# Dealing with Big Data in injection moulding

6. F&E-Konferenz zu Industrie 4.0

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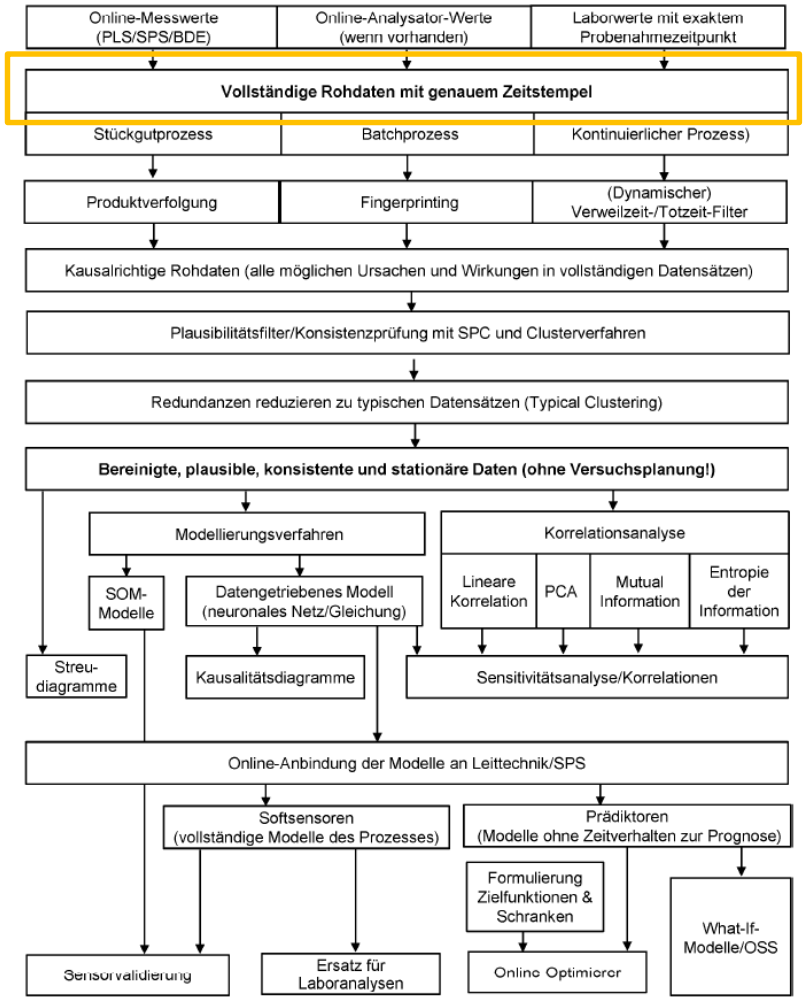
# Digitalization in injection moulding

- To implement Industry 4.0 in injection moulding companies, data must be collected, analyzed and also predicted.
- Inevitably, the term "big data" cannot be ignored. Big data is a term that has already been around for a few years, but continues to attract a great deal of attention with regard to various aspects.
- Questions that injection moulding companies are getting in touch with:
  - How can I use my data?
  - How can I increase my added value through data?
  - What exact examples are there and how can I learn from them?

- Todays opportunities continue to be underused, but this is not always necessarily due to a lack of ideas for the use of data.

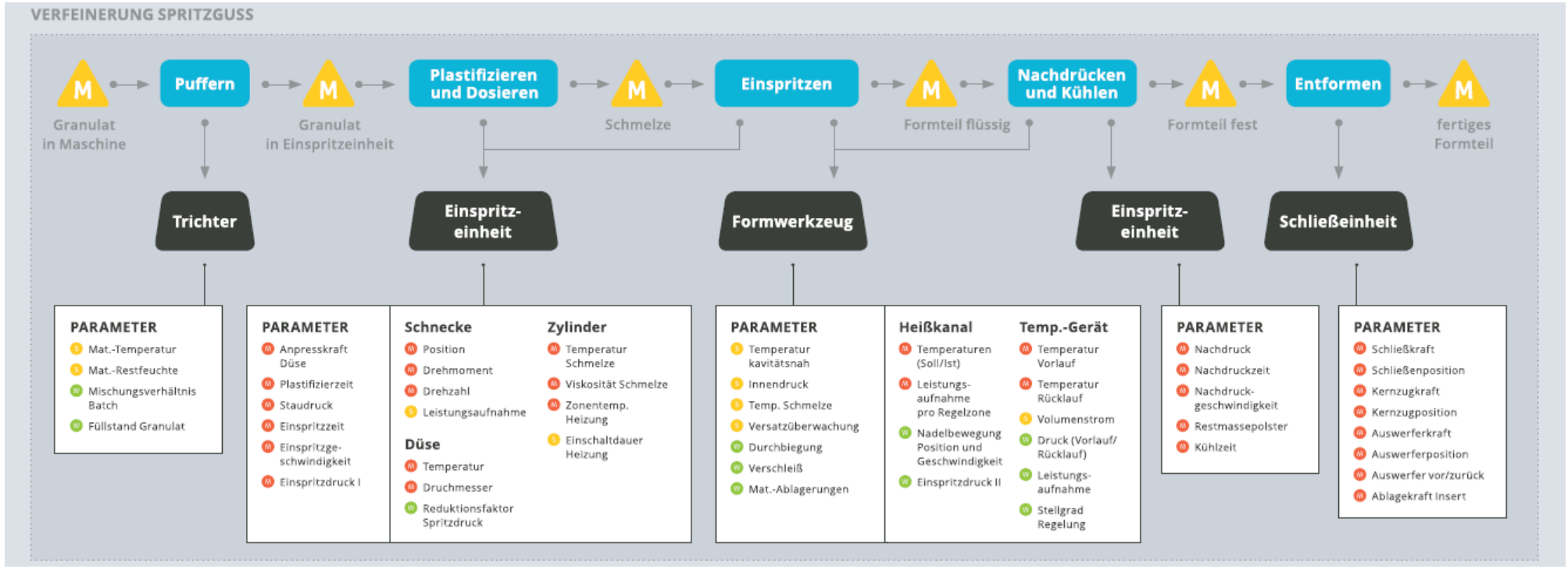
# Data analysis workflow




Quelle: VDI-Statusreport – Chancen mit Big Data Best Practice

- Some of the possibilities for data analysis are shown in the adjacent flow chart.
- However, the first stumbling block is usually already the database. Problems that arise:
  - What data do I need?
  - Is the data available in sufficient quality? What data quality do I need at all?
  - How do I get the data out of my machine?
  - How do I synchronise data from different machines and devices?
- The development of a data acquisition system for several injection moulding machines at the IWK serves as an example for the existing challenges.
  - Different injection moulding machines (Krauss Maffei, Engel, Arburg, Fanuc, Battenfeld)
  - Different data storage solutions (Database, Cloud)

# Which data do I need? - Injection moulding process database




Quelle: VDI-Statusreport – Industrie 4.0 in Spritzgießunternehmen

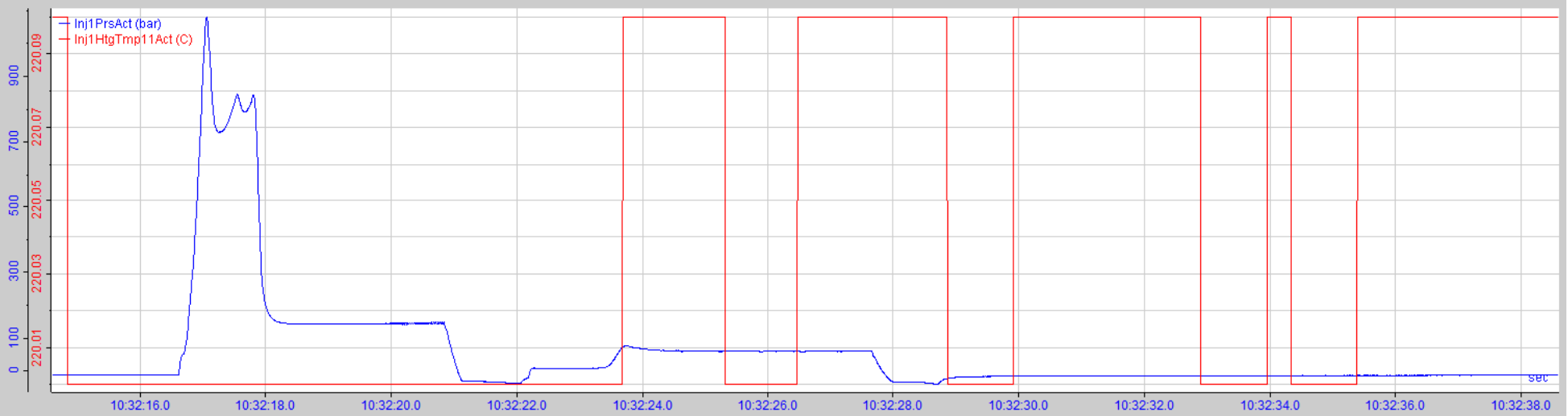
**VDI-PROZESS-MODELL**
SPRITZGUSS

LEGENDE

- **Prozessschritt** technologischer Teilschritt der Prozess-kette
- **Input-/Outputobjekt** Materialobjekte mit Zustandsbeschreibung
- **Fertigungsmittel** beteiligte Ressourcen mit Parametern
- **Informationsobjekt** sonstige Eigenschaften
- **Verfeinerung** detaillierte Darstellung eines Teilmodells
- **Priorität**
  - M Muss
  - S Soll
  - W Wunsch

# What data quality do I actually need?

- High-frequency signals vs. slow signals
  - Injection pressure [bar]
  - Nozzle temperature [°C]




- If, for example, the injection pressure can only be recorded at low frequency, valuable information is lost (e.g. maximum)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# Battenfeld Smart Power 60/210

**Data recording with iba DAQ-C**

**Data from the injection moulding machine**

- Euromap 63 (via Raspberry Pi)
  - Curve signals with 0.5 Hz sampling frequency rather cyclical values
  - Process parameters and setting parameters
- Sensor signals from the machine control cabinet
  - Curve signals with max. 1kHz sampling frequency (via I/O module)

**Data from the tool**

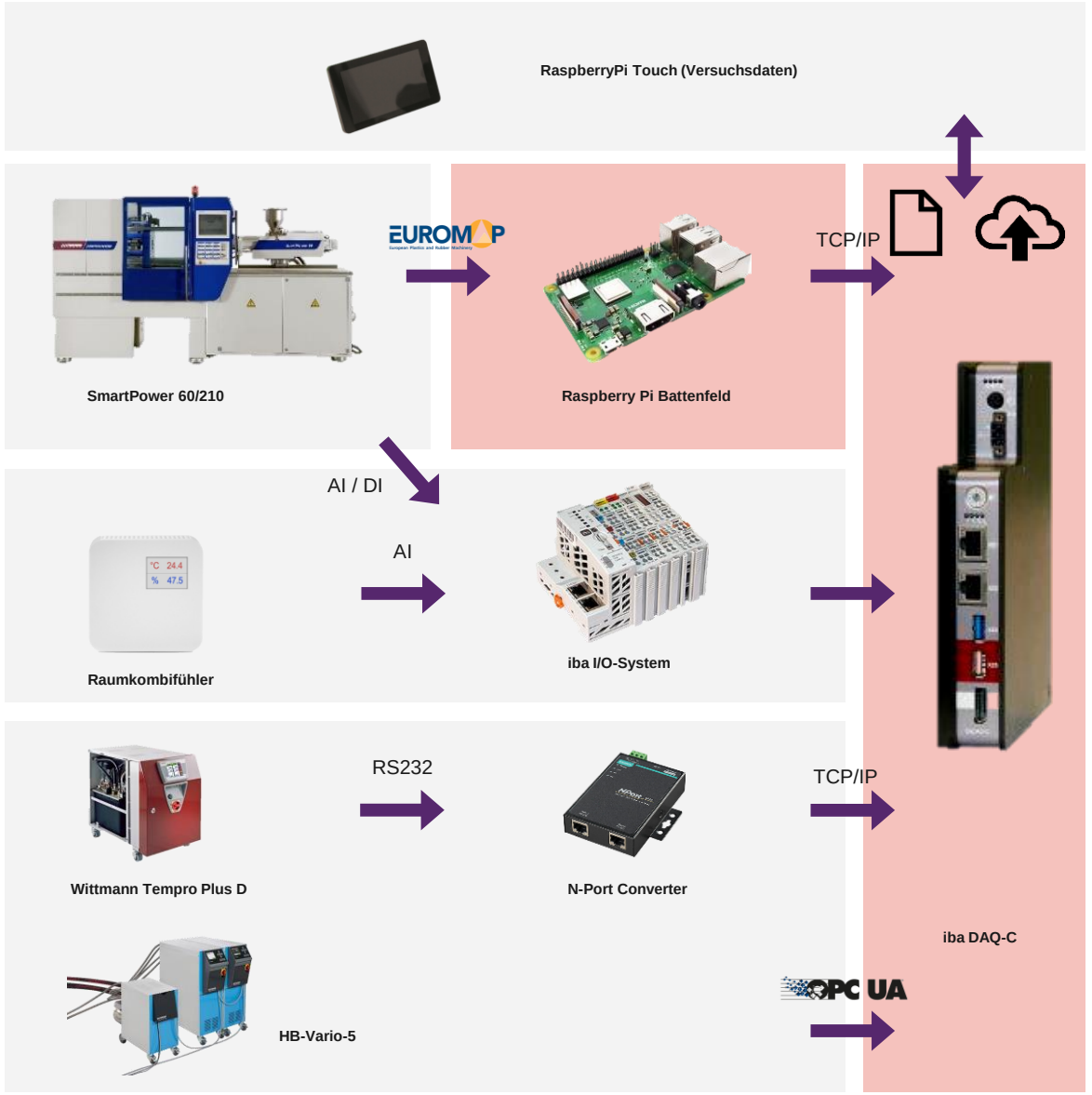
- Cavity pressure sensors 1 channel
  - Curve signals with max. 1kHz sampling frequency (via control cabinet and I/O module)

**Peripheral and environmental data**

- Temperature control units Wittmann Tempro Plus D (via RS232 & NPort)
  - Curve signals with 1Hz sampling frequency
- HB-Vario 5 unit (via OPC UA)
  - Curve signals with 1Hz sampling frequency
- Ambient temperature and humidity (via I/O module)
  - Curve signals with max. 1kHz sampling frequency (via I/O module)

**Trial data**

- Input via touch screen (via TCP/IP)



# Thank you for your attention!

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