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MANUFACTURING CASE STUDY

Our client is one of the largest foundries in the Southern Hemisphere. They manufacture and supply large diesel engine blocks to Daimler AG, producing 130,000 engine blocks annually.

Use Case

Predicting engine block defects and identifying high yield operating regions.

Industry

Manufacturing

Challenges

— High scrap rate
— High rework rate
— High cost

Solution

— Predictive model to identify engine blocks that would go on to be defective.
— Prescriptive model to identify high yield operation region.
— Computer vision model to improve QC inspection on sub-surface defects.

Results

— Halved scrap rate in the first month of deployment.
— 0% external scrap rate within three months (first time ever).

The challenge

The manufacturing sector, just like any other, faces serious challenges with global competition, local costs, cheap imports and productivity concerning local businesses within the sector. Economies are going through a period of great turbulence, affected by the global financial crisis and the resulting consequences.

Most sector players face similar challenges, increased costs for raw materials are squeezing margins and unless offset by pricing and surcharge increases, manufacturing companies are being strangled.

Companies are also now adapting the concept of Corporate Social Responsibility (CSR). While making any decisions, they also have to keep in mind the effects of it on the society and environment which restricts them in certain ways of manufacturing because of the emissions and waste generation. Manufacturers now need to use sustainable engineering strategies to step further ahead to compete with other competitors or it may lead to decline in their brand reputation more than the harm it may cause to environment.

With such challenges plaguing the sector as a whole, our client wanted to find a way to optimize their manufacturing process and reduce costs whilst doing so. They were experiencing very high costs due to shipping of defective engine blocks, high internal and external scrap rates and long delays in the manufacturing process due to rework. In a process whereby defects arise through no operational fault, the main challenge was how to reduce such unforeseeable costs.

"I have been using your prescriptive reports to make small calculated adjustments to our system.

The norm for us is 5-6% internal scrap and 10-15% rework. Over a 2 day period we managed to achieve 1% internal scrap and 8% rework.

In the past we have been able to achieve similar results, but we had absolutely no clue what we did to achieve the good result. This time round we have a fairly good idea of what we did to achieve the result.

Thanks for your tremdous efforts and help to take us to the next level."

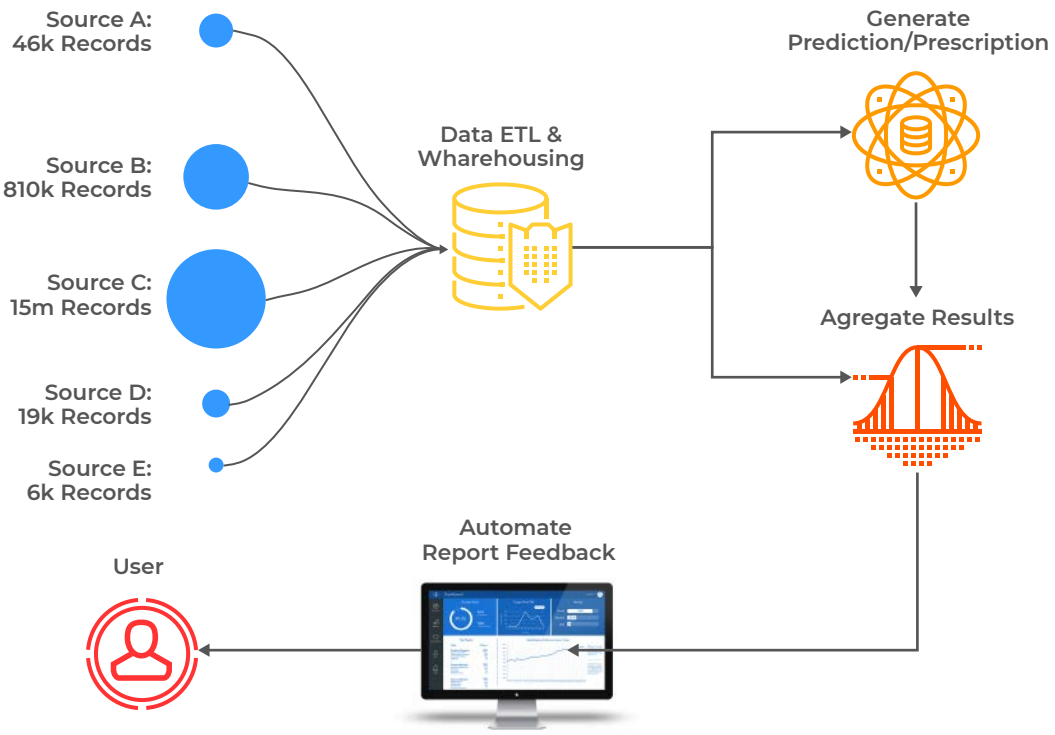
— CHIEF EXECUTIVE OFFICER

The solution

The solution deployed was DataProphet PRESCRIBE which utilizes advanced form of supervised and unsupervised machine learning to automatically discover the optimal operating regime for complex, multi-step, industrial processes.

When we started, there was so much data disparity, with the data siloed in different parts of the organization which made it difficult to apply any machine learning capabilities. To that effect, DataProphet started off with a process of data ETL and warehousing of that data across the whole group. The data was obtained from various owners within different business units, in various formats that included excel files, access DB data and CSV data sources. This data was brought into a single view that included 15 months historic production data with 173,000 records and 122,000 unique features.

This data would then go on to be fed into the predictive algorithm in an automated front end interactive web-based dashboard with a report feedback to the users as shown below:



System Location Agnostic

Can locate anywhere
AWS recommended

Module Based Architecture

Communication through RESTful API

Microsoft Azure

amazon web services

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The implementation

DataProphet then went on to develop and deploy a predictive and prescriptive solution powered by state of the art machine learning algorithms to identify engine blocks that would go on to be defective, and also identifying the optimum operating regions for maximum yield with variable process parameters. The solution delivers on three fronts:

About us

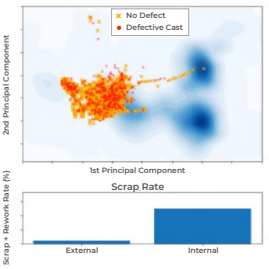
DataProphet is a global leader in Artificial Intelligence (AI) for manufacturing. Our award winning technology embeds unique adaptations and advancements of deep learning, enabling AI to have a significant, practical, impact on the factory floor. DataProphet's solutions are built to be adapted and integrated into existing environments, making it possible for our digital transformation team to take your operations from zero to AI. We understand manufacturing and that real impact is achieved with pre-emptive actions because real-time is often too late.

DataProphet PRESCRIBE

Using only the production process data, DataProphet predicts the most likely defect locations for given process variable values. The defects are always reported per physical location on the castings.

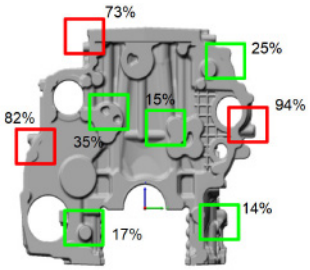
PRESCRIBE saved ~2% of total business costs - without any process changes!

Identifying a desirable operating region and generate an understanding of how key process variables differ as a function of yield regions. This would show clear progression across the Principal Component Analysis (PCA) space over time, with surface visualisation of good vs. bad for key variables.



DataProphet INSPECT

Using region based convolutional neural networks upon your finished products, improve QC inspection tasks by looking for subsurface defects that occur most commonly in the client's products.



The Results

For the first time in the history of the company, the client has achieved a 0% external scrap rate. They did not ship a single defective casting meaning no additional cost of returning and also very satisfied customers.

They have had a significant improvement in their QC inspections, faster and more efficient on every product all the time. This means that the additional human element that would have had to perform the tasks manually can now be deployed elsewhere within the factory.

Since deploying DataProphet's Artificial Intelligence Suite, the client has gone on to save millions of rands per month every month, meaning a significant improvement on their bottom line.