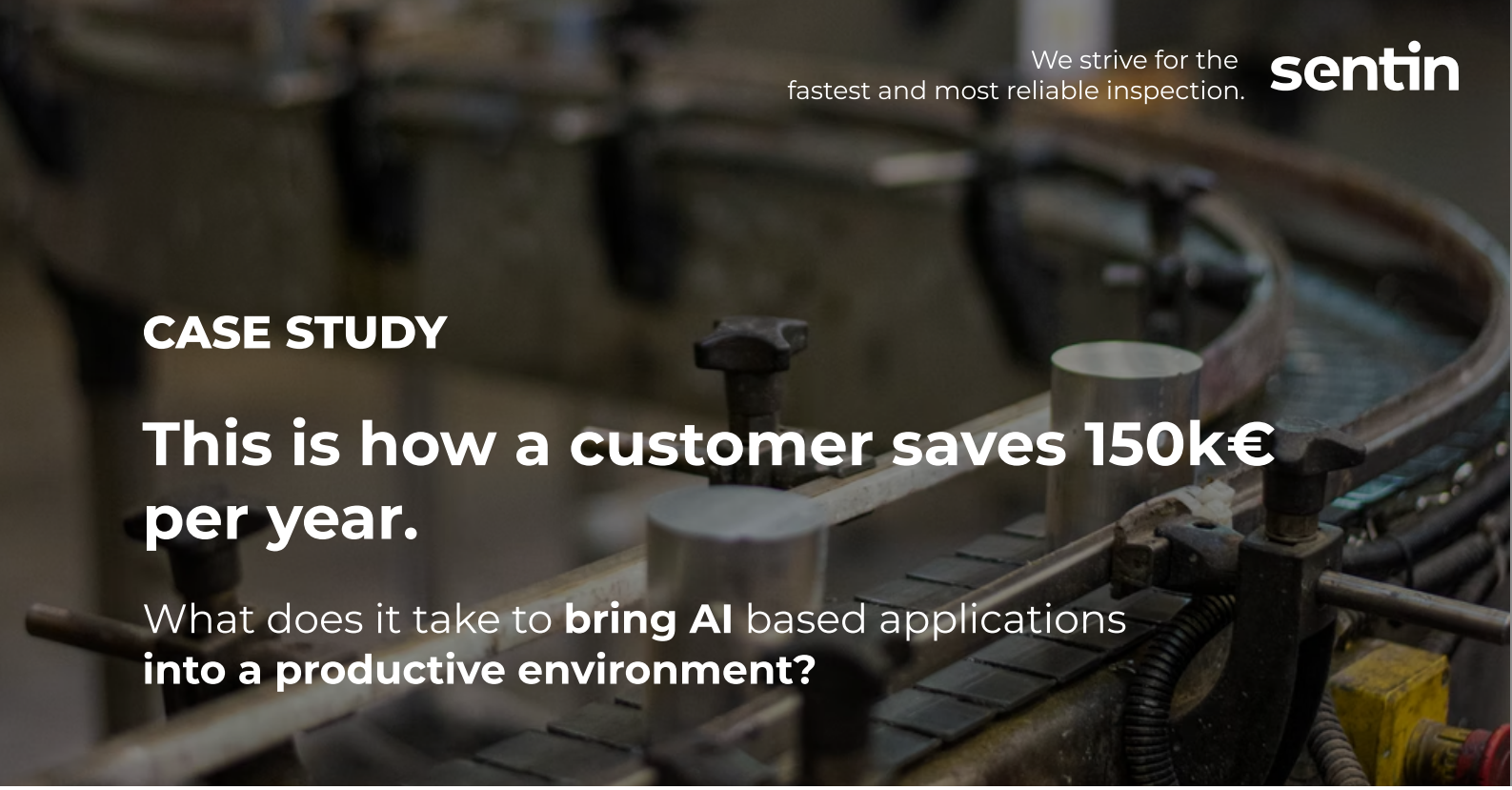


We strive for the
fastest and most reliable inspection.

sentin

CASE STUDY

This is how a customer saves 150k€ per year.

What does it take to **bring AI** based applications **into a productive environment?**

MOTIVATION

The scope of the project was to **improve an existing Machine Vision System**. The system currently in use was running a rule-based algorithm, applying different rules for every defect type and sorting out defective parts.

However, the inspection process needed improvement. The two main pain points for the customer were **too high scrap rates 10% (50% pseudo scrap) and too much downtime**, because a technician had to adjust the parameters of the system regularly.

Therefore, the rule-based algorithm should be replaced by an AI-based application.
Given that the system in question is part of a high frequency manufacturing process producing more than **100,000 parts per day**, improvements would mean six-figure annual savings for the customer.

REQUIREMENTS & GOAL

The AI approach was required to run in an **LabView environment** with the existing hardware. The aim was to run an AI model that can support the high-volume production of a **400ms cycle time (200ms evaluations time)** and reduce the pseudo scrap rate (false-positive).

> 10% SCRAP
(50% PSEUDO SCRAP)

BRING DOWN TO 5%
(XXX.000€/YEAR SAVINGS)

< 200 MS
EVALUATION TIME

400 IMAGES
DEFECT / OK

DEVELOPMENT CYCLES

To kick-off the development of the specific AI model the customer provided us with **400 images.** About 200 examples for good parts and 200 for defect parts. The provided images were directly exported from the current system. Any falsely classified images by the system were **corrected by an employee from quality assurance**. This quality gate for the data was necessary to assure that the training data was labelled 100% correctly. Otherwise, the AI would copy the performance of the existing system.

For an easy and fast **data exchange a cloud storage** solution was put into place. The customer simply sorted and uploaded the images into the provided folder structure (“ok” & “defect”).

With the first data set we then trained several AI models, optimized parameters, compared statistics and selected the most promising model as replacement candidate. First results on the test data were **promising with 90% accuracy.**

CASE STUDY

WHAT DOES IT TAKE TO BRING AI BASED APPLICATIONS INTO A PRODUCTIVE ENVIRONMENT?

However, after integrating the AI model into the existing manufacturing environment and **running it in parallel to the rule-based algorithm**, performance validation showed that the requirements of <5% pseudo scrap was not met.

We concluded that the model was **not robust enough to cover domain shifts** (systematically image shifts like contrast) and other influences like dirt and unsharp images. To tackle this issue, we implemented a **preprocessing based on edge detection** and adapted the **augmentation strategy** for the AI training - augmentation means generated changes in the training data to be more robust like rotation or scaling.

Via a remote access the updated model version was again implemented into the existing system to start a 2nd validation run. Whilst the environmental influences like dirt and domain shifts were no longer a problem, the test run revealed, that the algorithm was not detecting all types of defects sufficiently. The study of the validation and training data showed, that due to **new defect types**, that were not included in the initial 400 images, the algorithm failed to detect certain defects.

In order to cover all defect types that may occur, a second more comprehensive image acquisition campaign was launched. To create a more diverse data set, about **50 images of defective parts were collected daily over a time period of several weeks**. With this strategy, we were able to feed more data into the model training and improve the robustness and accuracy once again.

~150K €/YEAR SAVINGS

2.5% PSEUDO SCRAP

VALIDATION & INTEGRATION

After the final adaptions the customer ran a **full validation over the course of several days** - meaning that quality assurance inspected all evaluated parts by hand to cross check the AI's decision. The results from the manual validation and the statistics have shown that the set-out objective to bring the pseudo scrap rate under 5 % were met.

Following the successful test run the AI-based system was put into live production and is reliably helping our customer to **realize annual savings in the six-figure range.**

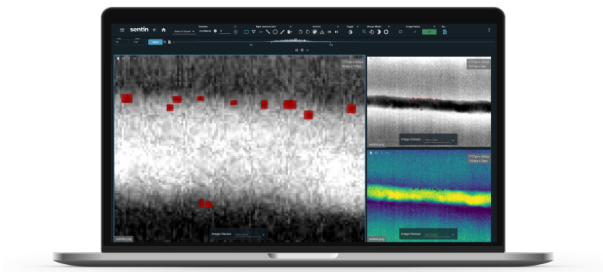
HOW YOU CAN START?

The most common way to deploy an AI solution with us is this:

Collect information & data e.g. with the checklist from our website.

Setup project: we develop a first AI solution for you and integrate it into sentin EXPLORER.

Continuous improvement of the model and usage in the sentin EXPLORER and its AI engine.



How fast can you count the porosities?
A human alone takes about 10-15 seconds. With a computer it takes less than a second.

HOW CAN WE HELP YOU?

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We strive for the fastest and most reliable inspection.

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