



A method to strategically pre-process data from industrial processes before storage and analysis

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Key Figures 2021



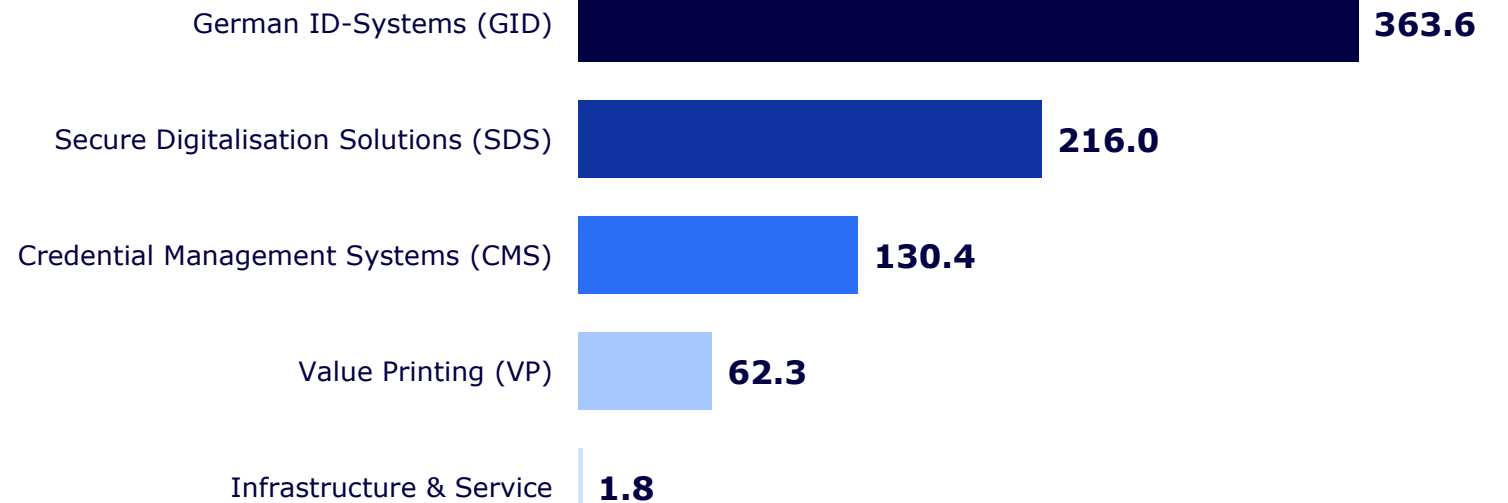
4,200
Patents



3,500
Employees



774.0
Sales in EUR million



Official IDs

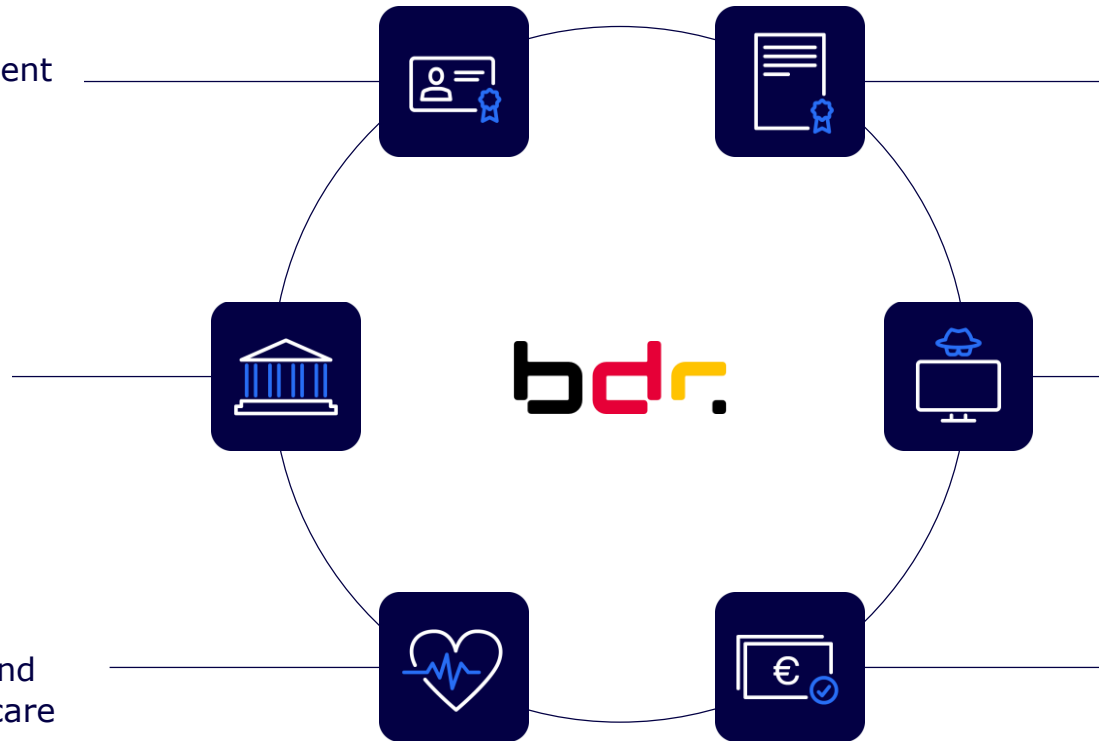
Secure official identities and pertinent documents (physical and digital), systems and processes.

eGovernment

Products and systems for secure and trusted digitalization of the public administration.

Health

Products and systems for secure and trusted digitalization of the healthcare system.



Security documents

Official security documents, such as banknotes, postage stamps, tax stamps and the pertinent security features.

High security

Digital products and solutions for security authorities and organizations with higher security requirements.

Finance

Products and systems to control and secure financial transactions in both the public and enterprise sector. (Taxes, banks, insurance, etc.)

Case Study

Document

- German passport.
- Used for the purpose of international travel.
- Expiration: 10 years.
- Complex document.

Process

- Punching process.
- A good process understanding is available.
- The access data from the PLC is possible.

Objective

- Product quality assurance by predictive knowledge of the tool wear state.
- Minimization of machine downtimes.
- Basis for analyzing the long-term behavior of the process.

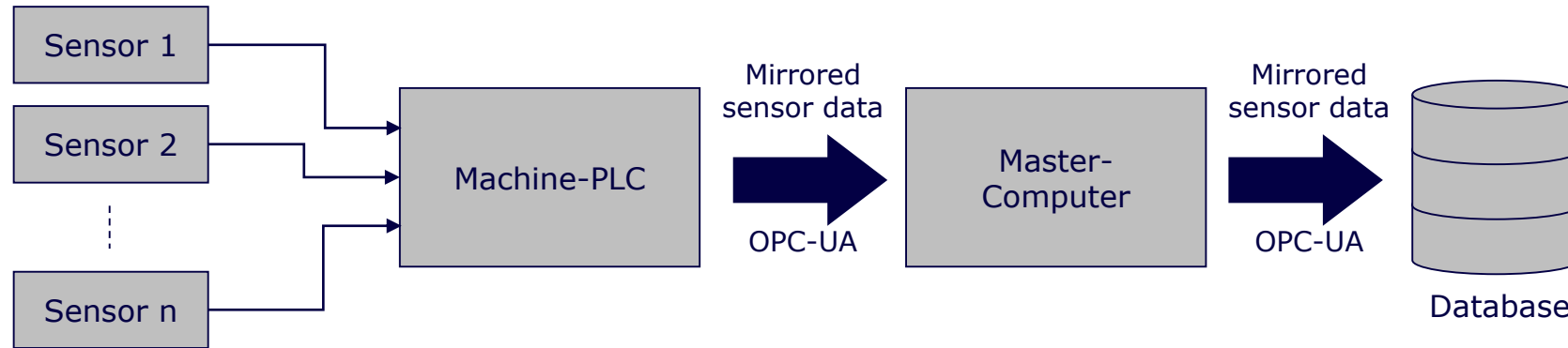


Product and process

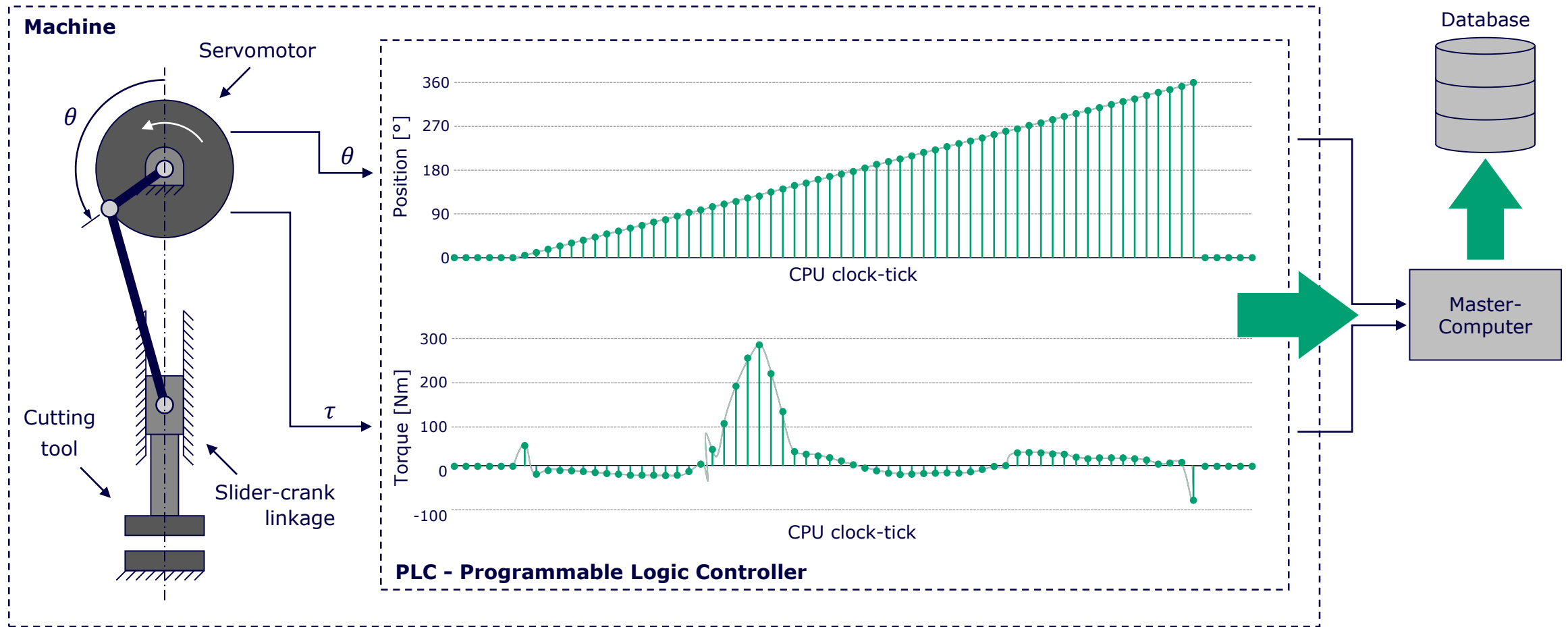


Data handling architecture

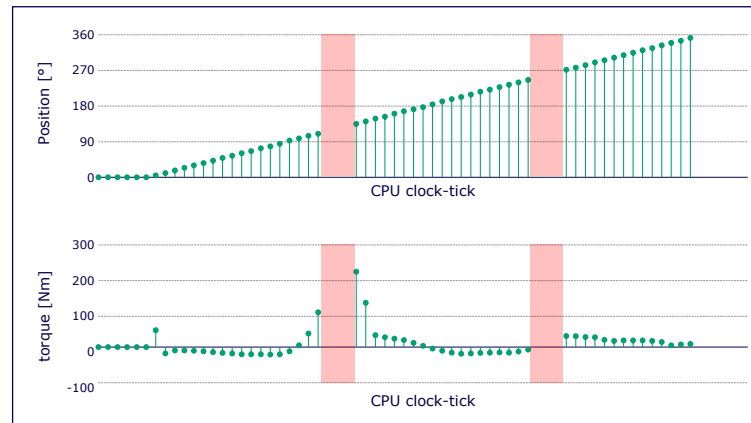
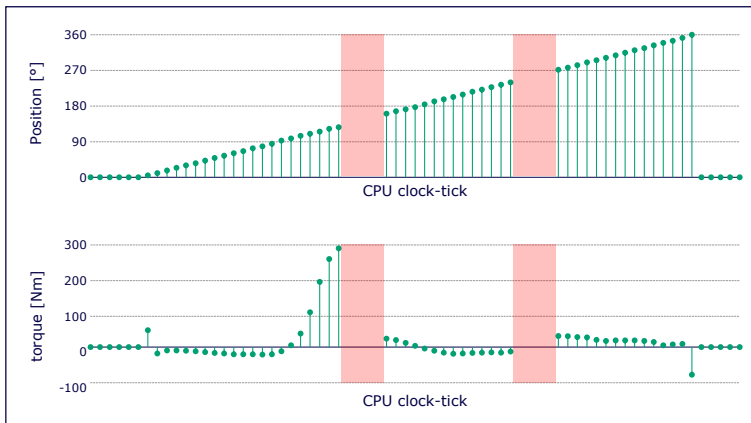
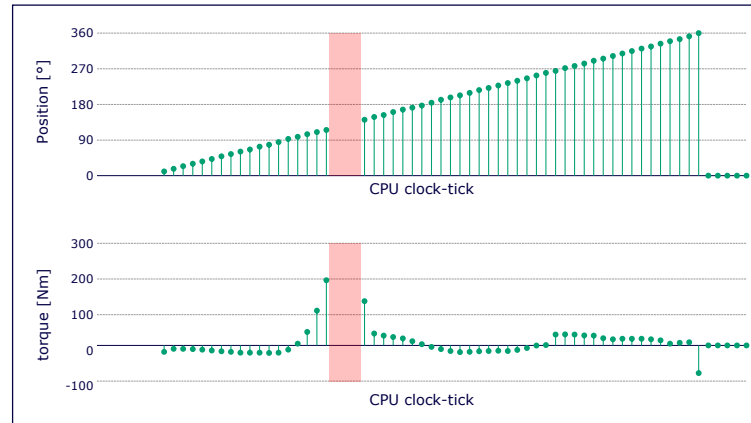
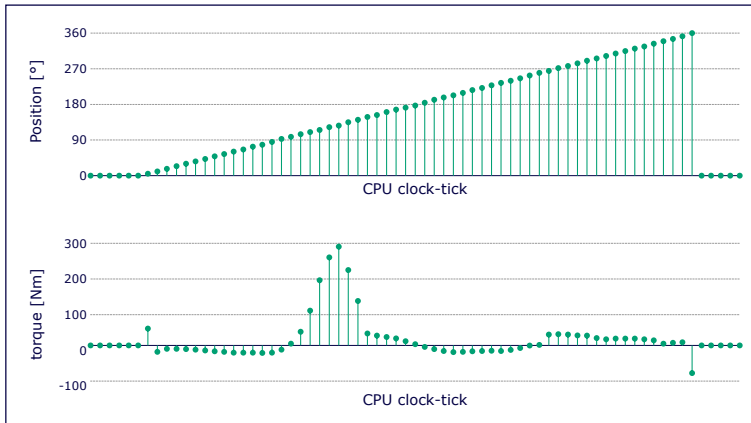
Original implementation



Original PLC implementation



Original implementation and its challenges



Results

Using the OPC-UA architecture with a 100Hz sampling rate, around 5% of the data is not transferred from the PLC to the database.

Even with only around 95% of the data, it is required a large storage in the database.

Using the original implementation, the tool wearing monitoring is compromised.

Open questions

- Is it possible to reliably measure the tool wear using the motor torque?
- How to reduce the amount of useless data transferred to the server and stored in the database?

Experiment and locally collected data

Overview of the experiment

Using the PLC measuring application to collect data from several machine cycles, four scenarios were tested:

Old and worn tool cutting a passport with **32 pages**.

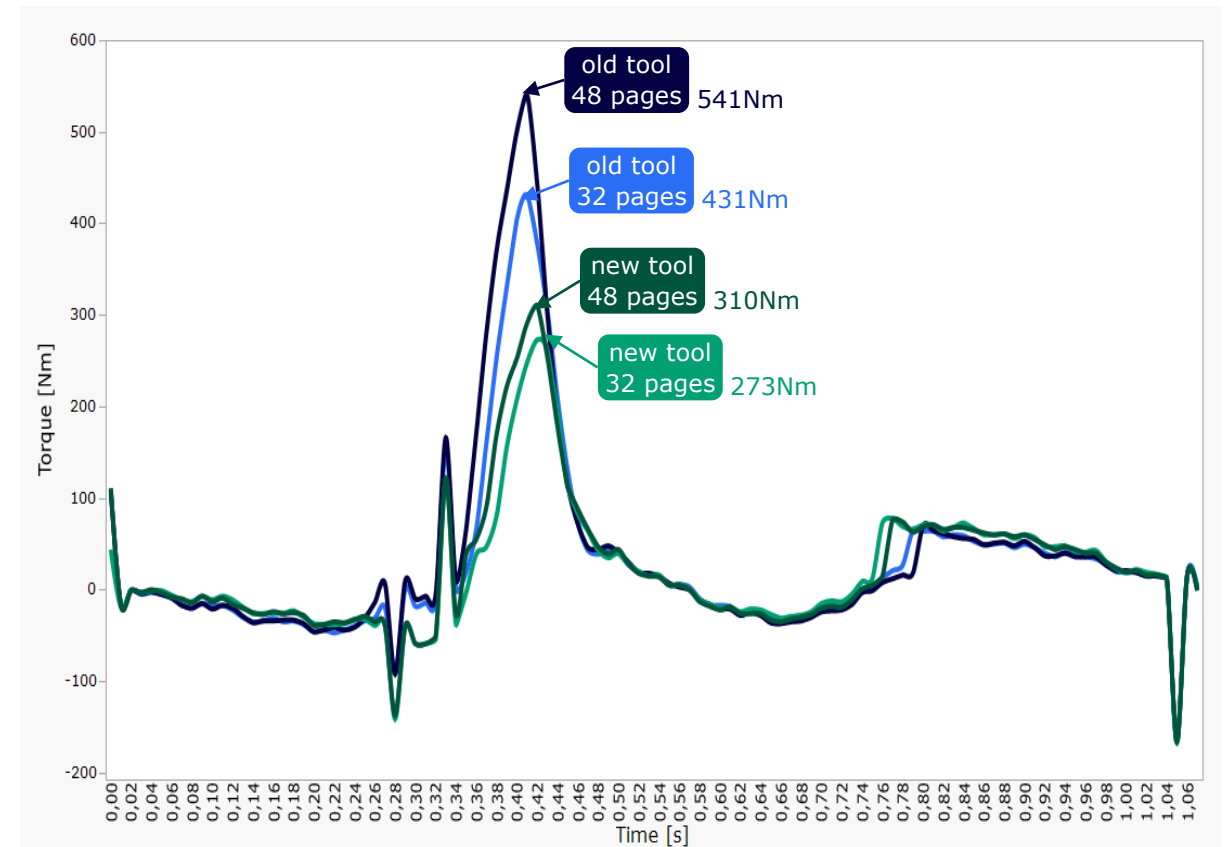
Old and worn tool cutting a passport with **48 pages**.

New and sharp tool cutting a passport with **32 pages**.

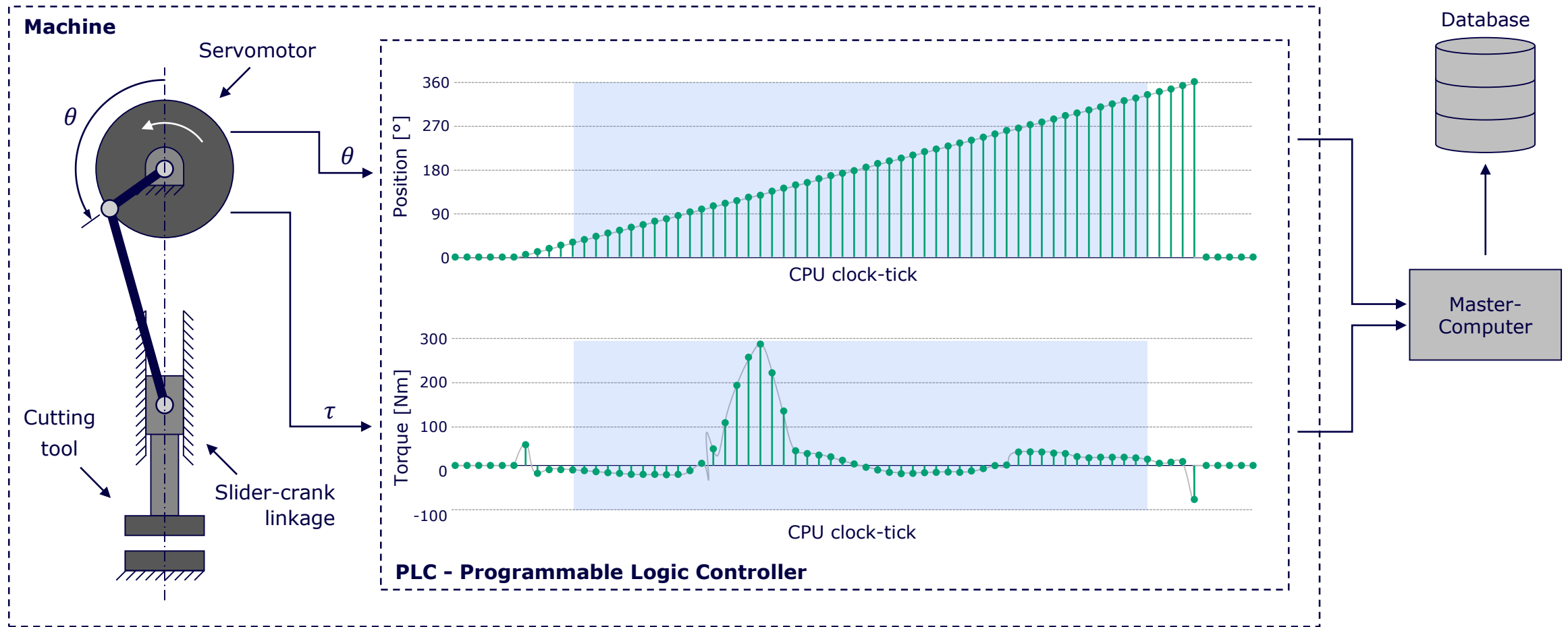
New and sharp tool cutting a passport with **48 pages**.

Analyze

- All the scenarios presented the same shape of the curve.
- Only the peak value could be used, instead of the whole machine cycle data.
- The peak value of the curve could be used for:
 - Tool wear monitoring.
 - Product classification (32 or 48 pages).

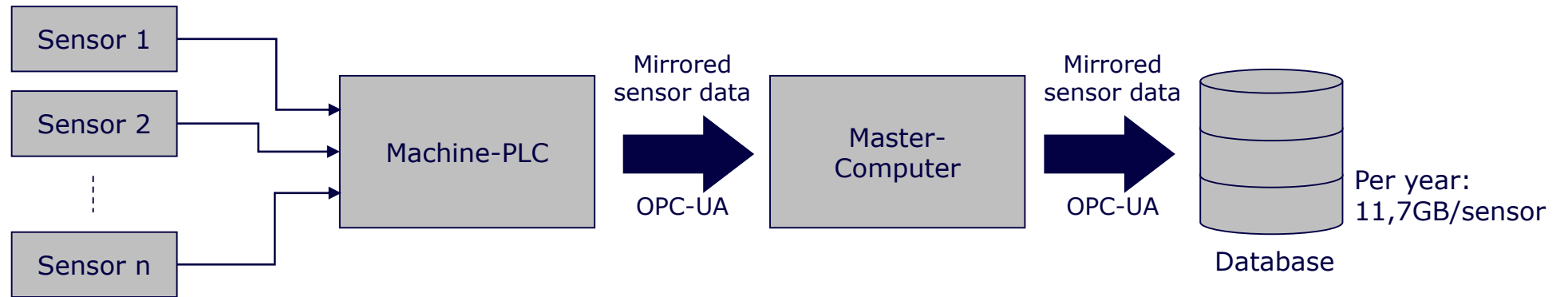


Proposed PLC implementation

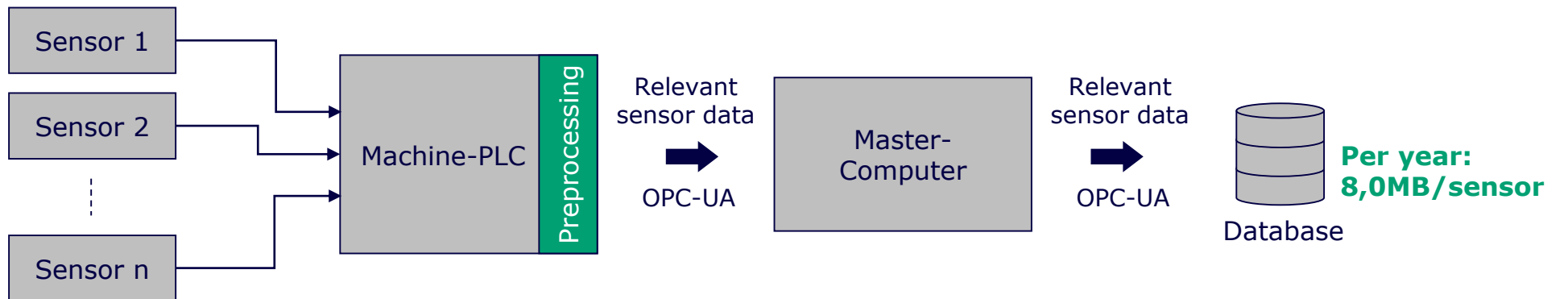


Data handling architecture

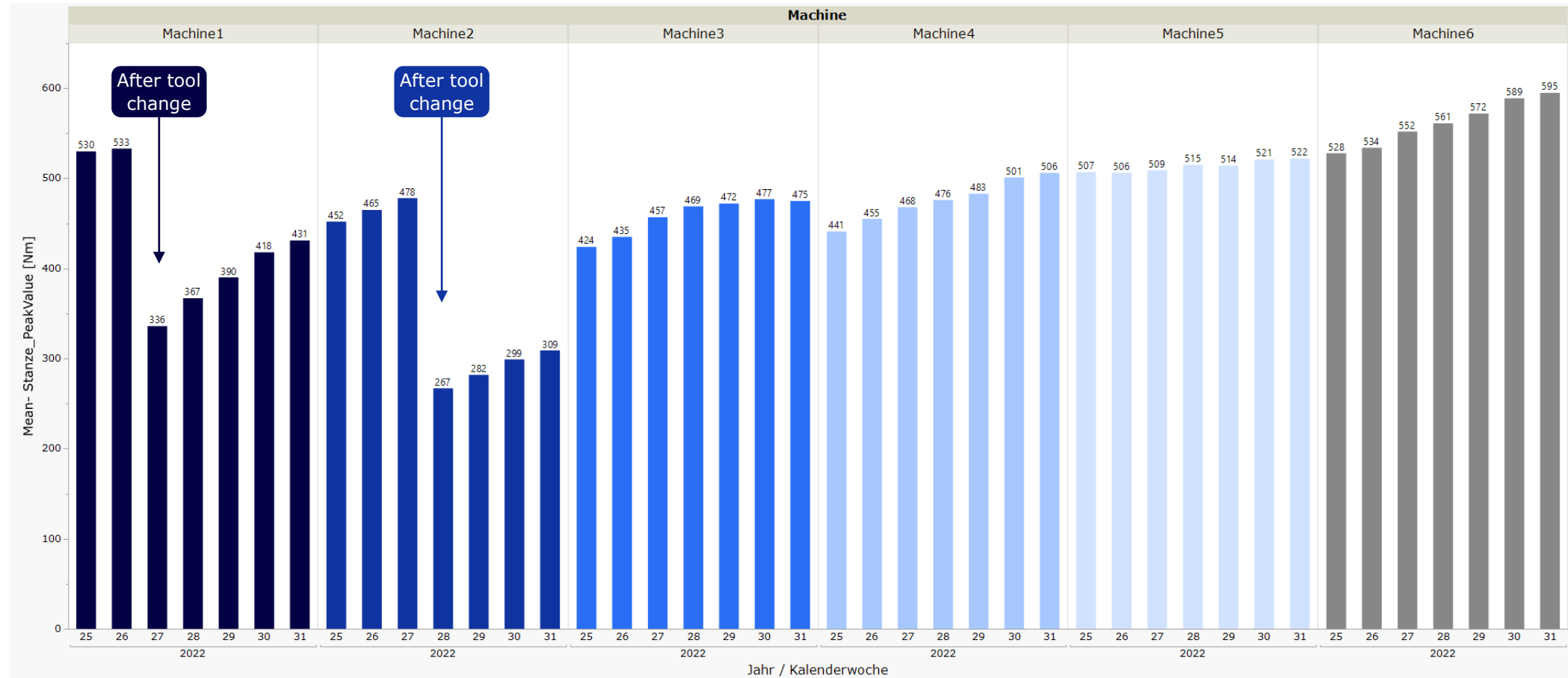
Original implementation



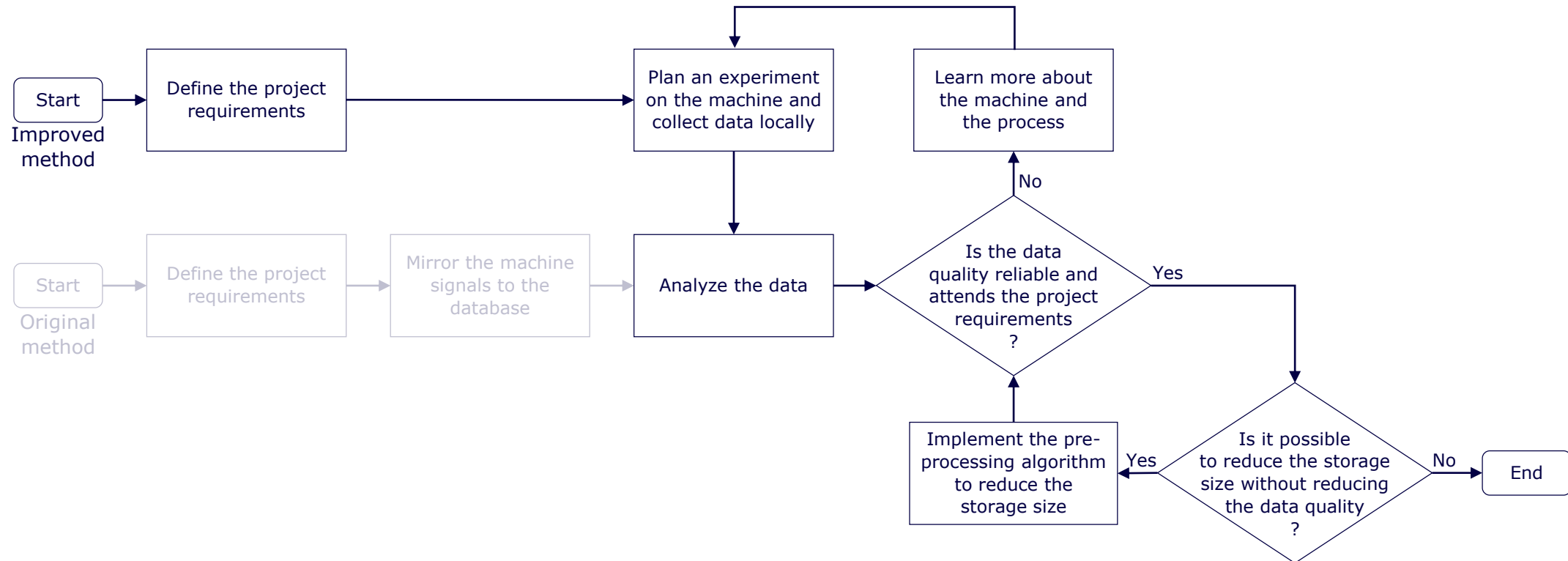
Proposed implementation



Example of a weekly machine report



The proposed method



Summary and outlook

Lessons Learned / Benefit

Lessons Learned

- Application-oriented approach necessary.
- Deep process and machine understanding extremely important.

Benefit

- Reproducible method for other machines and processes.
- Portability to variety of pushing processes in production.
- Knowledge of the tool wear state.
- Machine downtime reduction and consequently cost reduction.
- Basis for analyzing the long-term behavior of tools.
- Data storage improvement due pre-processing.



Thank you.

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