Highly confidential (I)

100 years of passion for technology and innovation

Welcome

Presentation of the industrial use case

PHOENIX CONTACT

Vision of Phoenix Contact

Our corporate principles

Together,
we are creating a sustainable world
based on our passion
for technology and innovation

PHOENIX CONTACT

Together,
we are creating a sustainable world
based on our passion
for technology and innovation.

Mission

Solutions
for electrification, networking, and automation
are our contribution
to a world in which renewable energy is available
for the benefit of everybody.

Culture

Independent

We always act in a way to ensure
our entrepreneurial freedom.

Innovative and Creative

We consider innovation
as a path-breaking bridge to a sustainable future;
thus we pro-actively develop our company.

Partnerships of Trust

Our actions
are based on a mutually committed spirit,
on friendliness and honesty.

Our relations
to customers and business partners focus
on sustainable benefits for both sides.

Our corporate culture
encourages trust
and supports employees' development
for achieving agreed targets.

Use Case

Background

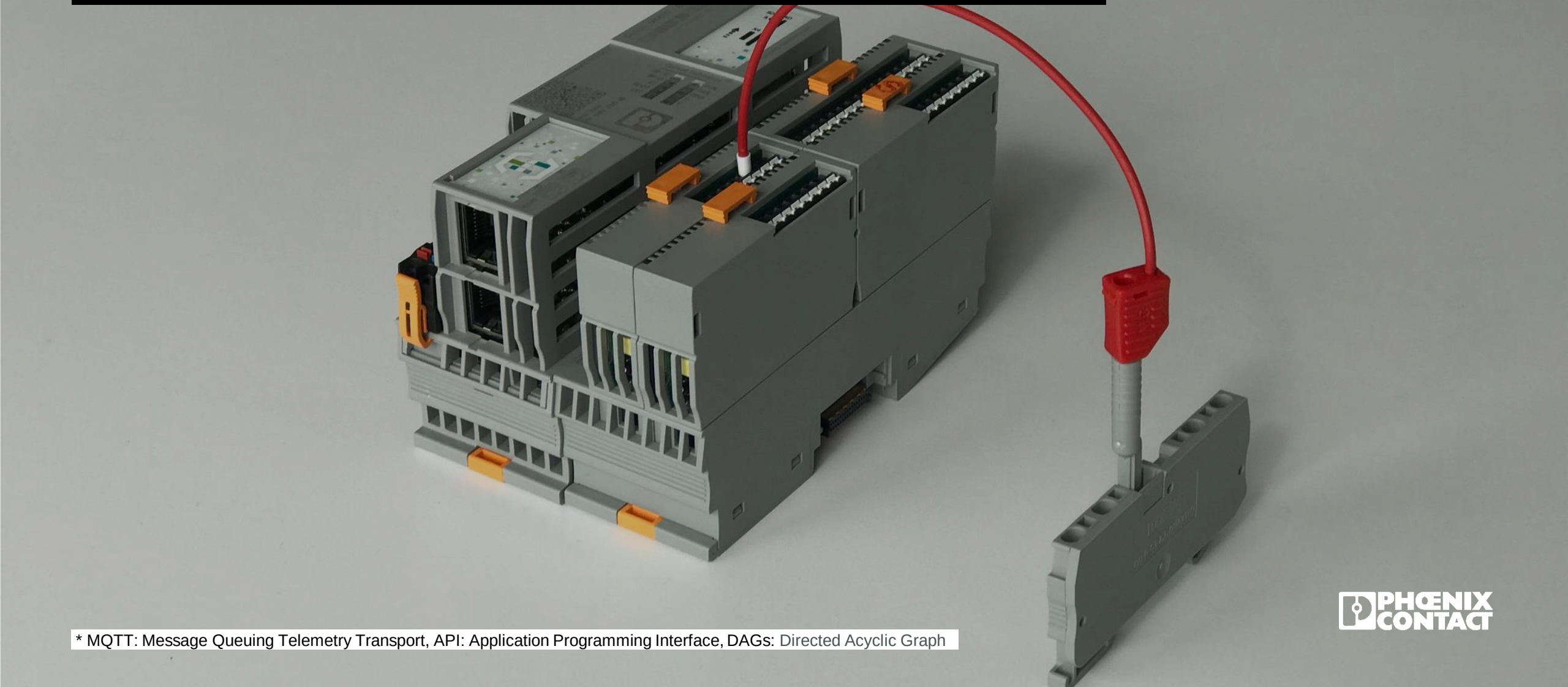
- Phoenix Contact's goal is to be carbon neutral by 2030
  - Become 25% more energy efficient
  - Create Product Environmental Footprint for IMA products
- Energy consumption and its recording are becoming increasingly important in production
  - Systematically record, implement and track efficiency projects in office and production

- **Goal: To model / predict the consumption based on the open production orders**
  - Can then be used for production planning, anomaly detection or smart alerting

Data Collection

Microservice Architecture

Data Collection with PLCnext Control & MQTT*



* MQTT: Message Queuing Telemetry Transport, API: Application Programming Interface, DAGs: Directed Acyclic Graph

Empowering the All Electric Society

Digitalization with Smart Industry Solutions

PLCnext Technology

Designed by PHOENIX CONTACT

PLCnext Control

Open control platform

PLCnext Engineer

Engineering-
Software

PLCnext Store

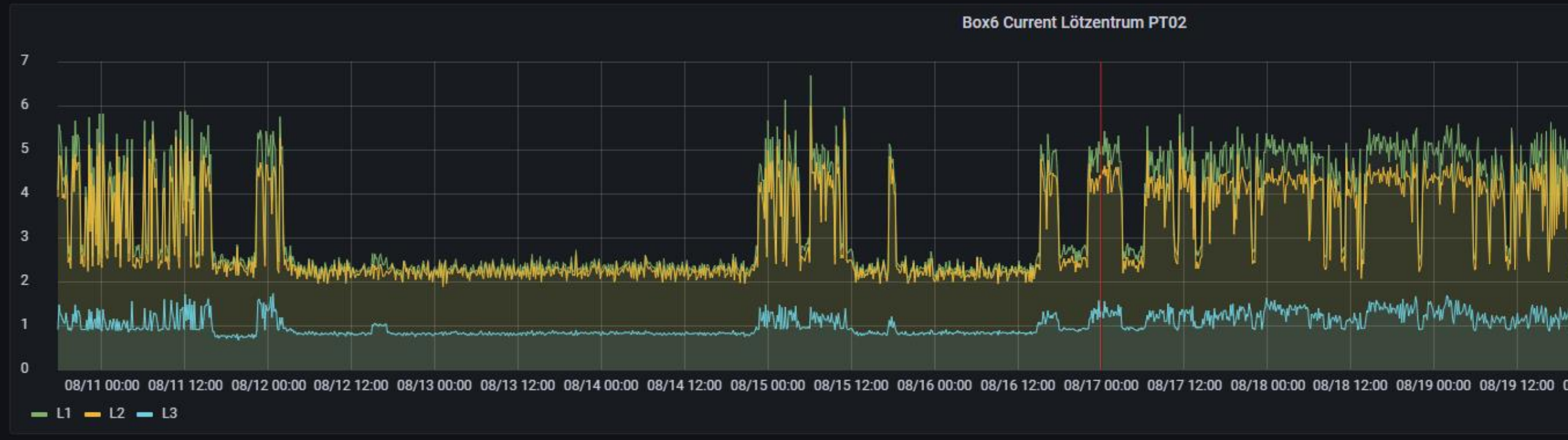
Digital marketplace

User Community

Exchange, Support, Tools

Technical Architecture

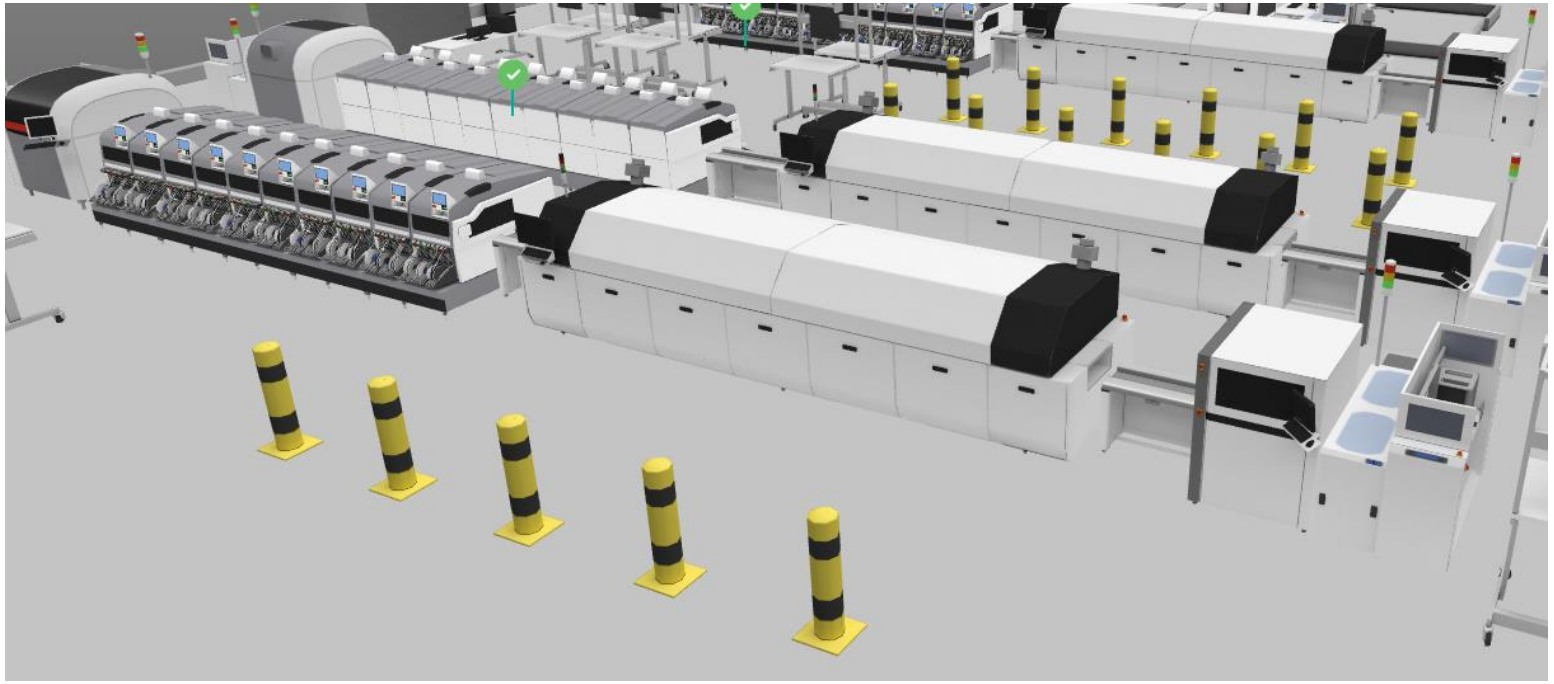
Data Insights



Use case

Use Case

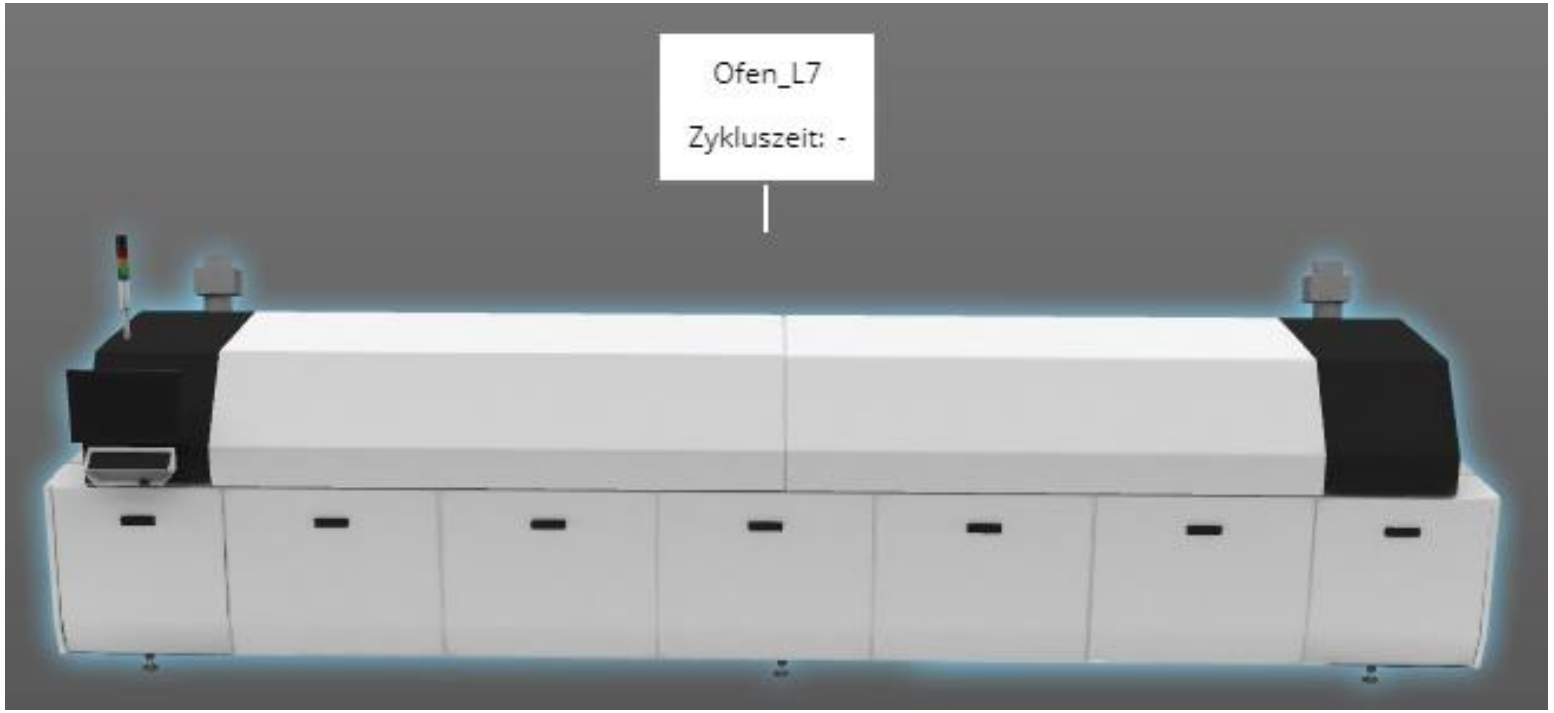
SMT Line



- Structure
  - Printer
  - Pick and place machine
  - Oven
  - Automatic optical inspection
- Data
  - Workorder data
  - Manufacturing process
  - Consumptions

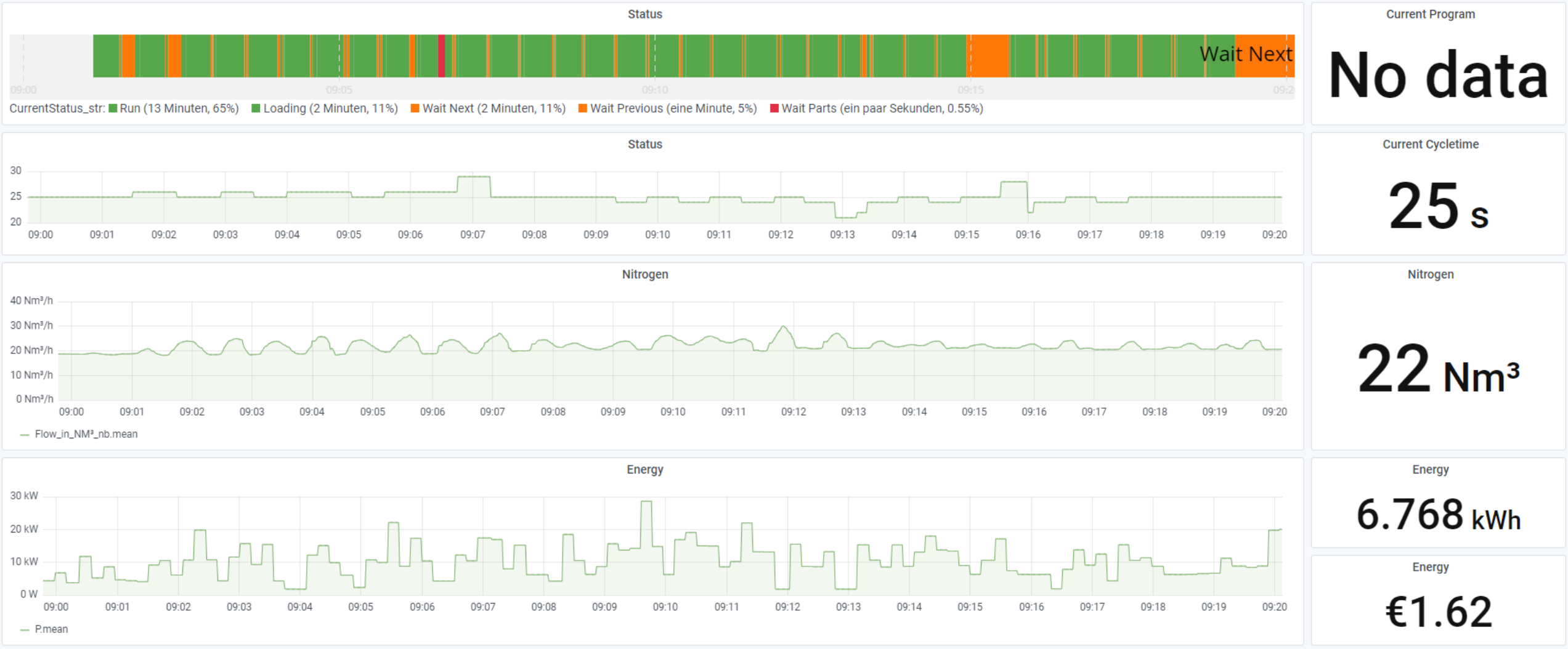
Use Case

SMT Oven



- Process
  - Heating
  - Soldering
  - Cooldown
- Data
  - Energy
  - Nitrogen
  - Soldering program
  - *Lead time*
- Use case
  - Consumptions (Anomaly, Prediction)
  - Carbon Footprint
  - Leak after maintenance (Anomaly)

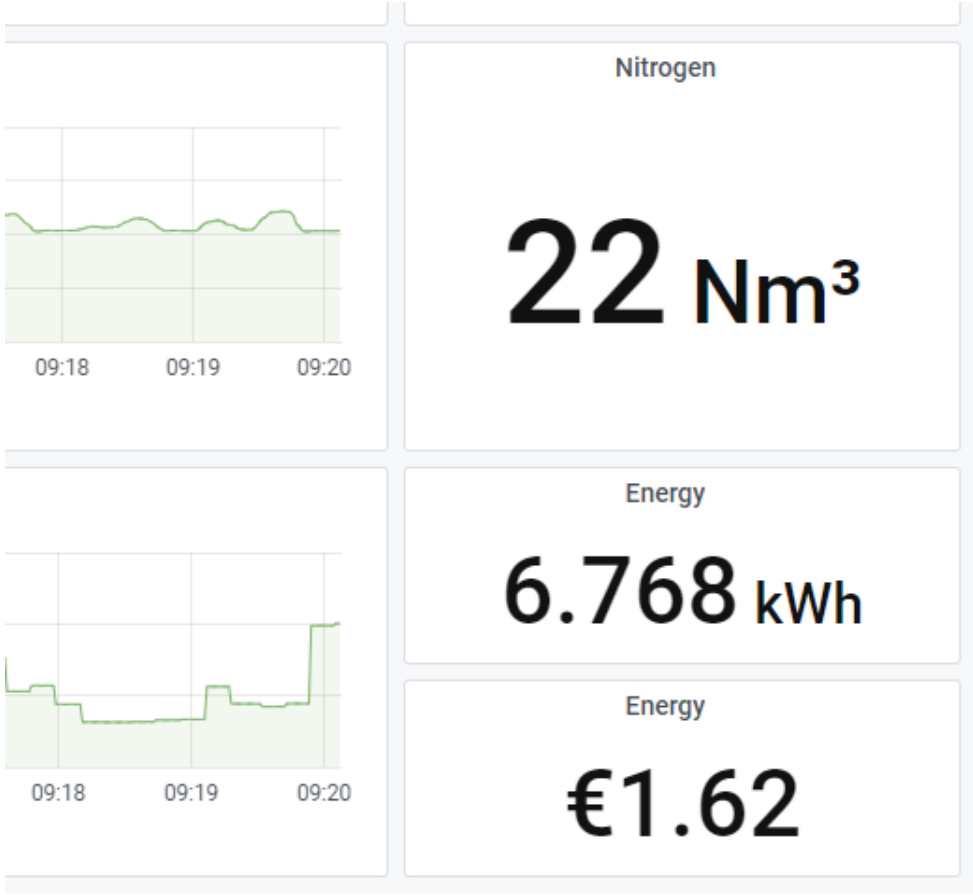
Use Case


Status
Wait Next
09:00
09:05
09:10
09:15
09:2
CurrentStatus_str: Run (13 Minuten, 65%) Loading (2 Minuten, 11%) Wait Next (2 Minuten, 11%) Wait Previous (eine Minute, 5%) Wait Parts (ein paar Sekunden, 0.55%)
Current Program
No data
Status
30
25
20
09:00 09:01 09:02 09:03 09:04 09:05 09:06 09:07 09:08 09:09 09:10 09:11 09:12 09:13 09:14 09:15 09:16 09:17 09:18 09:19 09:20
Current Cycletime
25 s
Nitrogen
40 Nm³/h
30 Nm³/h
20 Nm³/h
10 Nm³/h
0 Nm³/h
09:00 09:01 09:02 09:03 09:04 09:05 09:06 09:07 09:08 09:09 09:10 09:11 09:12 09:13 09:14 09:15 09:16 09:17 09:18 09:19 09:20
Flow_in_NM³_nb.mean
Nitrogen
22 Nm³
Energy
30 kW
20 kW
10 kW
0 W
09:00 09:01 09:02 09:03 09:04 09:05 09:06 09:07 09:08 09:09 09:10 09:11 09:12 09:13 09:14 09:15 09:16 09:17 09:18 09:19 09:20
P.mean
Energy
6.768 kWh
Energy
€1.62

Use Case

Hackathon

- Relevance
  - Optimization of energy consumption
  - Anomaly detection
  - Smart Alerting
- Business Problem
  - Model future consumption with the help of the production plan
  - Future consumption and prices as a criterion in production planning




haprotec
system-automation
BM037819