Steel: Leadership through data

December 2020

United States Steel

Steel is the fabric of today's society




Steel is the key material for most of today's technology

…and steel is an essential material for the economy of tomorrow

Electric vehicles: lighter yet stronger chassis and motors

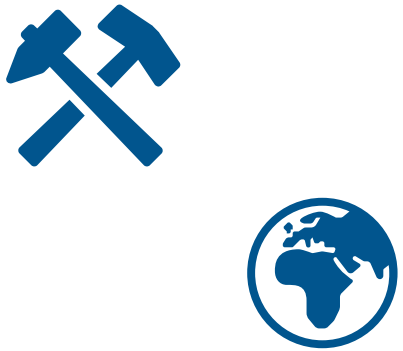
Renewables: structural parts of wind and solar power plants

Circular economy: steel is 100% recyclable

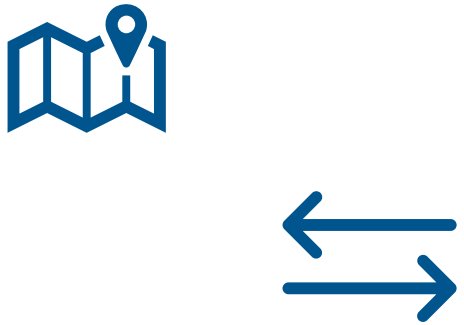
EUROFER:

"Steel is an **essential factor** in the development and deployment of **innovative, CO2-mitigating technologies**, improving **resource efficiency** and fostering **sustainable development**"

Global forces make innovation a must in the steel industry: innovate or die



Global raw material markets



Global overcapacity and trade wars

Increasing CO2 prices and targets

USSK at a glance: a unique playing field for innovation in many shapes and forms

Trivia

- Over 4mtpy of steel
- Product use: from cans to appliances to cars

- 8 division plants
- Temperatures from almost absolute zero to over 1,700 degrees
- Supersonic speeds
- Process duration from seconds to days

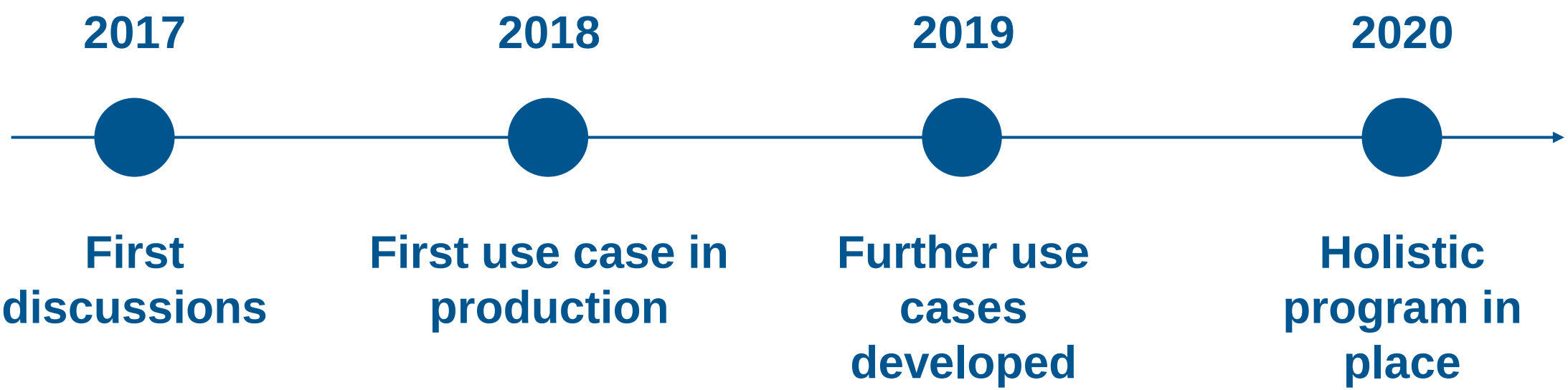
- Area of ~10 km2 (2,000 football pitches)
- Over 300km of railway

Note: Aerial picture from google.com

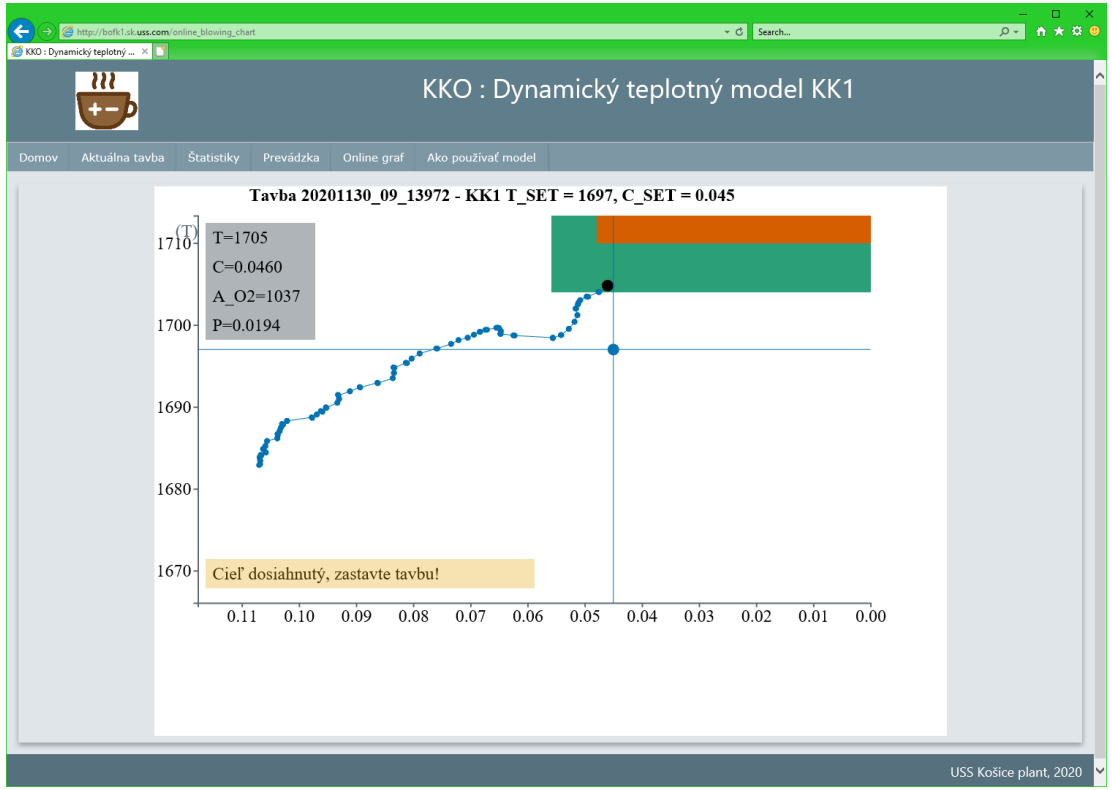
How can AI help us in all areas of our business

- **Health and safety**
- **Environment**
- **Quality**
- **Product**
- **Cost**

Based on own experiments and examples from abroad, we embarked on an ambitions digital and analytics journey



Success story: Making steel with AI



Success story: Context

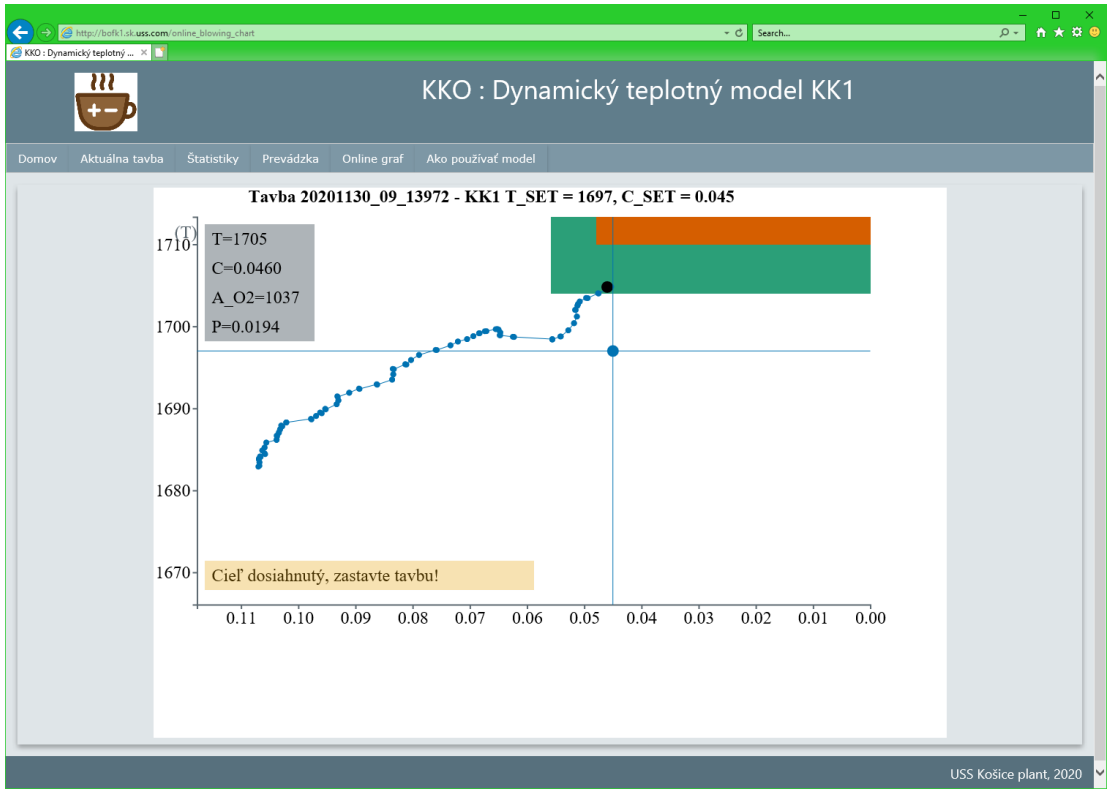
- Hot metal mixes with scrap in a **converter**
- Steel making is a batch process of size **~180t** which takes ~30 minutes
- Temperatures reach **over 1,700°,** oxygen is blown at **supersonic speeds**

Success story: Key challenge

Measurement of key parameters

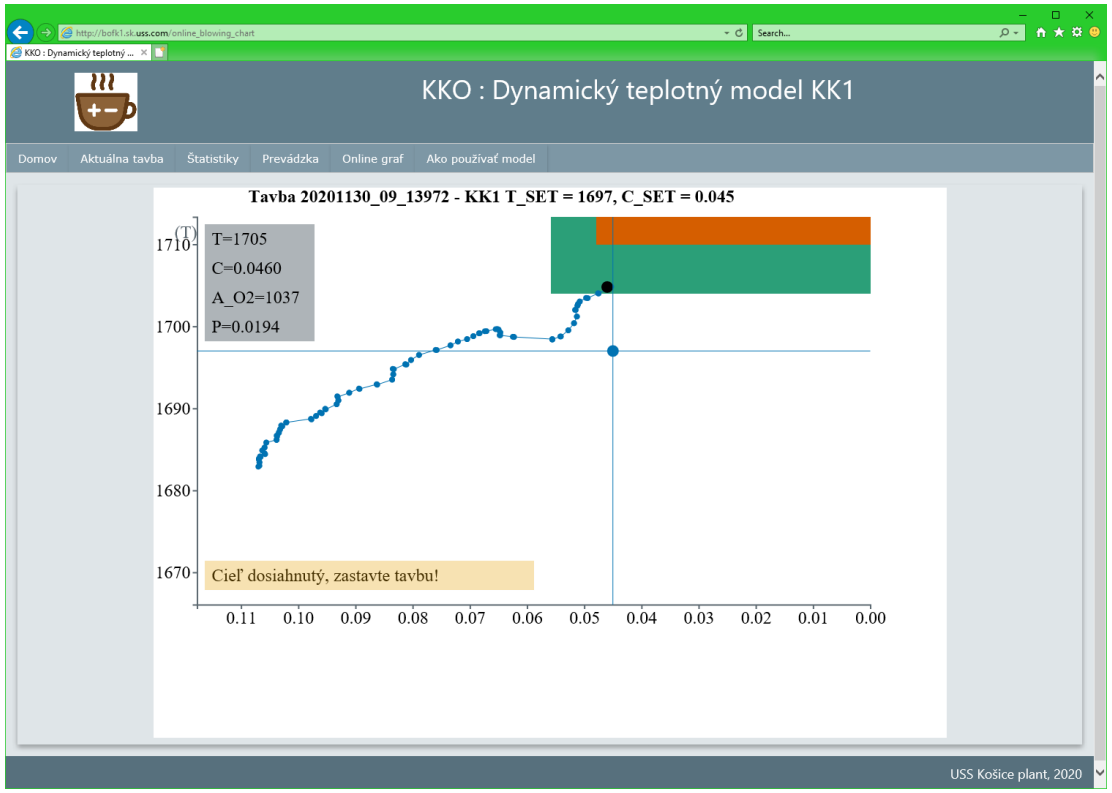
not possible in real-time

Success story: Approach



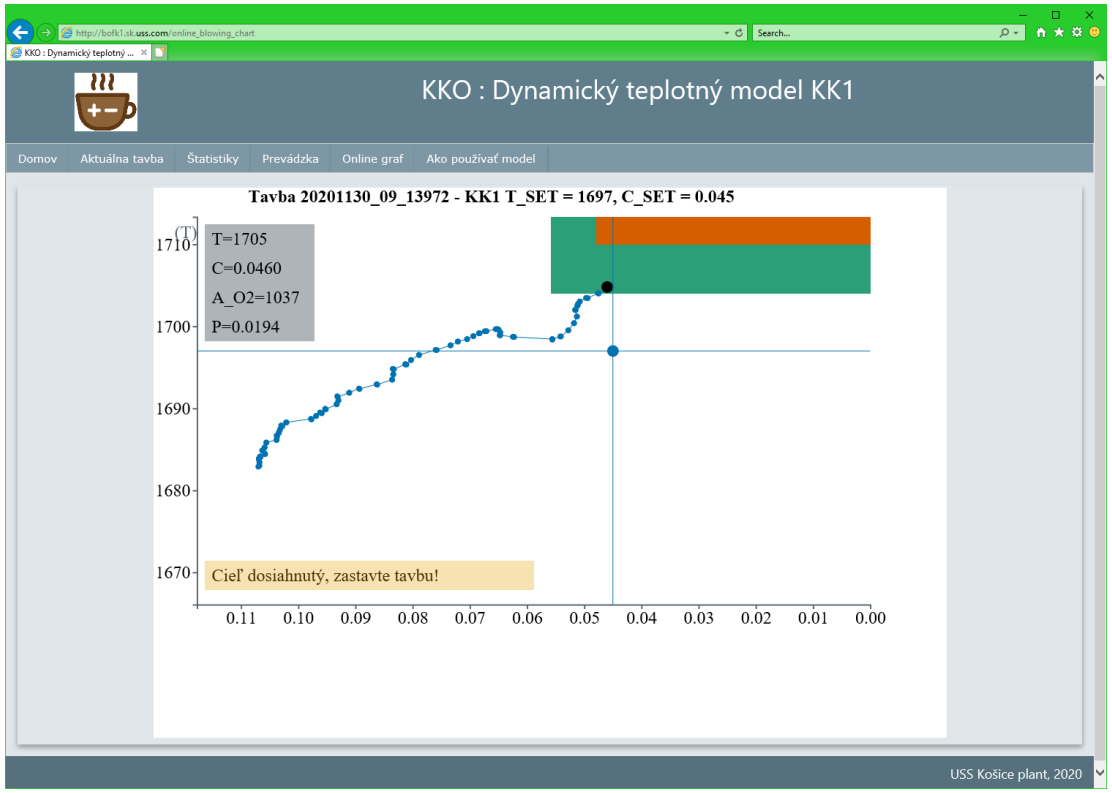
10 XGB models for each BOF vessel + drift correction model * 4 vessels making it **44 models** just for End Point Detection

Success story: Approach (continued)

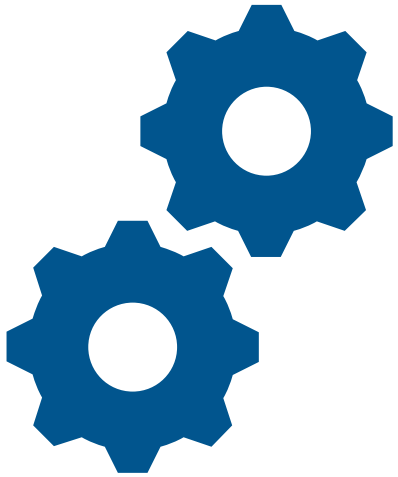


- 30 static data inputs and over **14 1/10s dynamic real time process control data** from sensors
- Models trained on over **2 years** worth of data

Success story: Result



Result: over 10% improvement in hitting the targets compared to result resulting in significant savings



Change is hard!

- **Operations** must be onboard and **believe**
- **Failure** is an **option**

Data is the new **gold**

- Collect and **store everything**
- **Know what you have** and make it available

It is not the same even if it looks the same

- Data shows differences, **even if everything is the same it is not the same**
- Everything changes over time, so **retraining** is needed on regular basis

Does not happen without the people and their expertise

- **On site time** is as important as data science skills

Make it stick

- **Leadership** is the key to success

Agile methods have a place in steel making, too

Our approach to Analytics: Program with multiple pillars

Aspiration

- Goals, cascade and timeline
- Target picture

Core team

- Required skills and capabilities
- Hiring and reskilling
- Training and development
- Career paths

Roadmap

- Intake system
- Prioritization
- Roadmap

Comms

- Internal
- External

Governance

- Cadence
- Link with USS (common infra, practices)
- Way of working (Agile)

Translators

- Academy
- Mindset shift
- Continuous improvement team

Ecosystem

- Schools
- Universities
- Suppliers

We are striving to be a

technology company

that just happens to make steel