KEY FIGURES

One of the top 100 industrial groups in the world with around 950 production sites

More than 75% of sales are made in the habitat markets

More than 4,100 sales outlets

2017 net sales
€40.8 BN

More than 179,000 Employees and 100+ nationalities represented

Created more than 350 years ago

Present in 67 countries
Innovative Materials

Comprising Flat Glass and High-Performance Materials, the Innovative Materials Sector holds a unique portfolio of materials and processes relating to habitat, transport, healthcare and industry markets. It provides the Saint-Gobain Group with its innovation-oriented culture.

+ Flat glass
  N°1 in Europe
  N°2 worldwide
  Present in 34 countries*
  Over 34,000 employees

+ High-performance materials
  N°2 worldwide
  Present in 36 countries*
  Over 28,000 employees

25% Of net sales
Construction Products

The Construction Products Sector designs and develops innovative solutions to improve the quality of living places and reduce the environmental impact of buildings, with unique product and service offerings for all construction fields, tailored to local conditions.

29% Of net sales

N°1 worldwide

- Plaster and plasterboard
- Mortars and floor coatings
- Ductile cast iron pipe

N°2 worldwide

- Insulation (all types of insulation products)
- Tile adhesives

N°1 in Europe

- Wall facings

N°2 in the United States

- Exterior Products

Present in

62 countries*

Over

47,000 employees

*Industrial presence
Building Distribution

The Building Distribution Sector brings the Group a thorough understanding of customers’ needs, be they building professionals, private project owners or large companies. It serves over seven million customers each year on the new building, renovation and home improvement markets.

46% of net sales

N°1 in Europe
Distribution of building materials

Present in
23 countries

Over
63,000 employees

More than
4,100 sales outlets
R&D centers of Saint-Gobain

3,700 researchers

8 cross-business R&D centers

1 produit out of 4 sold by Saint-Gobain today didn't exist 5 years ago
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Datalab: 3 teams, 25 data scientists
- Marketing & Sales
- Building Science
- Industry 4.0
INDUSTRY 4.0

I. A DEFINITION
II. PREREQUISITES
III. TEAM
IV. DATA
V. TOOLS AND METHODS
VI. EXAMPLES
Industry 4.0: a definition

The four stages of the industrial revolution

Connected industry is to a large extent self-organizing. The lubricant of a smart factory is information, which tells the machinery how it should organize itself in order to complete a certain job.

**Stage 1**
- Late 18th century
- First mechanized manufacturing equipment powered by water and steam

**Stage 2**
- Early 20th century
- Introduction of mass production with the help of electrical power

**Stage 3**
- Early 1970s
- Use of electronics and computers to automate manufacturing worldwide

**Stage 4**
- "Cyber-physical systems": real objects and virtual processes are interlinked

**1784**
- First mechanical loom

**1870**
- First assembly line (Slaughterhouse Cincinnati)

**1969**
- Use of electronics and computers to automate manufacturing worldwide

**Connected industry – smart factories**

Source: DFKI 2011, Bosch
Industry 4.0: opportunities

- **Shorter delivery times** – production of a customized product before commissioned by customers
- **More robust production** – production units autonomously learn to deal with exceptional situations
- **Reducing human errors** – increasing use of intelligent robots reduces production errors (especially in case of batch size 1)
- **Better usage of working hours** – advanced work hour planning by combining human and robot resources
- **Predictive Maintenance** – determine the condition of in-service equipment in order to predict when maintenance should be performed
- **Safer working conditions** – working environments with high security risk can increasingly be done by robots
- **Automation of human activities** – modern artificial intelligence allows the automation of complex tasks that were previously done by humans
Data science for industry 4.0

Steam power from agrarian to industrial society

Electric power for assembly lines and mass production

Computerization of production

20th cent.

21st cent.

Smart networks of humans, machines and products

Prerequisite

© acatech / FIR @ RWTH Aachen University

Source: infineon.com
Industry 4.0 prerequisites: connectivity

Smart factories are at the center of the Industry 4.0 (connected industry) revolution.

Credit: Max Pixel

Industry 4.0 prerequisites: connectivity

SCADA network

ERP
MES
SCADA Network
PLC PC PID
Sensors Actuators Hardware
Industry 4.0 prerequisites: connectivity

- HMI
- CLOUD SOLUTION
- OFF-LINE MACHINE LEARNING
- SCADA
- PLC
- Production sensors

Example: LoopEdge on a Dell Gateway
Data science project workflow for industry
Industry 4.0 team

- **Participant/Client**
- **Sponsor**
  - Defines the goals
- **Project Leader**
  - General planning and resources management
- **Data Scientist**
  - Extracts value from data
- **Data Owner**
  - Asserts content and quality of the data
- **Production Expert**
  - Gives operational insights and feedbacks
- **Sensors Expert**
  - Defines, selects, develops the right sensors
- **Industrial IT**
  - Gives access to data, manages architecture

**One project, different roles**
Industry 4.0 team: main risks

- **Sponsor**: Defines the goals
- **Data Owner**: Asserts content and quality of the data
- **Data Scientist**: Extracts value from data
- **Industrial IT**: Gives access to data, manages architecture
- **Project Leader**: General planification and resources management
- **Production Expert**: Gives operational insights and feedbacks
- **User/client**: N/A
- **Sensors Expert**: Defines, selects, develops the right sensors
Team: data owner

\[ X_{1255} \]

sensors failures?
production stops?
actual variations?

“\( X_{1255} \)”
... could be more explicit
Data: sources & sizes

- Sensors
- PLCs
- SAP
- MES
- External DB
- Internet

- Laptop
- BigData

- All automatic
- Partially Manual
- Manual
Tools: welcome to the jungle!

http://mattturck.com/bigdata2017/
### Examples of tools

#### from data toward information

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**Machine Learning cannot be bought**

The model is a living object:

- generated by a maieutic process
- data preparation is the key (tailored, line specific, has to be coded)
- need to be fed and trained by experts
INDUSTRY 4.0

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Visibility

Hive → Pandas + in house MIC python code + D3.JS (Mike Bostock) | tSNE + Bokeh
Transparency

Pandas + Scikit-Learn + SHAP
Predictive capacity

Pandas + simpy + visvis
Predictive capacity

Pandas + simpy + visvis + pulp
Takeaways

• Connectivity is the prerequisite
• Start with a diagnosis, identify opportunities and start small
• Build a project team: IT, data scientists and process experts
• Keep control of your data
• Avoid black boxes: the deliverable has to be the code
Thank you!

• Data scientist

• Dataviz / Virtual-Augmented Reality Eng.

We are hiring

sgr-paris.saint-gobain.com