ZETA

Sustainable cleanroom design

A data-driven approach

Sustainable cleanroom design

WHO IS INOSIM?

Founded in 2003, INOSIM has evolved into a process simulation market leader, with its offices on Dortmund's Science and Technology Campus.

Headquarter offices in Dortmund, Germany

Peer Sander – M.Sc. Chemical Engineering
Head of Technical Affairs

In March 2024 INOSIM joins the ZETA Group bringing simulation-based decision-making in engineering and operations to the next level.

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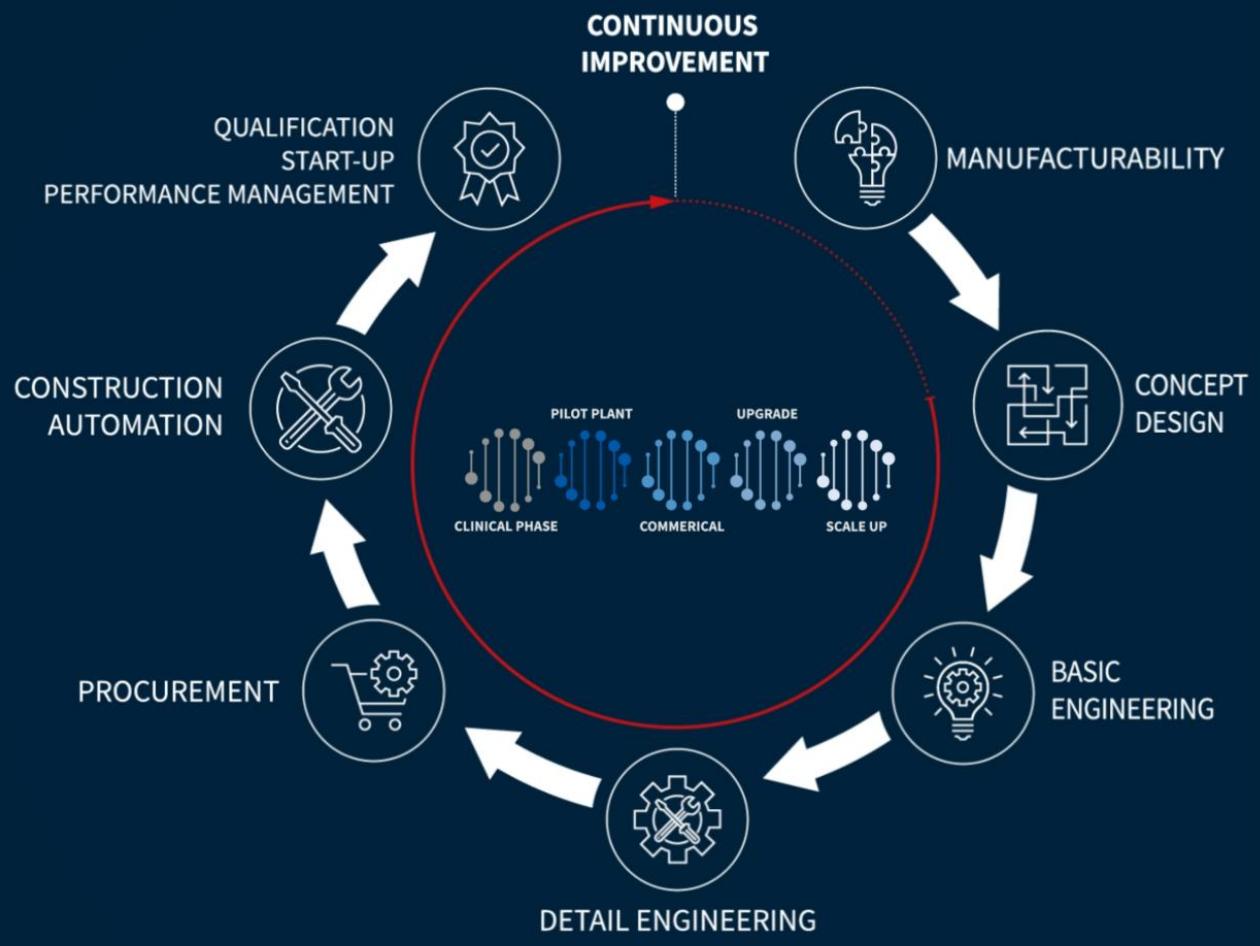
INOSIM IN THE ZETA COSMOS



The INOSIM Story

2021	First application of INOSIM simulation @ZETA
2022	Improved project delivery for ZETA customers
2023	Closer partnership and first cooperative projects
2024	Acquisition of INOSIM GmbH by ZETA
2025	Driving digitalization in batch industry with joint forces

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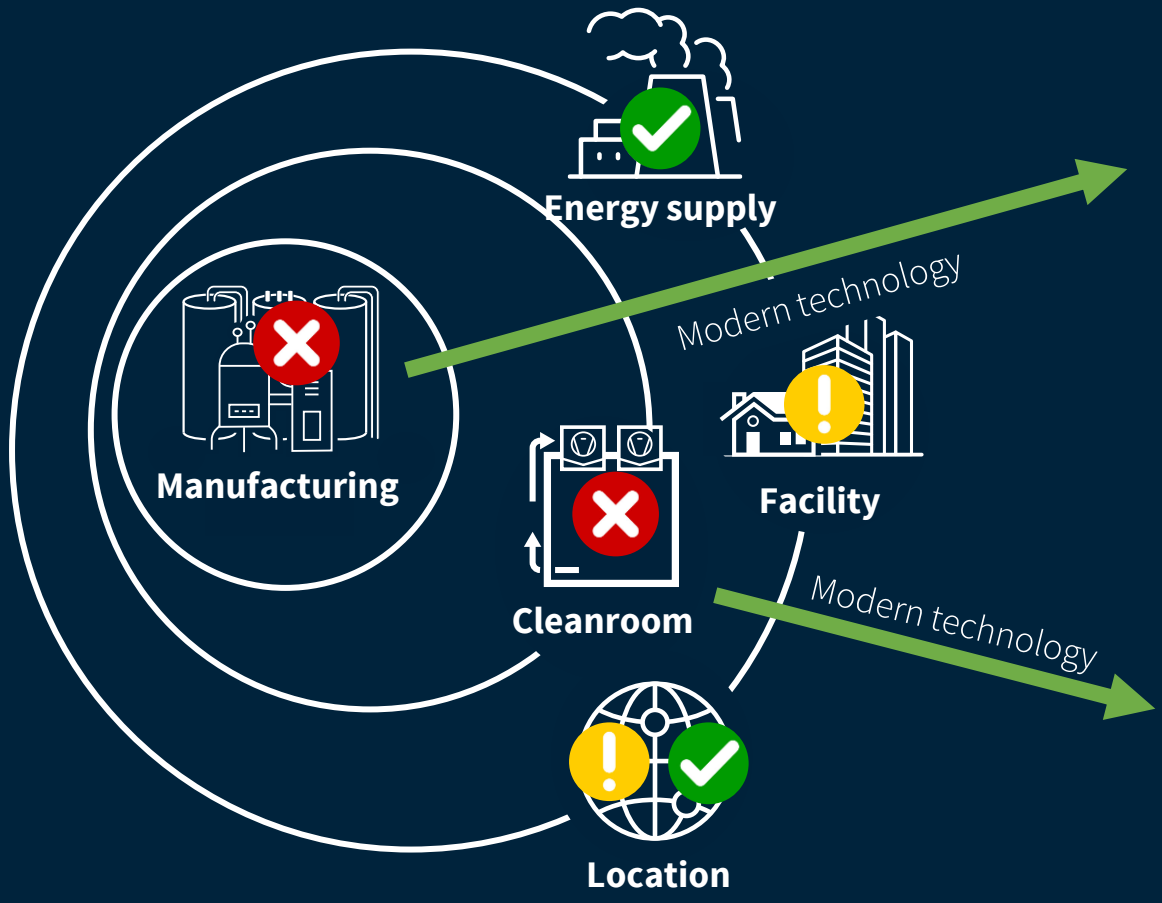
SUSTAINABILITY IN PHARMACEUTICAL FACILITY DESIGN



Process Simulation

- Targeted design of utility systems
- Energy efficient process design

Problem: Limited influence on overall consumption

Innovative Technology

CFD Studies

- Accurate simulation of air exchange
- Optimization of equipment and ventilation system placement

Problem: Missing know-how about process influence

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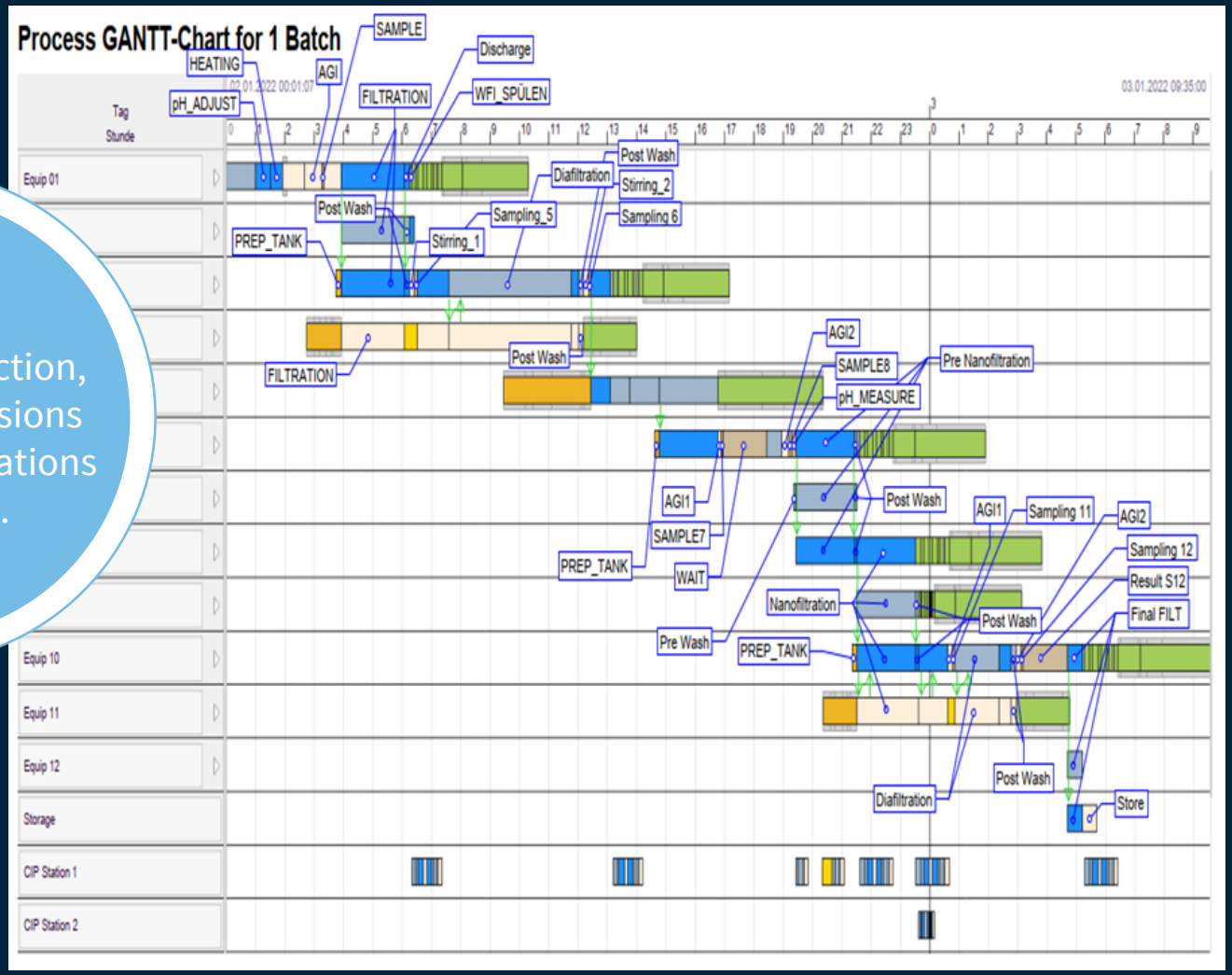
THE POWER OF PROCESS SIMULATION

Each Process step is analysed to identify its impact to the cleanroom.

Operator interaction, Heat Load emissions and critical operations are tracked.

An exact schedule of the productino process is virtually generated.

Including uncertainty



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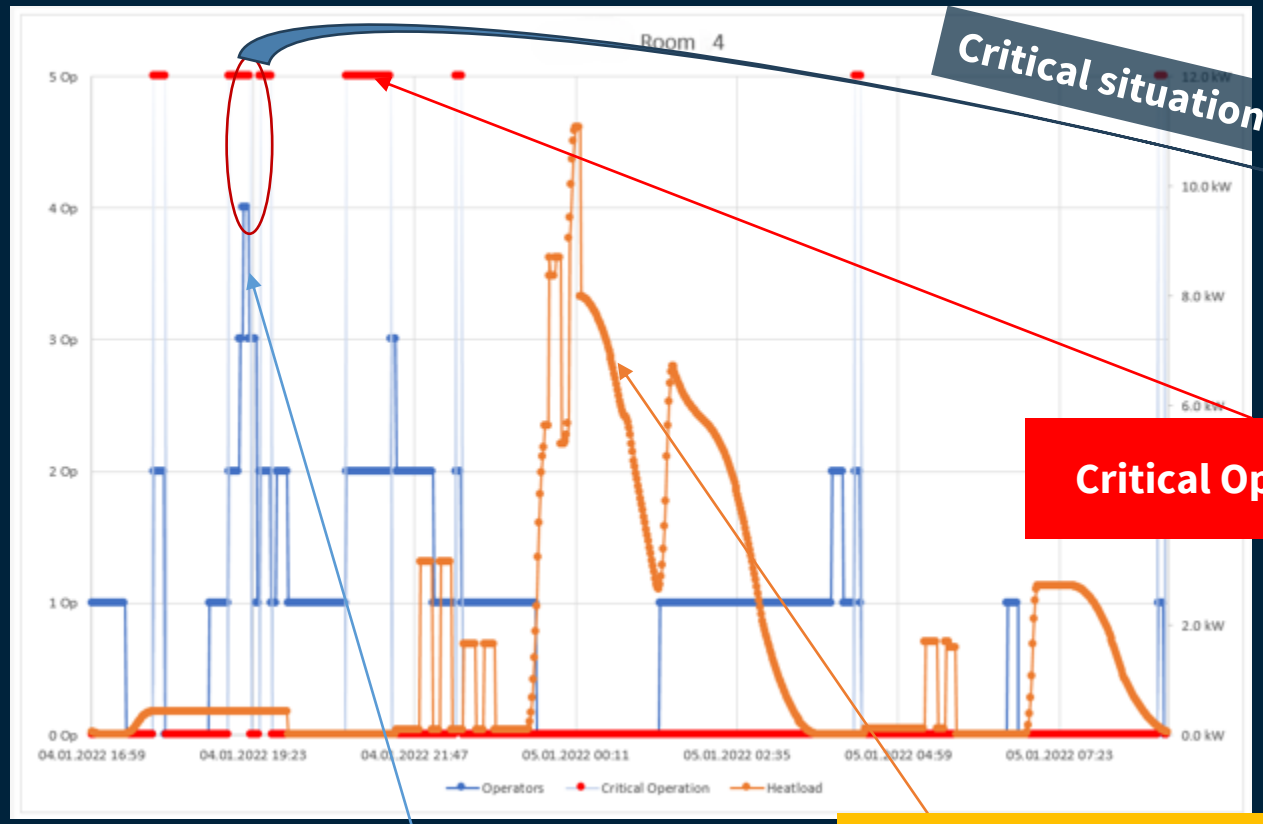
SIMULATION OUTPUT

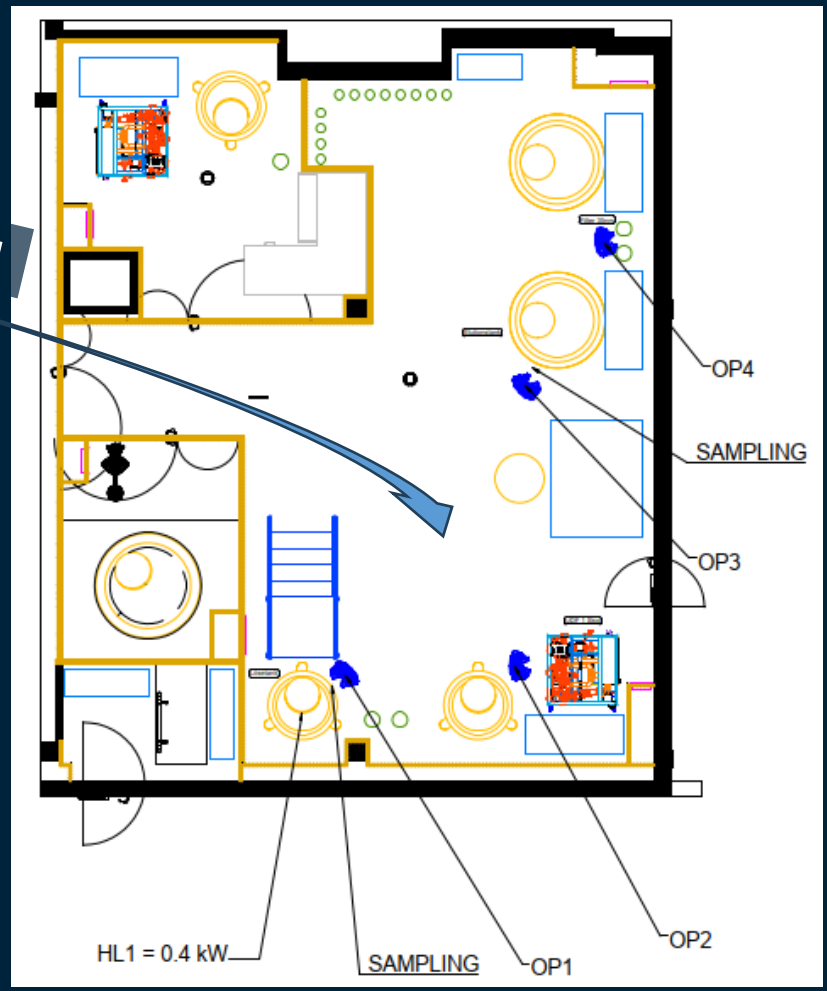


Critical situations are considered

Critical Operations

Room Occupancy

Heat Loads



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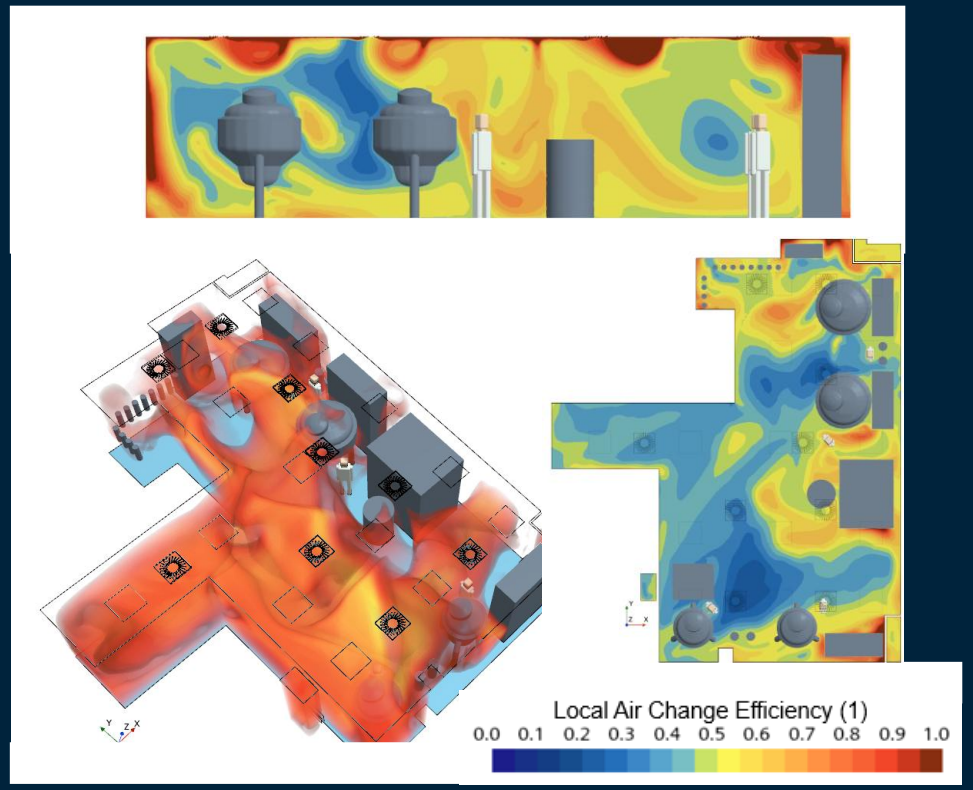
3-D CFD STUDY

Process knowledge serves as input for CFD study

- Where are operators?
- Where are which heat sources?
- What critical operations are performed?

Analyzed for multiple critical situations

- **Accurately define requirements for cleanroom**
  - Ensure robust design
  - Ensure energy efficient design
- **Basis for optimization (e.g. equipment placement)**
- **Up to 57% energy savings in first use cases**



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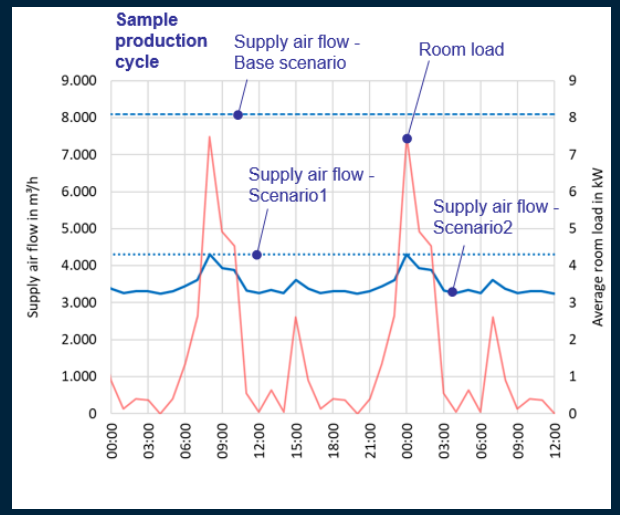
FURTHER BENEFITS

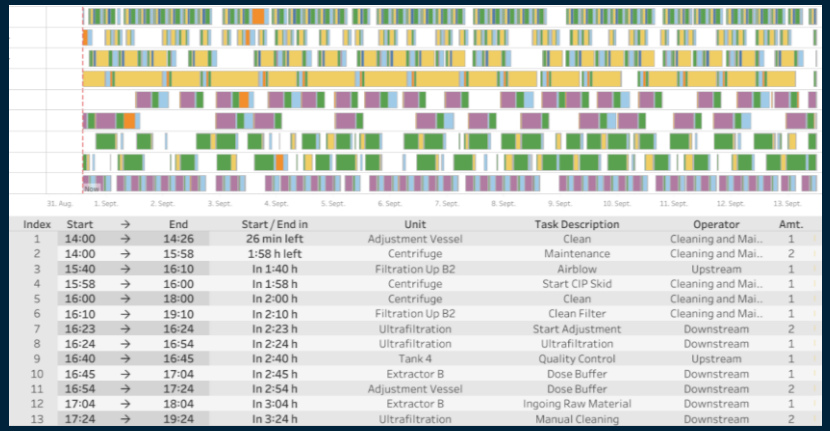
Application of process simulation enables further benefits for clean rooms

Gate design



Dynamic ventilation control

Real-time production support



Index	Start	→	End	Start / End in	Unit	Task Description	Operator	Amt.
1	14:00	→	14:26	26 min left	Adjustment Vessel	Clean	Cleaning and Mai..	1
2	14:00	→	15:58	1:58 h left	Centrifuge	Maintenance	Cleaning and Mai..	2
3	15:40	→	16:10	In 1:40 h	Filtration Up B2	Airblow	Upstream	1
4	15:58	→	16:00	In 1:58 h	Centrifuge	Start CIP Skid	Cleaning and Mai..	1
5	16:00	→	18:00	In 2:00 h	Centrifuge	Clean	Cleaning and Mai..	1
6	16:10	→	19:10	In 2:10 h	Filtration Up B2	Clean Filter	Cleaning and Mai..	1
7	16:23	→	16:24	In 2:23 h	Ultrafiltration	Start Adjustment	Downstream	2
8	16:24	→	16:54	In 2:24 h	Ultrafiltration	Ultrafiltration	Downstream	1
9	16:40	→	16:45	In 2:40 h	Tank 4	Quality Control	Upstream	1
10	16:45	→	17:04	In 2:45 h	Extractor B	Dose Buffer	Downstream	1
11	16:54	→	17:24	In 2:54 h	Adjustment Vessel	Dose Buffer	Downstream	2
12	17:04	→	18:04	In 3:04 h	Extractor B	Ingoing Raw Material	Downstream	1
13	17:24	→	19:24	In 3:24 h	Ultrafiltration	Manual Cleaning	Downstream	2