

Unleashing OEE+: Revolutionizing Global Manufacturing Excellence at Merck

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Who We Are & What We Do

Who we are

We aspire to be the premier research-intensive **biopharmaceutical company**. We're at the forefront of research to deliver innovative health solutions that advance the prevention and treatment of diseases in people and animals.

What we do

We use the power of leading-edge science to **save and improve lives** around the world.

Our areas of focus

- Oncology
- Vaccines
- Infectious diseases
- Cardio-metabolic disorders
- Immunology
- Neuroscience
- Ophthalmology

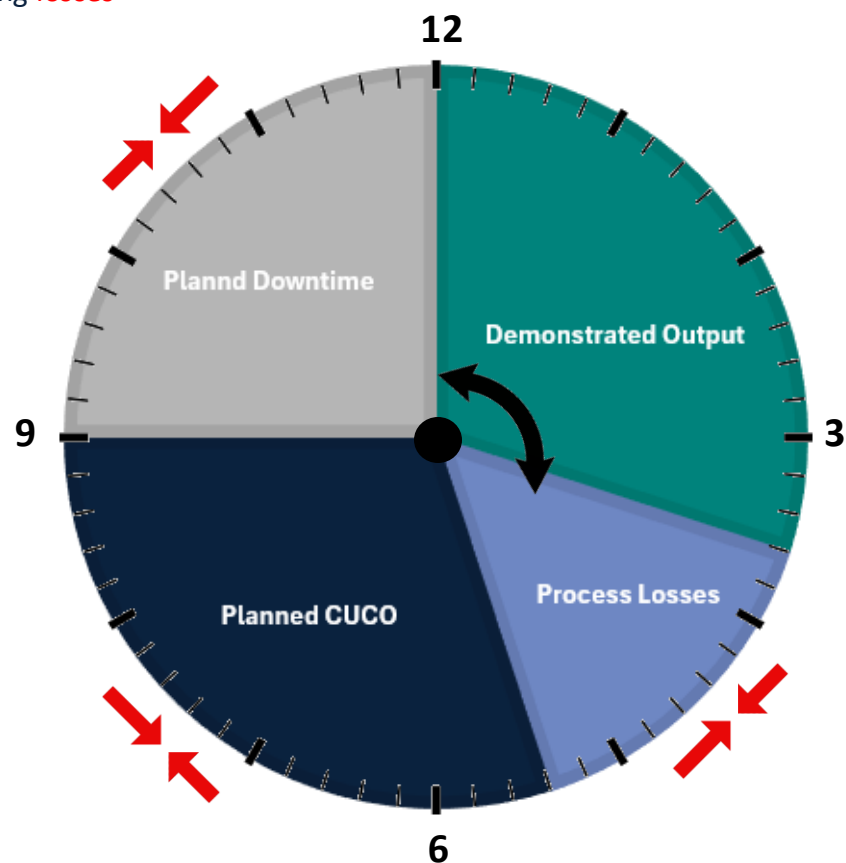


Why is OEE+ important in Manufacturing?

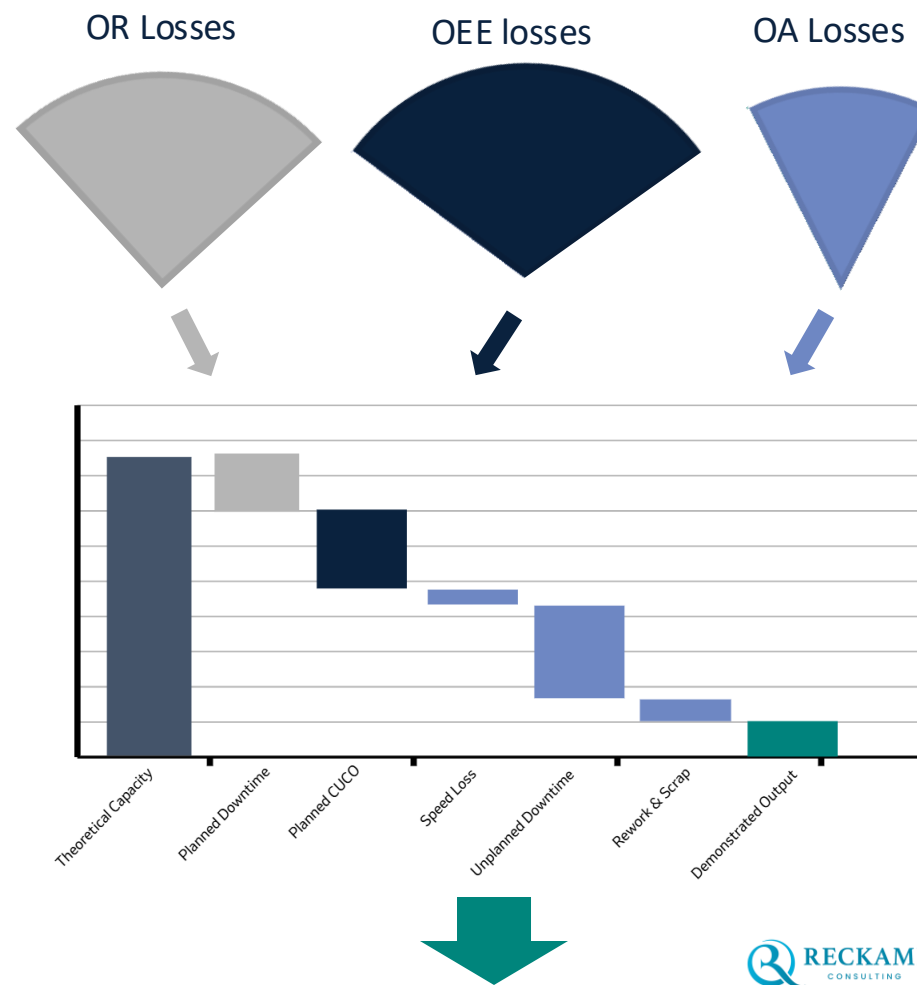
What is OEE+? (OA/OEE/OR)

OA/OEE/OR are a measure of the time spent manufacturing good product.

There are many benefits to implementing this system with the most important being identifying **losses**

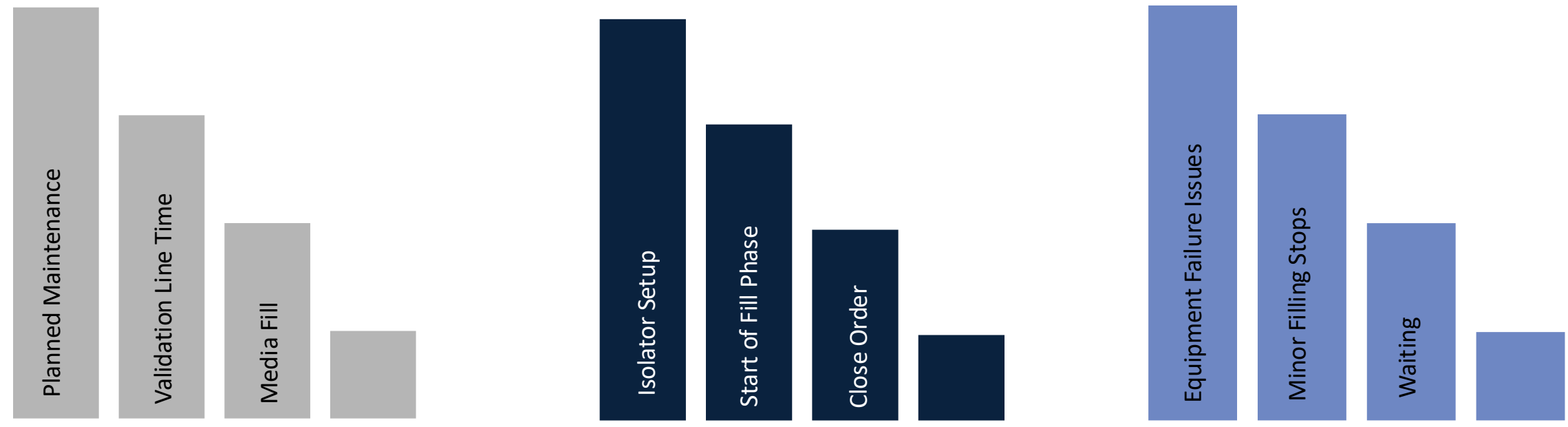


Identifying Losses & Unlocks Capacity





Making Losses Visible – Drive Efficiency Improvements

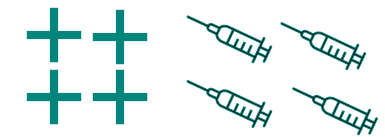


OR Losses

OEE Losses

OA Downtime

Unlocks Capacity



OEE+ Digital Tool



Measuring and monitoring **OA/OEE** in conjunction with a process improvement program

The **OEE+** digital tool that measures, monitors and **visualizes losses** and calculates OA, OEE and OR.

Understand Current State



Target Improvement Areas



Measure Impact of Improvements



'Measurement is the first step that leads to control and eventually to improvement. If you can't measure something, you can't understand it. If you can't understand it, you can't control it. If you can't control it, you can't improve it.' – James Harrington



- ✓ Unlocks **capacity**
- ✓ Decrease **time to produce**
- ✓ Better **manage equipment/capital**

A Look Back in Time...

Initial Development of OEE:

- Real time Downtime Tracking
- Real Time Metrics calculations (Batch Progress, Cumulative Downtime & Categorisation)
- Historical Analysis



SUCCESS

OEE Solution 2023

Public

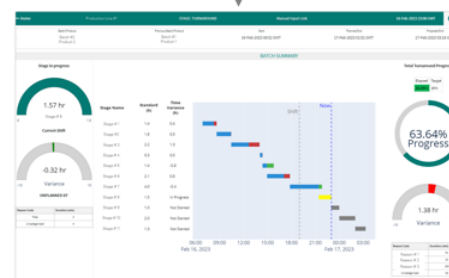
Real Time Monitoring



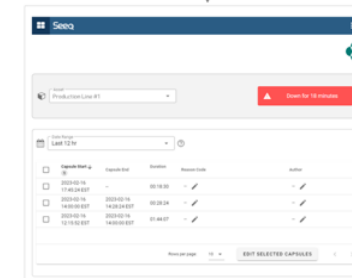
By measuring and visualizing production effectiveness in near real time shop floor personnel can:

- Spot problems quickly to **minimize downtime**
- Identify opportunities to **reduce losses** and **improve production effectiveness**.

Shop Floor Screens



Manual Downtime Input



Main Screen





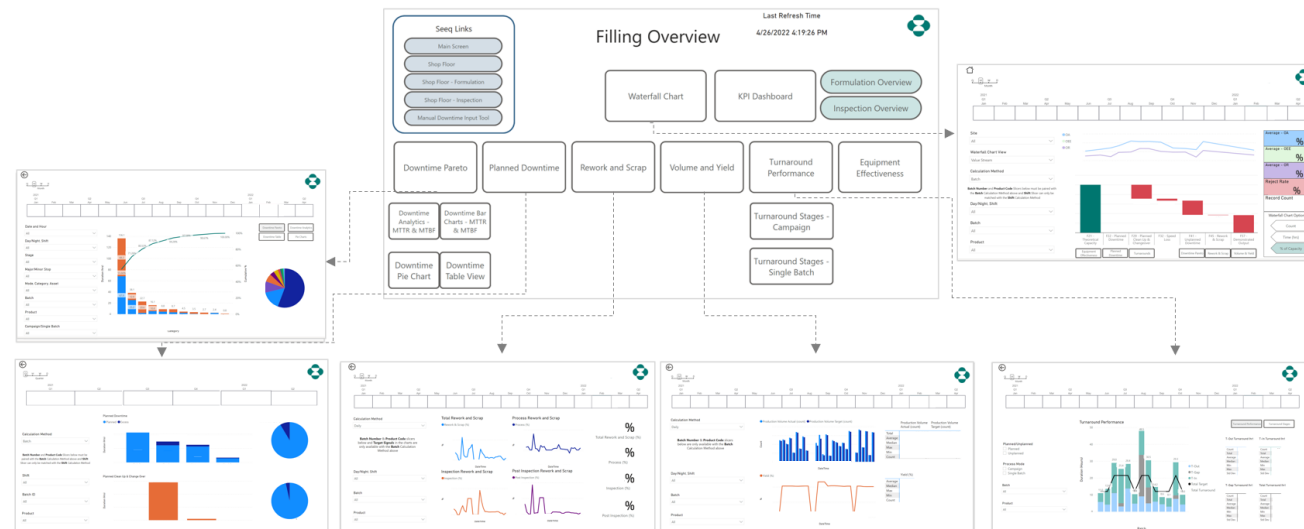
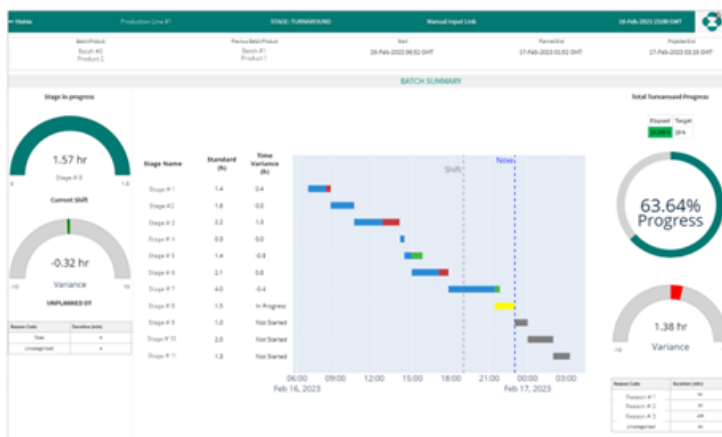
OEE+ Digital Tool Current State

Real Time Monitoring

Highlights performance issues in near **real time** enabling the team to take timely action

Continuous Improvement Analytics

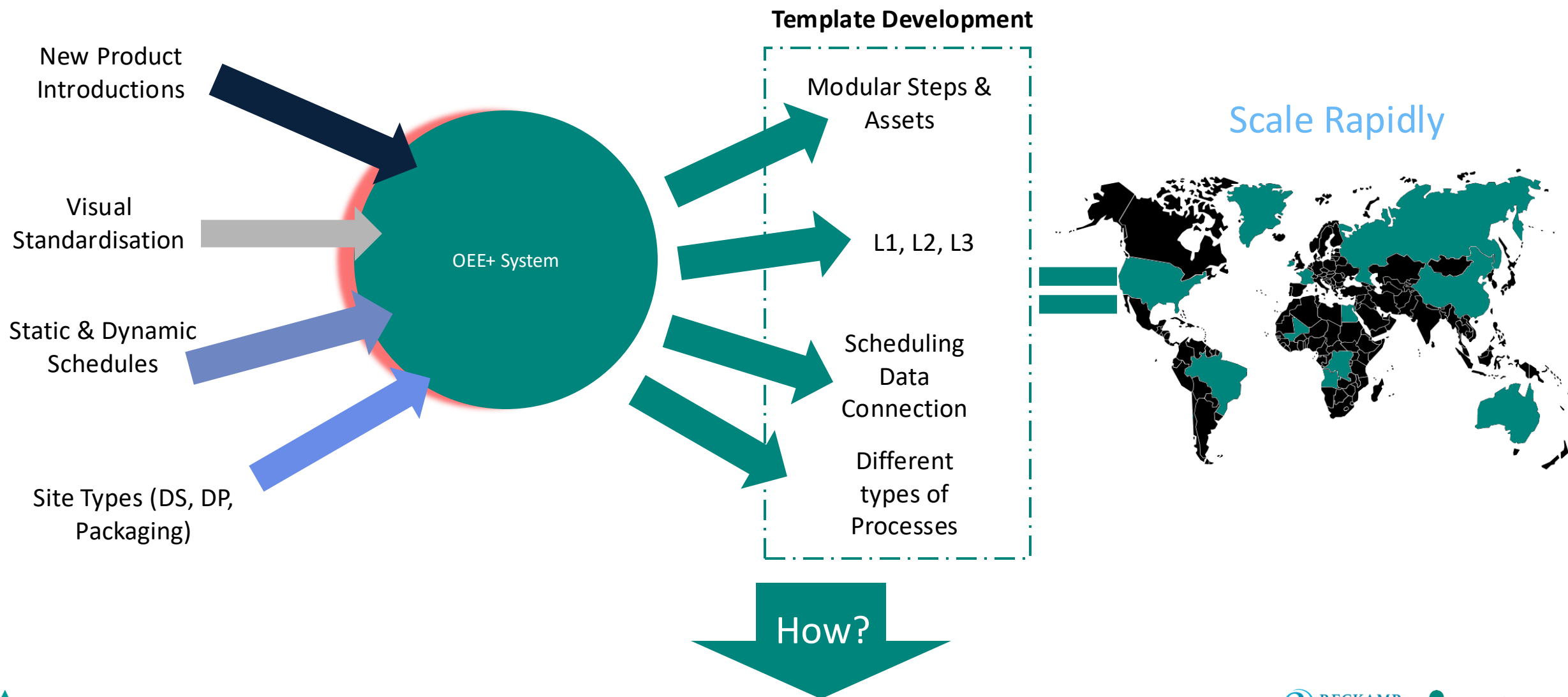
Visualizes **historical** performance with drilldown capabilities



Powered by: **Seeq DATA LAB**

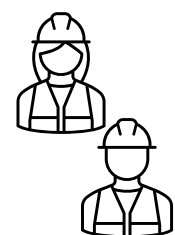
Powered by: **Seeq WORKBENCH**

Challenge: Scale Across the Network

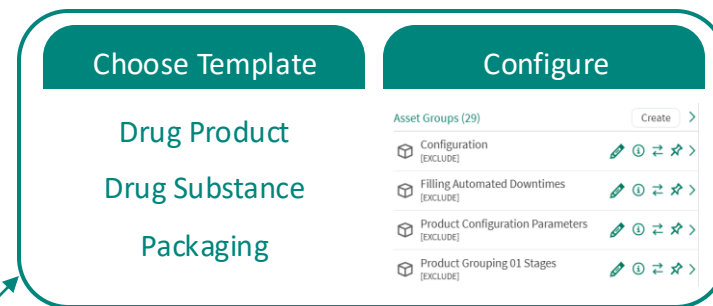


Template Development (Simplify > Standardise > Digitise at Scale)

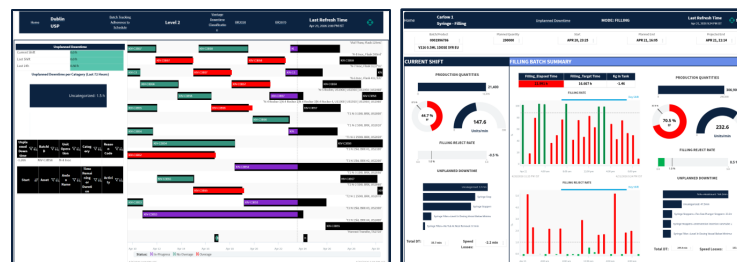
1. Modular Data Configuration
2. Visualisation Standards
3. Scheduling Data Connection



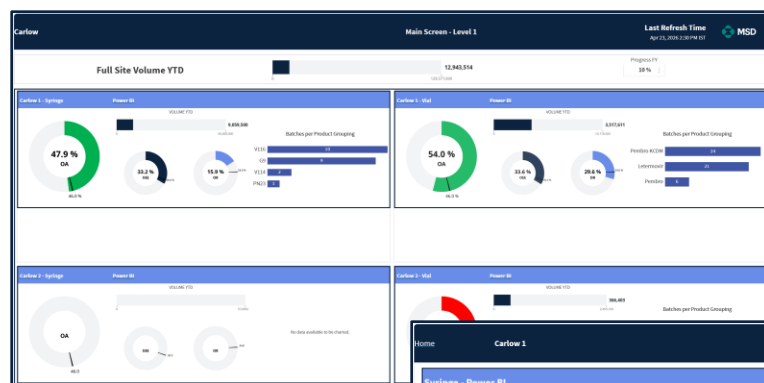
Data Interaction & Inputs (Scheduler)



Standardised Real Time Visualisation



Level 1, 2 & 3 Real-Time Efficiency Views



Level 1 Manufacturing Facility View

Standardised Real Time KPIs:

- OA (Equipment Efficiency)
- CUCO Efficiency
- On Track/Off Track
- Downtime

More Granular Detail

The L1, L2, L3 Views represent scale:

Level 1 View

- Airport Terminal
- “Flight Status” on Terminal Board.

Level 2 View

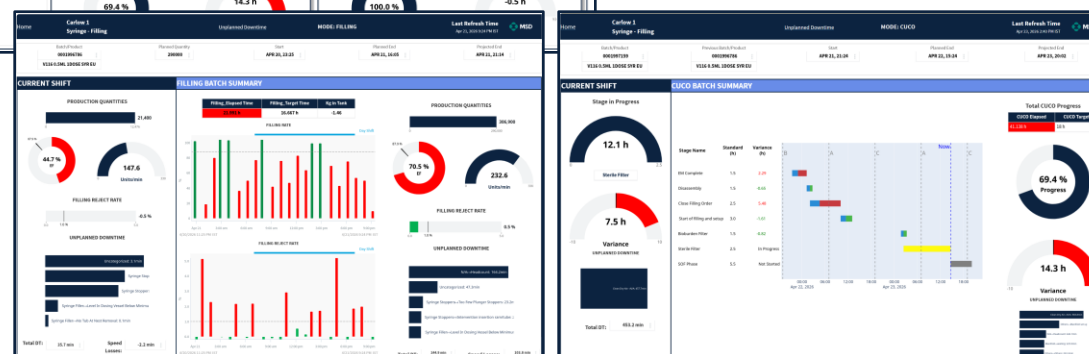
- Area View Batch Status
- Unit Operations.

Level 3 View

- Asset / Equipment View visualising
- More Granularity with Plan vs Actual cycle time performance on each processing step.



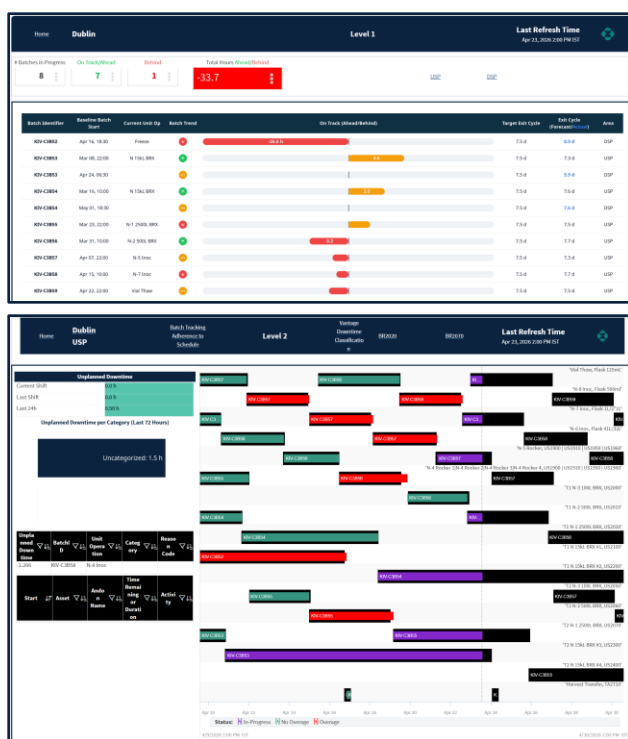
Level 2 Area / Unit Operation View



Level 3 Asset / Processing steps View

Categorization of Processes for Templates

Drug Substance



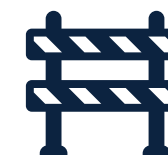
Drug Product



Packaging



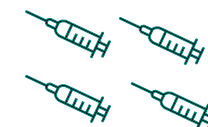
Template Screens In Progress



OEE+ Results Example



Unlocks Capacity



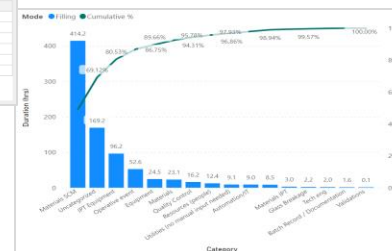
Baseline:

- Downtime collect Manually
- No Minor Stops Visibility
- 6 different sources of Downtime
- Fill efficiency **61%** .



OEE+ Deployment:

- Real Time Triggers & Actions
- Automated Downtime Categorisation
- Single Source of Downtime



Result:

- Major Project Upgrade
- 80% reduction in De-lider downtime
- Full Potential Mindset
- Fill Efficiency **75%**
- **~10% Increase Capacity**

OEE+ Template: Scaling Capacity Across the Network

Rapid Scaling Through Templates

The OEE+ template approach enables standardized deployments across manufacturing sites.

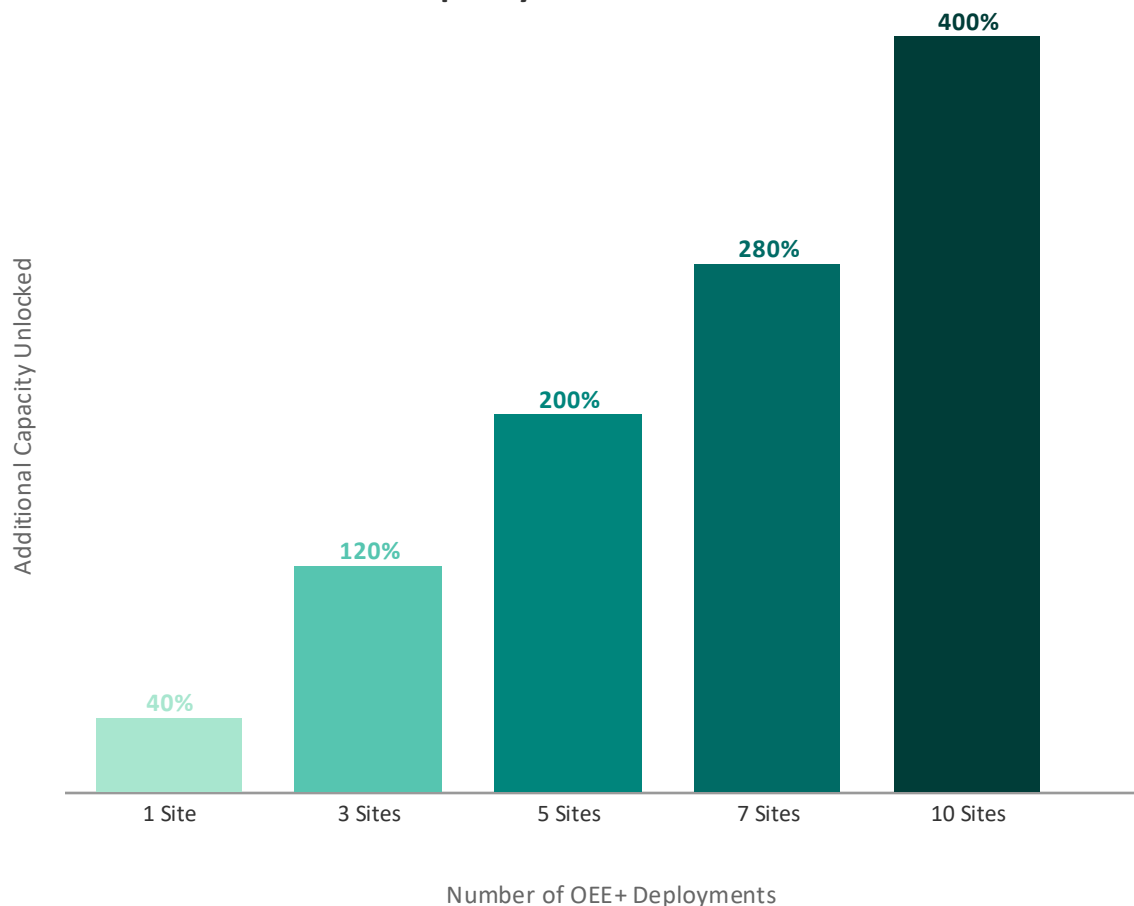
As more sites adopt the template, capacity gains scale rapidly across the network.

- Standardized templates reduce deployment time
- Consistent measurement across all sites
- 4 critical assets per site amplify gains at each deployment
- Network-wide visibility drives further optimization

Scaling based on example Project:

10% Capacity Increase x N Deployments x 4 Critical/Bottleneck Assets (Average) = Cumulative Batches Returned to Network

Cumulative Capacity Unlocked Across Network



4 × critical assets per site = (40%)

Q&A