

# Use Machine Learning to Optimize Steel Production

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# Industrial machine learning for factories

Current data analytics software struggles to solve the process improvement challenges facing modern industrial companies. Fero Labs was founded by a group of machine learning and industry experts to bridge this gap.

Steel manufacturers are particularly well-situated to benefit from Fero. In one of Europe's largest steel mills, Fero succeeded in **increasing the prediction accuracy** of a critical quality metric by **×1.5**. This allowed the mill to **reduce scrap rate** and **maximize production throughput**.

Significant improvement over existing data analysis techniques is only the beginning. Fero machine learning (ML) software automatically handles **complex and messy data** and **continually improves in accuracy** as more data flows into the software.

With Fero's easy-to-use ML software, factory personnel gain access to an adaptive data analytics toolbox to predict **production quality** issues, minimize **machine downtime**, identify **production bottlenecks**, and intelligently **schedule maintenance**.

Fero delivers an expected revenue increase of \$3.6M per year

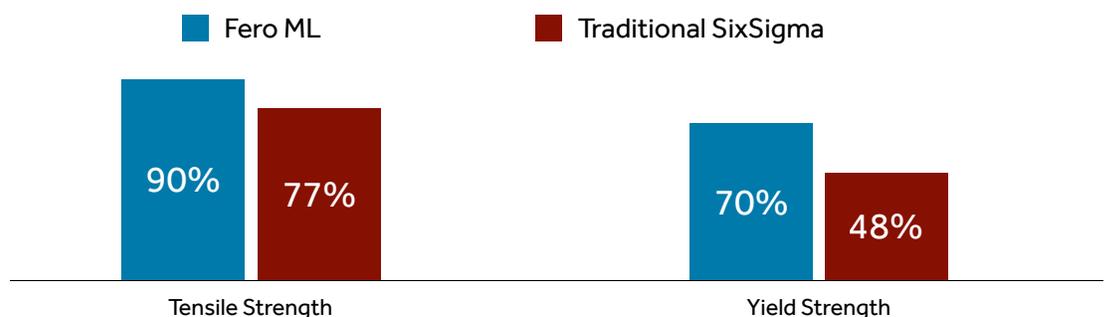
## OPPORTUNITY:

Steel plants track thousands of variables that affect the quality of their end product. **Manufacturers are under pressure to meet specific tensile and yield strengths.** Moreover, steel coils are often afflicted by mill scaling and crack defects. Manipulating this process is challenging. **Human workers, even domain experts, cannot possibly analyze all the data available.** Improving quality and reducing defect rates can generate **an additional \$3.6M in revenue** per year depending on production rates and capacity.

## FERO DIFFERENCE:

- Fero's state-of-the-art ML engine exhaustively explores **all possible combinations** of how factors affect quality metrics and defect types. It can **identify the primary factors** that are challenging to discover and model by hand.
- Fero's ML model predicts tensile strength with **90% accuracy**, and yield strength with **70% accuracy** (at 5% tolerance). This means that on average, for **80% of the coils**, Fero's predictions are within **5% of the true quality metrics**. Traditional SixSigma methods, such as robust linear regression, only attain an average 62.5% accuracy level. See Figure 1 below.

**Figure 1:** Fero ML prediction accuracy (blue) vs. a traditional SixSigma method: robust linear regression (red). All results indicate the percentage of coils where the predicted quality metric is within 5% tolerance of the actual measured metric.



## Fero benefits for steel

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Decreasing scrap rate directly reduces manufacturing costs. In addition to this, there are additional benefits to gain from Fero's ML software.

- Fero's state-of-the-art ML engine exhaustively explores **all possible combinations** of how variables affect quality. It can **identify the root cause** of defects that humans are unable to detect.
- Fero can predict the material properties of every coil of steel as it rolls off the hot mill. Plant engineers can immediately detect and **react to out-of-specification production**, thus reducing scrap rate.
- Fero can also **simulate new product mixes** and "what if?" scenarios. Our ML models have been shown to predict (at 5% tolerance) tensile strength with 90%, and yield strength with 70% accuracy.

## One of Europe's largest steel mills implements Fero

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Our customer, a large steel mill with **6 Mtpa of finished-product capacity**, has successfully applied Fero ML to one of their production lines. Fero was able to accurately identify the direct factors that contribute to key quality metrics and mill scaling. This gave our customer confidence in leveraging their data in a novel and effective way. Our customer now **run all their new campaigns in this production line through Fero's ML software** before actual implementation.

Success at this production line has raised the question: What else can be achieved with data from the rest of the steel mill? Fero is now exploring **over 15 additional use cases with this customer**.



## How is Fero different?

Since its inception, Fero has focused on creating value for heavy industries. Our **statistical machine learning (ML) models are different from classical ML and neural networks** in several ways.

	Fero Labs	Classical ML & Neural Networks
<b>Interpretable</b>	Our interpretable models <b>explain their predictions</b> , so you can identify the root cause of problems.	Classical models are typically black-box: they do not provide useful insights for process improvement.
<b>Confident</b>	Our probabilistic models always <b>output confidence intervals</b> with each prediction so you know when to trust them.	Classical models only output raw predictions, so engineers cannot reliably decide whether to trust predictions.

	Fero Labs	Traditional SixSigma
<b>Exhaustive</b>	Our models <b>process all your data at once</b> , including unstructured text fields, so that you can extract the most value.	SixSigma methods only use small subset of available data and are typically limited to numerical or categorical measurements.
<b>Adaptive</b>	Our models <b>continuously adapt to changes in the factory</b> by learning from recent data, thus providing up-to-date predictions.	SixSigma projects are done offline and have to be regularly repeated, which is time-consuming and expensive.

## Fero delivers bottom-line returns

There is much hyperbole around ML, so we want to guarantee value for our customers before we deploy our models. To that end, we start every engagement with a **Fero Pilot**.

During the pilot, we apply our ML models to your historical data, **without interfering with your day-to-day operations**. We grant unlimited access to our models and guide you to derive insights firsthand. We move on to a full deployment of our models only after their accuracy is verified. As Fero is a product rather than a consulting service, we encourage you to build new ML models for other use cases within your operations. You only pay for the models that attain good predictive accuracy for your use cases.

