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Manufacturing
Case Study

AUTOMOTIVE WHEELS OEM

COMPANY **OVERVIEW**

Our customer is one of the world's leading manufacturers of a wide range of high-quality, light-alloy wheels for premium vehicles. This global automotive OEM prides itself on excellence, innovation, adaptiveness, reliability, and the technical upskilling of its teams. Aligned with the new era of data-driven production, the company is also fully committed to eliminating manufacturing errors in the spirit of continuous improvement.

THE CASE FOR IMPROVEMENT—REDUCE 'HOT' SCRAP AND X-RAY SCRAP OF MANUFACTURED WHEELS

DataProphet PRESCRIBE—our flagship AI-driven process optimization solution—was deployed at this automotive OEM to reduce scrap produced during its light-alloy wheel manufacturing process.

'Hot' (i.e., visual) scrap—from manual inspection of wheels just out of the casting furnace—constituted the bulk of casting defects for this automotive OEM. Reducing them would mean significant savings from needless value-adding to a product that would later fail downstream inspection.

Subsequently, the wheel maker determined that X-ray scrap further down the line also warranted scrap reduction. Therefore, DataProphet agreed to target the reduction of both "hot" and X-ray scrap with PRESCRIBE.

PRODUCT **TRACEABILITY CONSIDERATIONS**

After some discussion and analysis of the customer's data infrastructure, we found that the plant's product traceability system was not yet contiguous enough (i.e., through the heat treatment, machining and painting stages) for PRESCRIBE to guarantee unique product identification end-to-end.

For this reason, it was agreed to focus on two wheel types with a view to optimizing the casting stage only, as opposed to optimizing for the entire wheel-making process.

Projected ROI of 10x
their initial investment over a 2-year period

OUR SOLUTION—AUTOMATING THE UPDATE LOOP FOR **CONTINUOUS IMPROVEMENT**

Every factory runs according to a control plan. Meeting and exceeding KPIs for production (especially those pertaining to rolled throughput yield from shift to shift) usually involves adjustments to this control plan. Traditionally, however, these adjustments necessitate time-intensive expert analysis of data. And yet, such analysis is heavily constrained by a human's inability to factor in the combined effect on a production outcome of hundreds of parameters impacting a manufacturing process.

DataProphet PRESCRIBE is an expert execution system (EES) that continuously ingests raw production data from multiple sources in a factory. Parsed information then feeds into an AI model capable of taking in hundreds of millions of measurements in a single implementation. In processing the data, the system accounts for the complex, non-linear interdependencies that underpin the targeted manufacturing process.

More specifically, PRESCRIBE correlates the following:

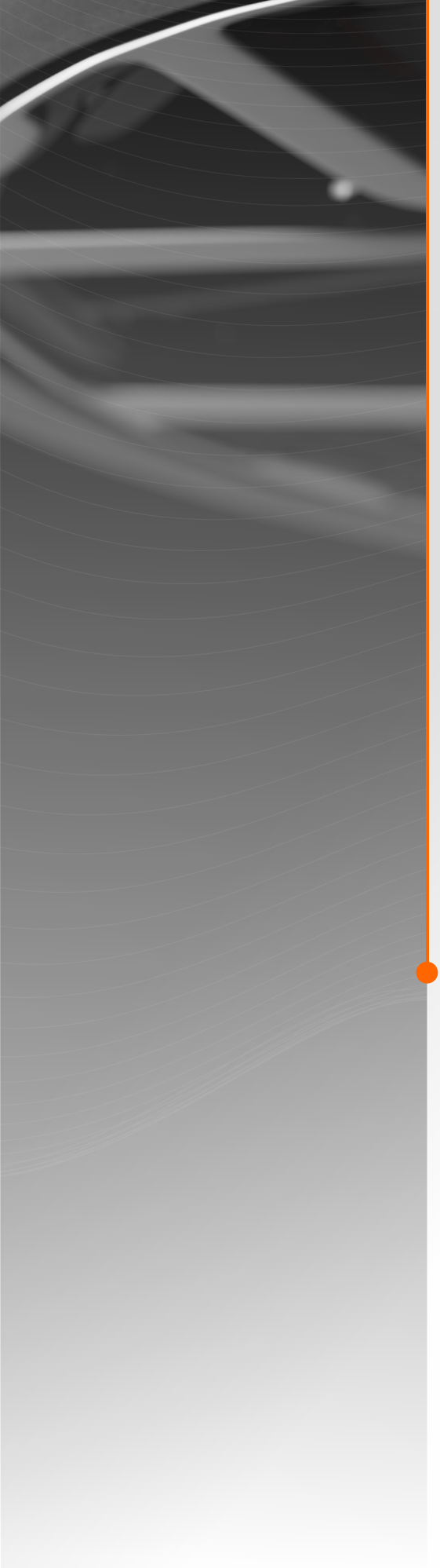
- historical production data (indicating where a product's line has historically produced the best results).
- the current production state.

This high-level insight allows deep learning discovery to identify the next-best stable operating region. Prescriptions can then be delivered for an optimal recipe, allowing for lower and upper limits of the controllable parameter/s in question.

By overlaying historical and actual quality and process data, PRESCRIBE's model works to automate the update loop of the control plan for continuous improvement. What this looks like for operators is a prioritized list of easily actionable prescriptions timeously delivered to a dashboard.

Enacting the prescriptions moves production closer to its best-of-best (BOB) operating region.

dataprophet PRESCRIBE



COLLABORATING WITH THE CUSTOMER AROUND PROCESS AND **QUALITY DATA CRITICAL TO OPTIMIZATION**

For this customer, machine set point (i.e., 'recipe') adjustments would be sent to operators on the casting furnaces for them to apply—to measurably improve line control and enhance yield on two agreed wheel types.

To this end, DataProphet built a data collection system that enabled high-resolution monitoring and contextualization of process data and quality data (linked to the controllable parameters deemed by our prescriptive AI to have the highest impact on scrap reduction).

Namely, we trained the AI model to generate pre-emptive prescriptions falling within an optimal process envelope for the following parameters:

- Furnace pressure
- Die temperature
- ON/OFF times of cooling channels in the die
- Metal temperature
- Metal fill-up temperature

THE **AGREED BENCHMARK**

Prior to implementation, the DataProphet team aligned with the customer around how to measure the success of the PRESCRIBE deployment. It would be determined via a commissioning test, during which the following needed to be achieved:

- ≥ 80% compliance from factory operators with DataProphet's prescriptions.
- A prescription compliance increase as compared with historical performance.
- Assuming full compliance—a combined defect rate reduction of between 25% and 30%.

CONTEXTUAL **REFINEMENTS**

FOR **MANUAL LOGGING OF SCRAP**

A first-in-first-out (FIFO) quality data collection protocol can be relatively straightforward if automated. However, in advanced manufacturing, operators may still need to log some scrap manually; under the pressure of daily production troubleshooting across several machines, this may expose the line to a discrepancy between shift timestamps and the timestamps of logged defects. Adhering to the temporal accuracy required for traceable logging depends on an easily applied protocol. On this point, DataProphet collaborated with the customer to simplify and standardize the manual logging process, thus facilitating near one-to-one wheel traceability.

FOR DYNAMIC REFLECTION OF **CONTROLLABLE PROCESS PARAMETERS**

In automotive wheel manufacturing, controlling the die temperature is not as simple as adjusting the metal temperature. Instead, what controls the die temperature is the attached cooling channels (as they open and close at different points in the casting cycle). After discussion with operators, process data for the respective cooling channels' dynamic ON/OFF timing was collected in addition to the overall die temperature profile—this informed a refined (i.e., highly accurate) set of prescriptions for the AI model to generate.

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THE RESULTS

During the commissioning test, factory operators adhered to the critically important compliance level of 80+% for one of the two targeted wheels. These adjustments to the control plan resulted in consistently high performance and measurably conclusive results for the targeted product.

TO BE EXACT, DATAPROPHET PRESCRIBE REDUCED PRODUCTION SCRAP BY **29% ON THIS WHEEL.**

Furthermore, extrapolating this result to all products and furnaces at the site would result in:

ROI of 10x their initial investment over a 2-year period.

A production **volume increase of 2.4%.**

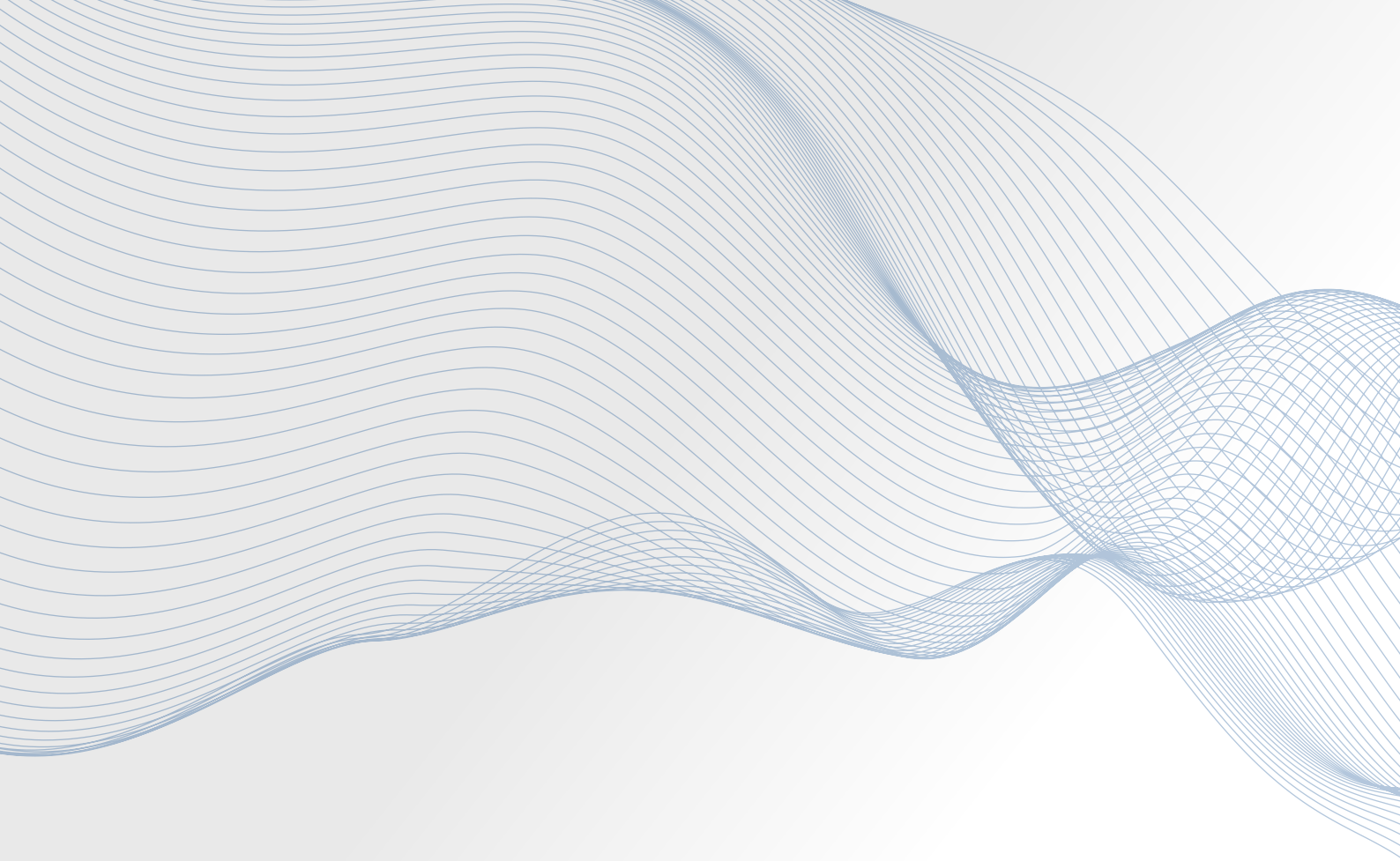
PRACTICAL CONSIDERATIONS **AND OPPORTUNITIES GOING FORWARD**

In addition to the scrap rate reduction, the data discovery journey itself added significant value to the plant's standard operating procedure by revealing critical areas for improvement in data logging across the production line. This was achieved by:

1. **REFINING THE DATA**
2. **IMPROVING LOGGING RESOLUTION**
3. **LOGGING OF ADDITIONAL PARAMETERS**
4. **IMPLEMENTING A MORE TRACEABLE AND RELIABLE METHOD OF RECORDING VISUAL SCRAP.**

In conclusion, the improvement in data integrity (realized as a necessity for DataProphet PRESCRIBE) will enable this wheel manufacturing OEM to achieve further Digital Maturity goals and even greater control over production processes.

The success of the first iteration of this project also offers great promise for scaling future cost-saving and scrap reduction opportunities—across more casting furnaces and for a broader range of wheel- and die types.



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