CONTINUOUS MONITORING: FROM DATA TO REAL SAVINGS IN OFFICE BUILDINGS

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Emma Eynon

Fantom Factory

Emma Eynon is the CEO of Fantom Factory Ltd, an IT services company exclusively dedicated to the provision of SkySpark data analytics. Fantom Factory offers SkySpark as a Service, training, and consultancy to companies of all sizes around the world.

As an experienced technical support engineer, writer, and group trainer, Emma leads the business efforts on accredited eLearning training and development. As a British Army veteran and Armed Forces community champion, she contributes a strong focus on helping people from all backgrounds to the core values at Fantom Factory.

Steve Eynon

Fantom Factory

Steve Eynon is the technical lead behind Fantom Factory Ltd, lending assistance to organisations around the world with SkySpark, Fantom, and Project Haystack. As a result of Steve's innovations, Fantom Factory offers enhanced SkySpark services, specialist consultancy, bespoke web software solutions, and award winning eLearning education.

As a true full stack developer specialising in web technologies, Steve believes passionately in making difficult technology accessible to everyone, which is integral to the Fantom Factory vision and [illegible] model.

Jan Siroky

Energy Twin

Jan Široký is the CEO and co-founder of Energy Twin, a company transforming building operations through AI and predictive analytics. He holds a doctorate in cybernetics and has over twenty years of experience in building control and data analysis.

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Turning building data into knowledge.

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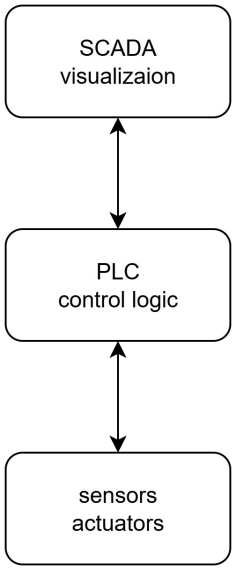
Current reality: control-focused, not insight-focused

- Automated control of building systems.
- Technicians use live system graphics with online and historical data.
- Focus is on daily operation, not long-term analysis.



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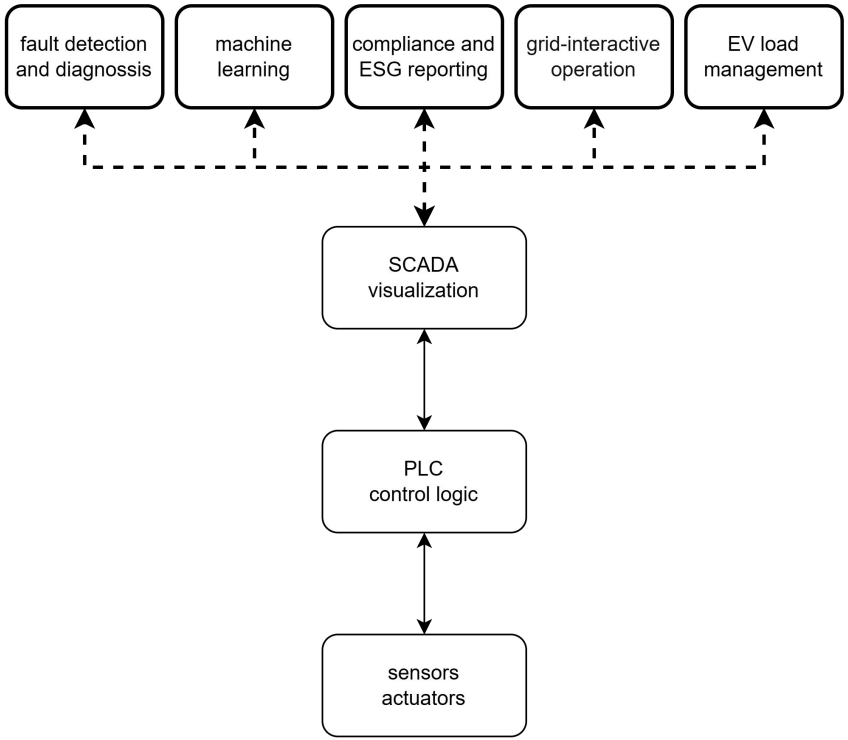
From control to intelligence: using data effectively

- Free your data!
- Vendor-independent.
- Flexible and future-ready.



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What is needed before analytics can work.

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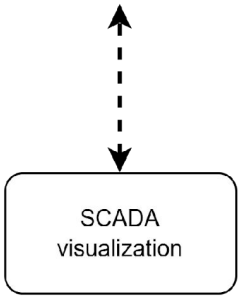
Data Connection

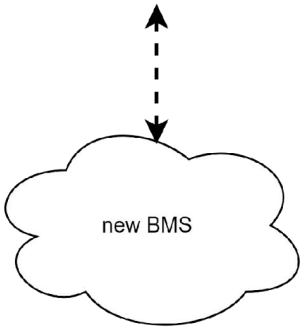
Best

Existing API / protocol



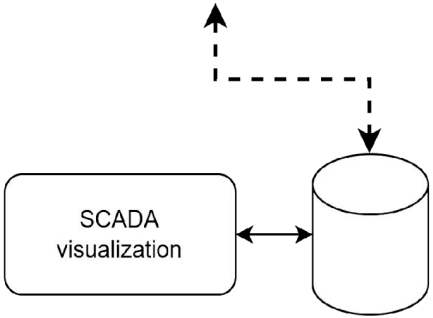
Expensive

complete new system

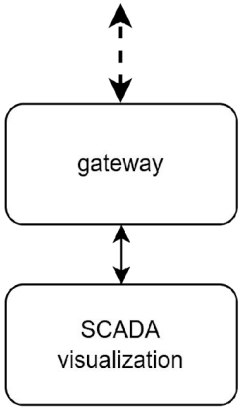


Creative

SW "hack" like direct
database connecton



dedicated HW



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Data Quality

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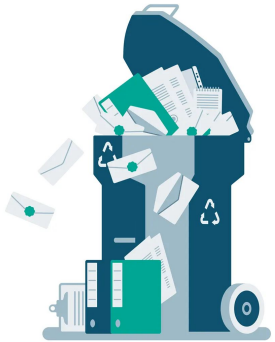
Data Quality

- Switched signals
  - Supply or return air temperature?
- Faulty measurements
  - Zone temperature 28 °C?
- Timezone handling
  - UTC vs. local time?

GARBAGE IN,
GARBAGE OUT



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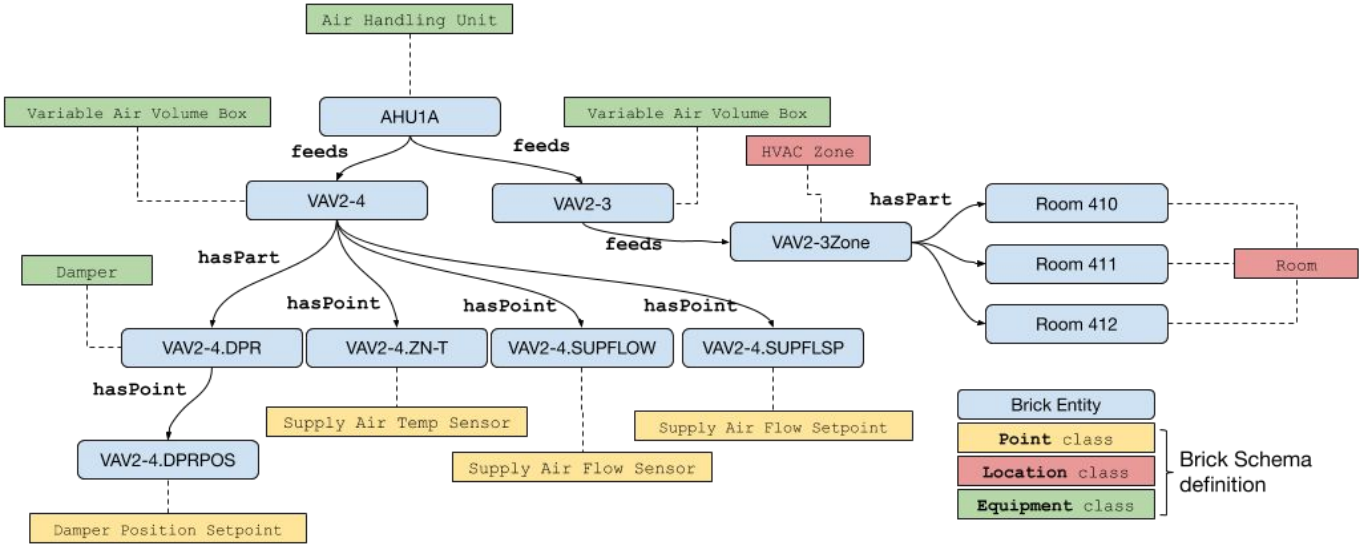
Metadata

- Semantic model, ontology, tags, …
- Haystack, Brick, IFC, etc.



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What becomes possible once data works.

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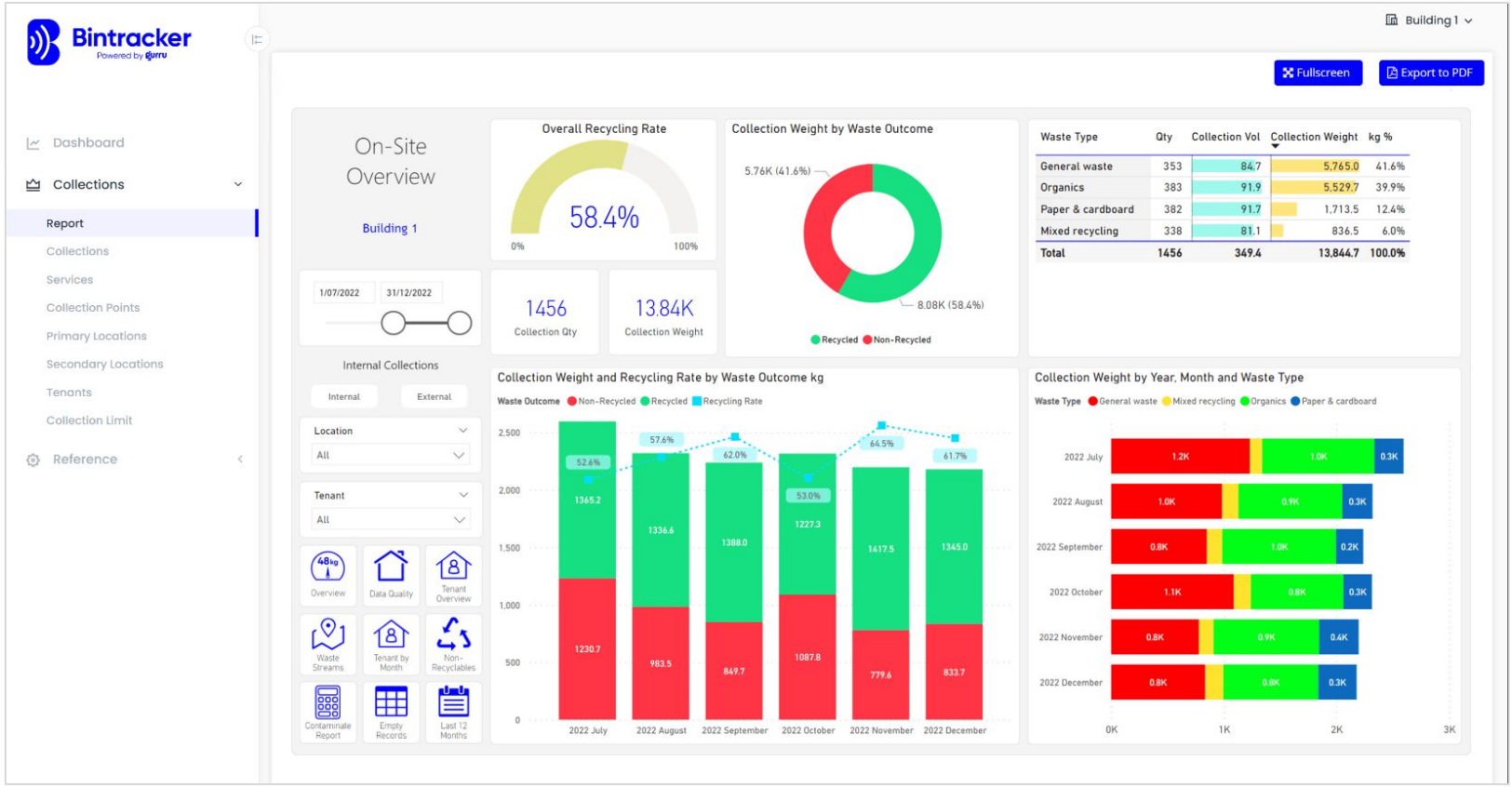
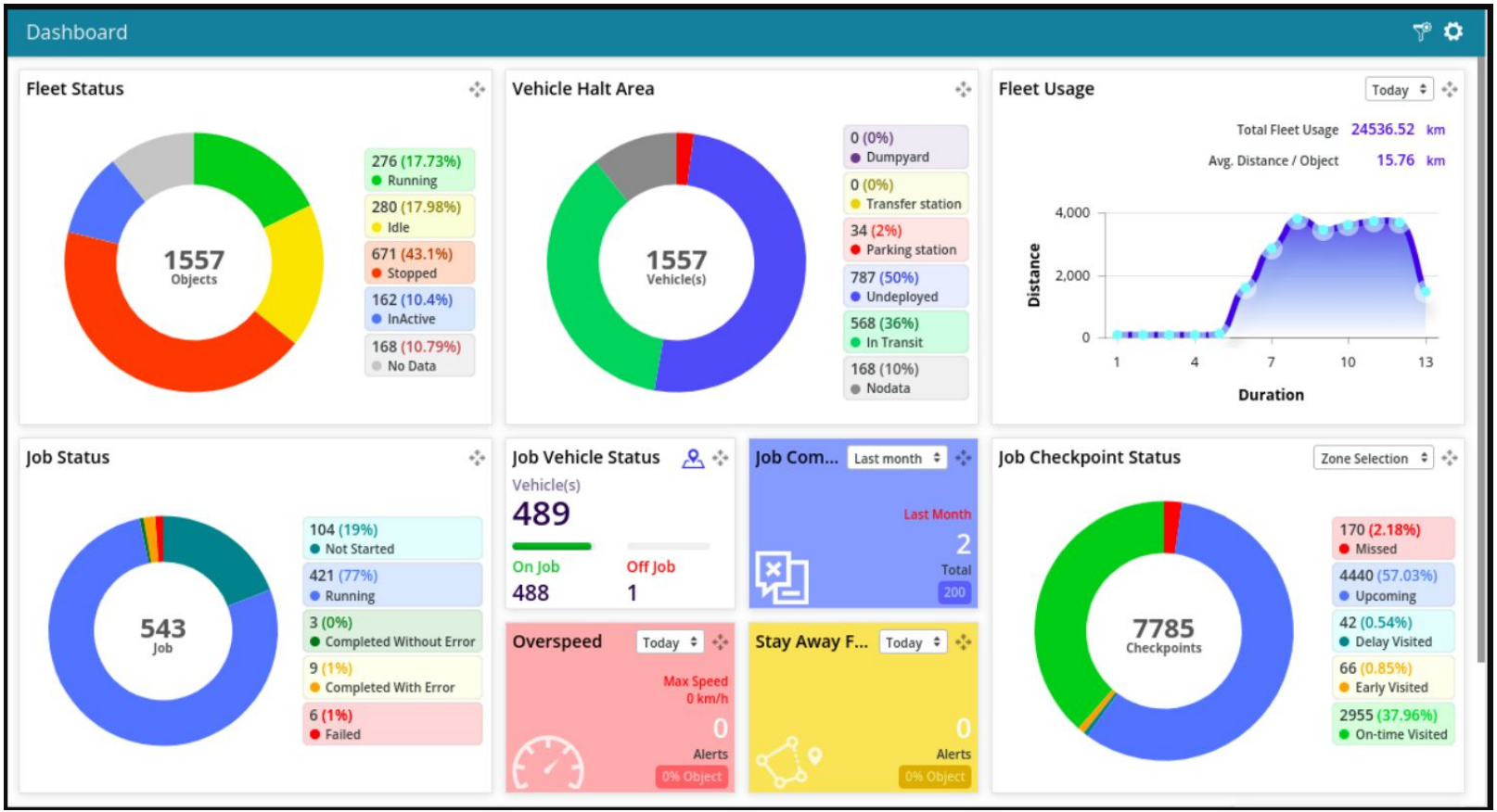
Dashboards

- A view is how your data is represented and can be highly detailed.
- A dashboard should always be a quick and easy view of key data.
- Key data provides intelligence for decision making and goal tracking.

-> Plan your views, dashboards, and reports to aid decision making.


Bintracker
Powered by guru
Building 1
Fullscreen
Export to PDF
Dashboard
Collections
Report
Collections
Services
Collection Points
Primary Locations
Secondary Locations
Tenants
Collection Limit
Reference
On-Site Overview
Building 1
Overall Recycling Rate
58.4%
0%
100%
Collection Weight by Waste Outcome
5.76K (41.6%)
8.08K (58.4%)
Recycled
Non-Recycled
Waste Type | Qty | Collection Vol | Collection Weight | kg %
General waste | 353 | 84.7 | 5,765.0 | 41.6%
Organics | 383 | 91.9 | 5,529.7 | 39.9%
Paper & cardboard | 382 | 91.7 | 1,713.5 | 12.4%
Mixed recycling | 338 | 81.1 | 836.5 | 6.0%
Total | 1456 | 349.4 | 13,844.7 | 100.0%
1/07/2022
31/12/2022
1456
Collection Qty
13.84K
Collection Weight
Internal Collections
Internal
External
Location
All
Tenant
All
Overview
Data Quality
Tenant Overview
Waste Streams
Tenant by Month
Non-Recyclables
Contaminate Report
Empty Records
Last 12 Months
Collection Weight and Recycling Rate by Waste Outcome kg
Waste Outcome Non-Recycled Recycled Recycling Rate
2,500
2,000
1,500
1,000
500
0
52.6%
57.6%
62.0%
53.0%
64.5%
61.7%
1365.2
1336.6
1388.0
1227.3
1417.5
1345.0
1230.7
983.5
849.7
1087.8
779.6
833.7
2022 July
2022 August
2022 September
2022 October
2022 November
2022 December
Collection Weight by Year, Month and Waste Type
Waste Type General waste Mixed recycling Organics Paper & cardboard
2022 July 1.2K 1.0K 0.3K
2022 August 1.0K 0.9K 0.3K
2022 September 0.8K 1.0K 0.2K
2022 October 1.1K 0.8K 0.3K
2022 November 0.8K 0.9K 0.4K
2022 December 0.8K 0.8K 0.3K
0K
1K
2K
3K


Dashboard
Fleet Status
1557
Objects
276 (17.73%)
Running
280 (17.98%)
Idle
671 (43.1%)
Stopped
162 (10.4%)
InActive
168 (10.79%)
No Data
Vehicle Halt Area
1557
Vehicle(s)
0 (0%)
Dumpyard
0 (0%)
Transfer station
34 (2%)
Parking station
787 (50%)
Undeployed
568 (36%)
In Transit
168 (10%)
Nodata
Fleet Usage
Today
Total Fleet Usage 24536.52 km
Avg. Distance / Object 15.76 km
Distance
4,000
2,000
0
1
4
7
10
13
Duration
Job Status
543
Job
104 (19%)
Not Started
421 (77%)
Running
3 (0%)
Completed Without Error
9 (1%)
Completed With Error
6 (1%)
Failed
Job Vehicle Status
Vehicle(s)
489
On Job
488
Off Job
1
Job Com...
Last month
Last Month
2
Total
200
Overspeed
Today
Max Speed
0 km/h
0
Alerts
0% Object
Stay Away F...
Today
0
Alerts
0% Object
Job Checkpoint Status
Zone Selection
7785
Checkpoints
170 (2.18%)
Missed
4440 (57.03%)
Upcoming
42 (0.54%)
Delay Visited
66 (0.85%)
Early Visited
2955 (37.96%)
On-time Visited

demo

kira SkySpark

sonrai

BUILDINGS

DLR Group

INDOOR
Denver Studio

AQI	PM 2.5	TVOC	CO2
298 hazardous	32	511	801

INDOOR
Hudson Studio

AQI	PM 2.5	TVOC	CO2
• • • error	...	...	...

INDOOR
LA Studio

AQI	PM 2.5	TVOC	CO2
294 hazardous	37	665	1482

INDOOR
Denver Studio

AQI	PM 2.5	TVOC	CO2
298 hazardous	32	511	801

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INDOOR
LA Studio

AQI	PM 2.5	TVOC	CO2
294 hazardous	37	665	1482

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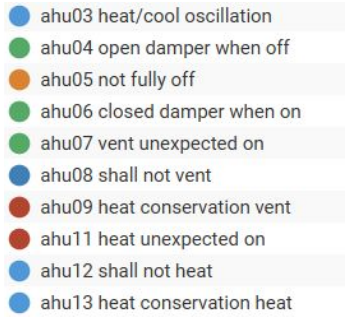
Fault Detection and Diagnosis (FDD)

- Set of rules designed for particular equipment type.

- Simple example - Valve oscillation

  - Controller default parameters never adjusted.
  - Equipment replaced with different dynamics.
  - Hydraulic balance changed over time.

  - Not detected by PLC / BMS alarms.
  - Not detected by technician on site.



It's moving, right? Then it works.

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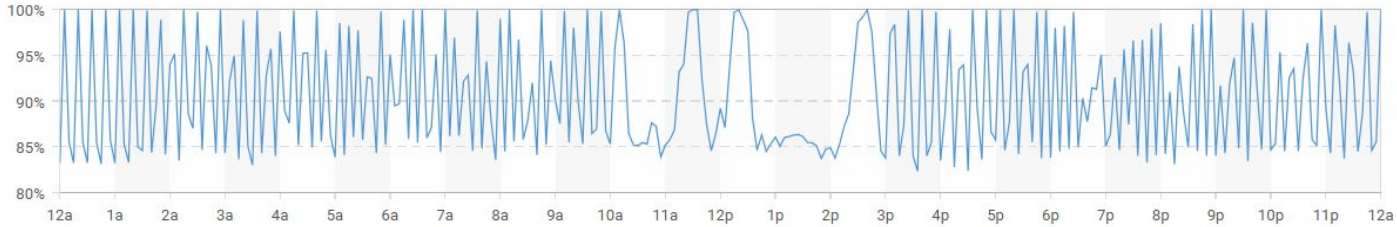
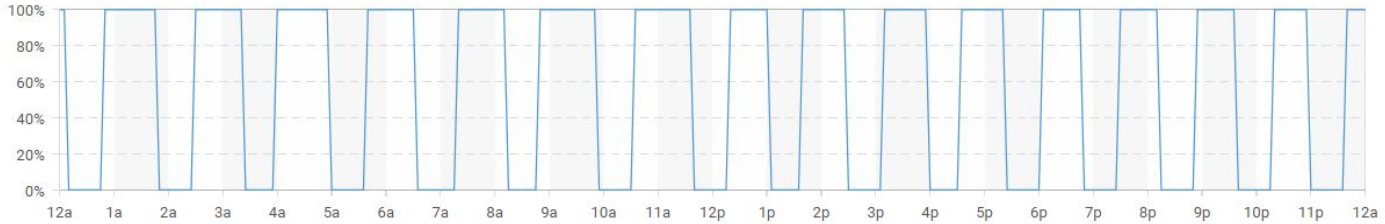
Fault Detection and Diagnosis (FDD)

- Valves are designed typically for 100 000 cycles.
- With incorrect control you can make it in months!



How many valves are in your buildings?

- Oscillations can subsequently cause issues.
- Discomfort, instability of the entire system.



What is your approach?

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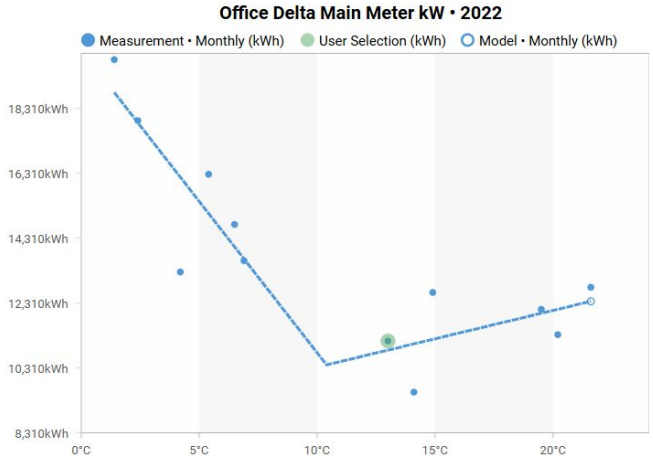
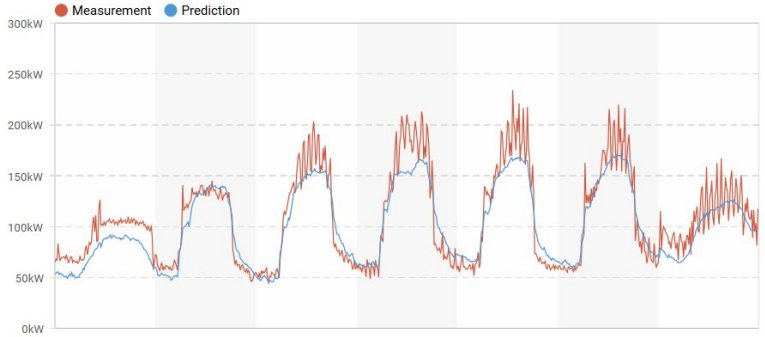
Machine Learning (ML)

- Learning from historical data.
- Simplest example:
  - ASHRAE change point models.
  - Degree-days models.
- **Granularity matters** – moving from monthly to minute data.
  - Rapid increase in model complexity.
  - Results are far more actionable.





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Machine Learning

Use Case	Training Period	Purpose
Energy conservation measure evaluation	Before ECM implementation	Evaluate savings in real time
Continuous commissioning	Stable operation period	Optimize operation, detect anomalies
Grid-interactive operation	Stable operation period	Predict peaks and enable price-driven flexibility

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Different roles have different data needs.

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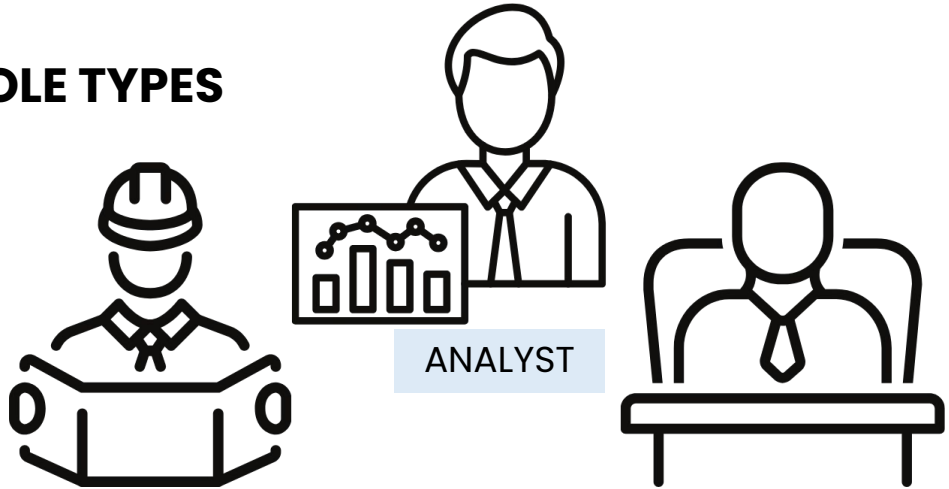
Roles

- Each role needs intelligence from data for action.

TYPICAL ROLE TYPES



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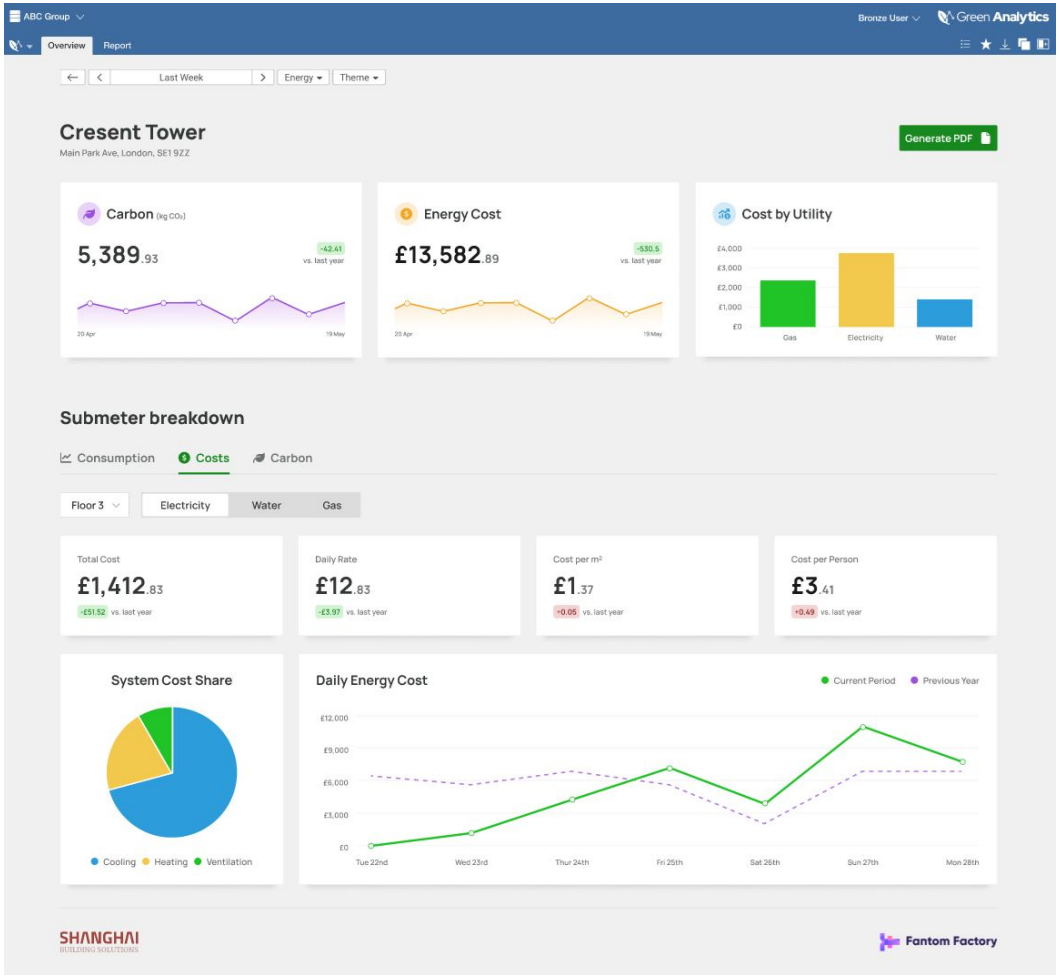
EXECUTIVE



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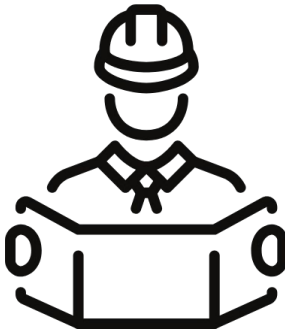
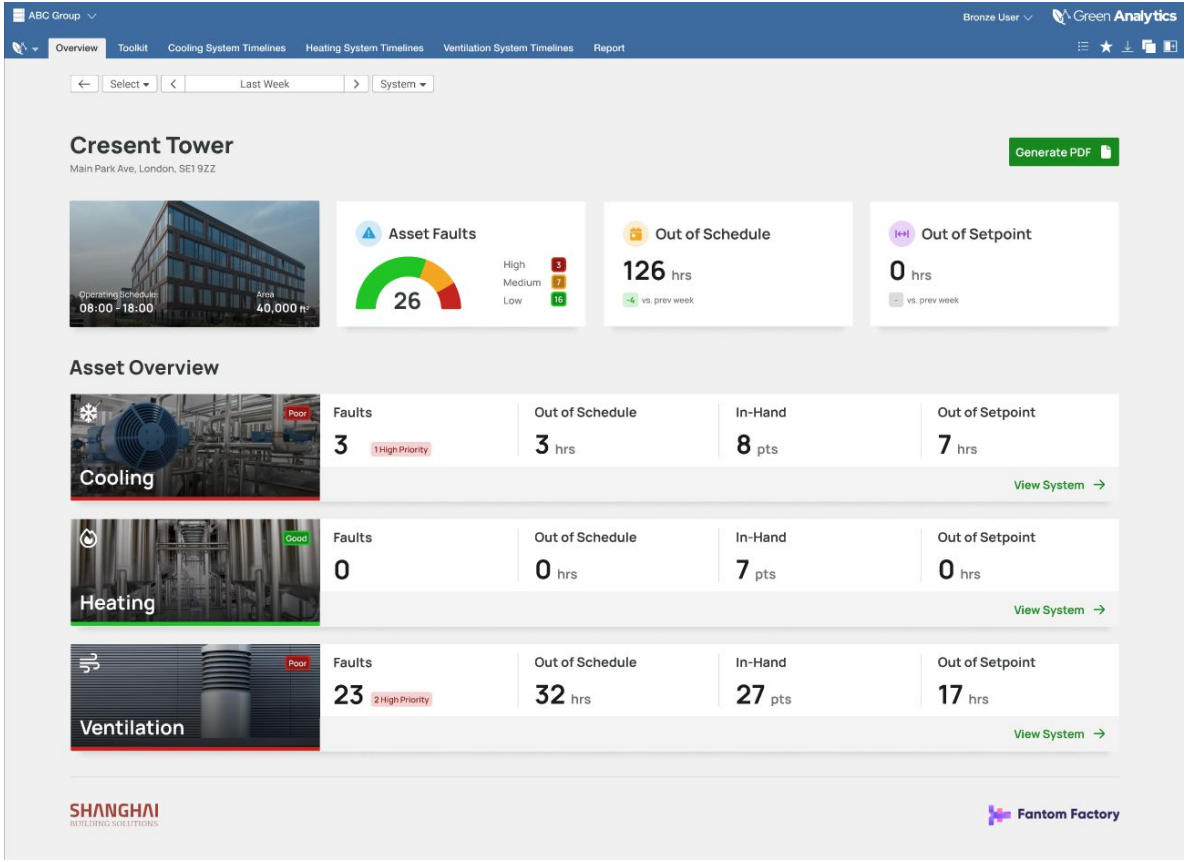


ENGINEER



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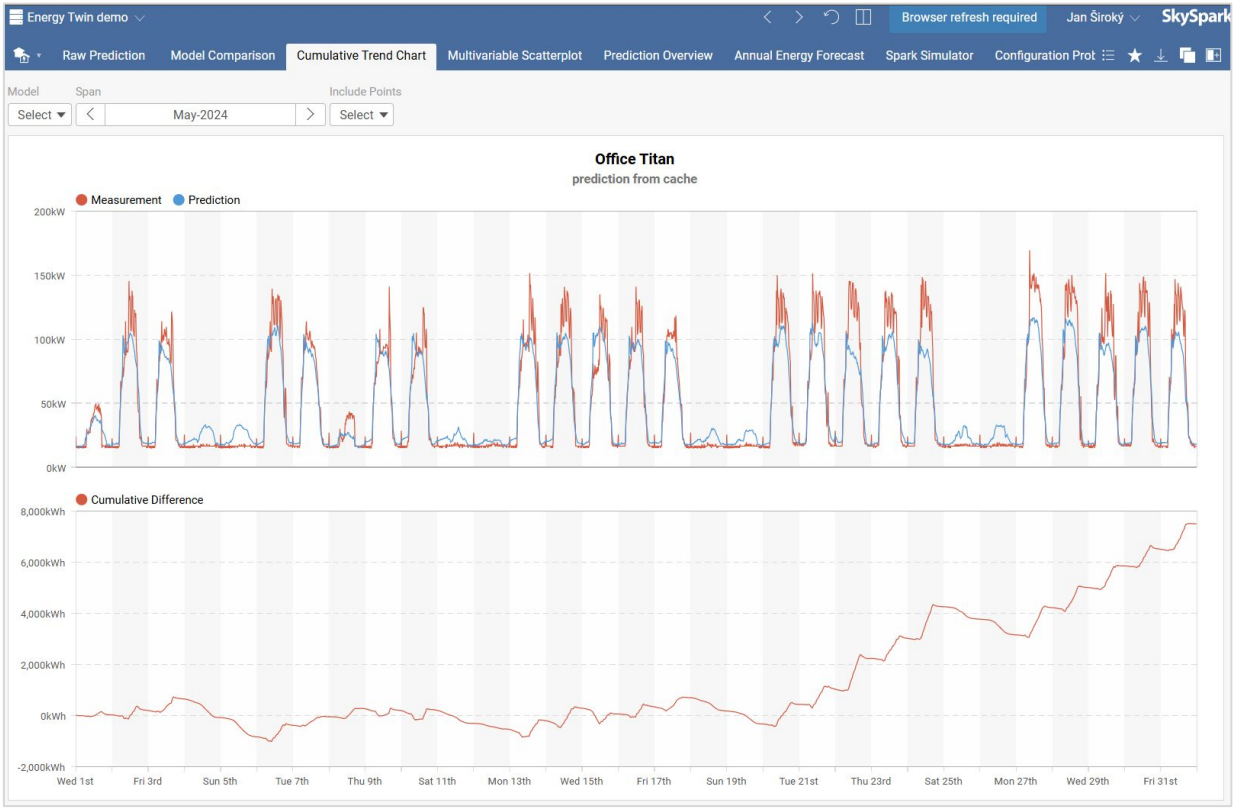
ANALYST



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Key Takeaways

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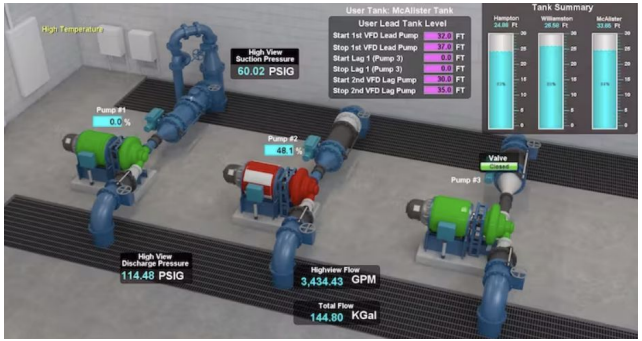
Key Takeaways

- Open BMS with accessible data matters more than flashy graphics.
- Focus on data quality — bad data hurts.
- Metadata makes FDD and ML scalable — and therefore profitable.

3D looks nice, data works better.



Floor Area	Yearly Consumption	Savings potential (%)
393m²	146,624kW	39.8%
11,796m²	2,412,803kW	35.86%
1,385m²	84,715kW	27.87%
389m²	15,589kW	21.68%
293m²	31,332kW	16.74%
272m²	38,371kW	15.19%
57m²	14,849kW	13.83%
187m²	23,387kW	12.91%
181m²	24,354kW	11.37%
435m²	32,435kW	9.379%

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Thursday, Nov 6th 5 PM CET / 11 AM EST