors
- Simulation & Digital Twins
- Robotics, Automation & HMI (level 1-2)
- People
- System of insights Databases
- System of engagement (O365, apps)
- System of records (level 3 and higher: ERP, MES, …)
- Basic infrastructure (Networks; Datacenters; Cloud; End user devices)
- IT Security: Safe data→ “No BF takeover”
- Governance (Focus on implementing)
Build the enabling Technology Platforms
Collaborate with partners

Technology Incubators
- Techport
- Amsterdam Science park
- Yes Delft

IT and Technology Partners
- IT: IBM, TCS, CG, Microsoft
- Technology: Siemens, Pri Metals

Local technology companies and start ups
- Technolution
- Improvement IT
- Scyfer
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Digitization at Tata Steel

Predictive Maintenance, IoT connected devices, Grease pots, TS Engineering / Technolution

IoT services
- Connected sensors
- Connectivity
- IoT platform for:
  - Store data
  - Control sensor functioning
  - Apply business rules

Grease pots
- Appr. 800 pots on difficult to access locations
- Refill
- Temperature and vibration give information about bearing condition
- Connected version not on the market
Track and Trace industry vehicles

- Various means of transportation:
  - Locomotives
  - Torpedo cars
  - Trucks

- Purpose:
  Optimise logistics on site and off site

Track and Trace

- Logistics of trucks
- Follow scrap types, quantities
- Cooperation with our partner in logistics IJLT

Tata Steel Slide

Digitiliazation at Tata Steel 25

Track and Trace

TataTrack
Smart Coil

Smart coil

Add information to a coil related to the exact position over the length of the coil

Smart coil Applications

- Track and Trace the coil throughout the world
- Print a barcode on the surface (every meter)
- Make data available about the coil:
  - Dimensions (higher Yield)
  - Exact Mechanical Properties
  - Quality information (Defect Tracking)
- Make use internally for:
  - Dynamic Recipe control
  - Defect fighting
Smart Coil, Deep Learning, Surface Defect Recognition, Scyfer

**Deep Learning**
- The system learns by showing the system good results instead of programming criteria

**Improve Steel Defect Detection**
- Several defects with different root causes
- Some accurately classified with traditional technology
- Others have a high error rate
The digital twin factory is an **exact** copy of the physical factory.

Enable advanced product-mix and process optimisations, and contextualise predictive maintenance

Retrofit factories with sensors and connectivity:
- track things for the manufacturing process
- information on pressures, speed of work, wear and tear, temperatures, and inventories.

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**Roll Grinding Shop**

- Efficient use of equipment
- Relation between steel grade and wear
- Logistics of roll use, transport, location and amount of grinding
- Preventive Maintenance of equipment
Data and Analytics, Makeability Tubes,

**Data and Analytics**
- Store data about orders, supply chain, production, process and product properties.
- Apply advanced analytics
- Apply additional tooling like deep learning

**Applications**
- Makeability Check
  Can a customer request being made, yield performance and delivery time
- Improve complaints analyses.
  Show a picture of the defect immediately give the root cause and blocks other products from the same production batch
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The way to lead

To build the leading European steel business that is sustainable in every sense

- Customer focus
- Leadership
- Value chain excellence
- Innovation
- People
- Culture
- Responsible steel

Strategy
Thank you