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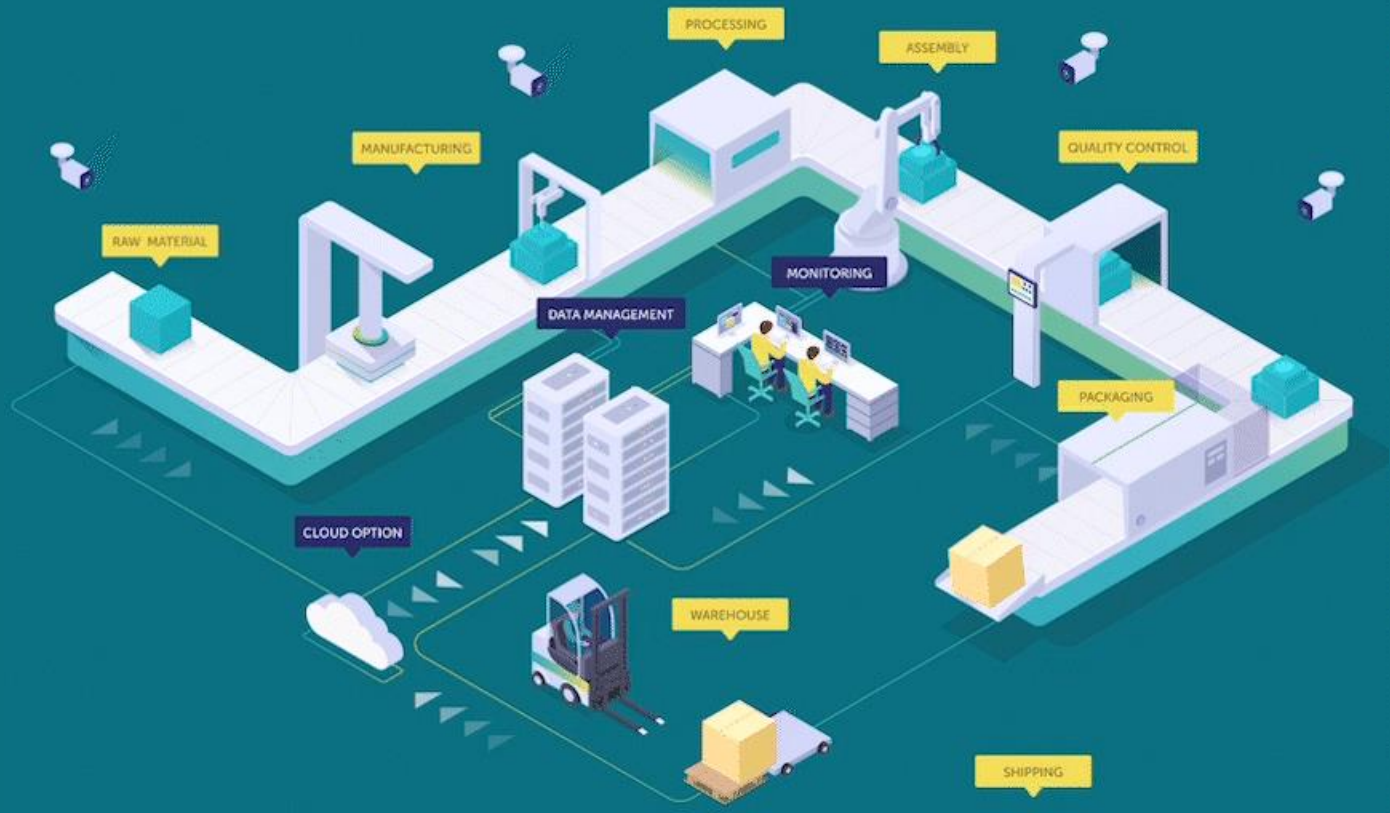

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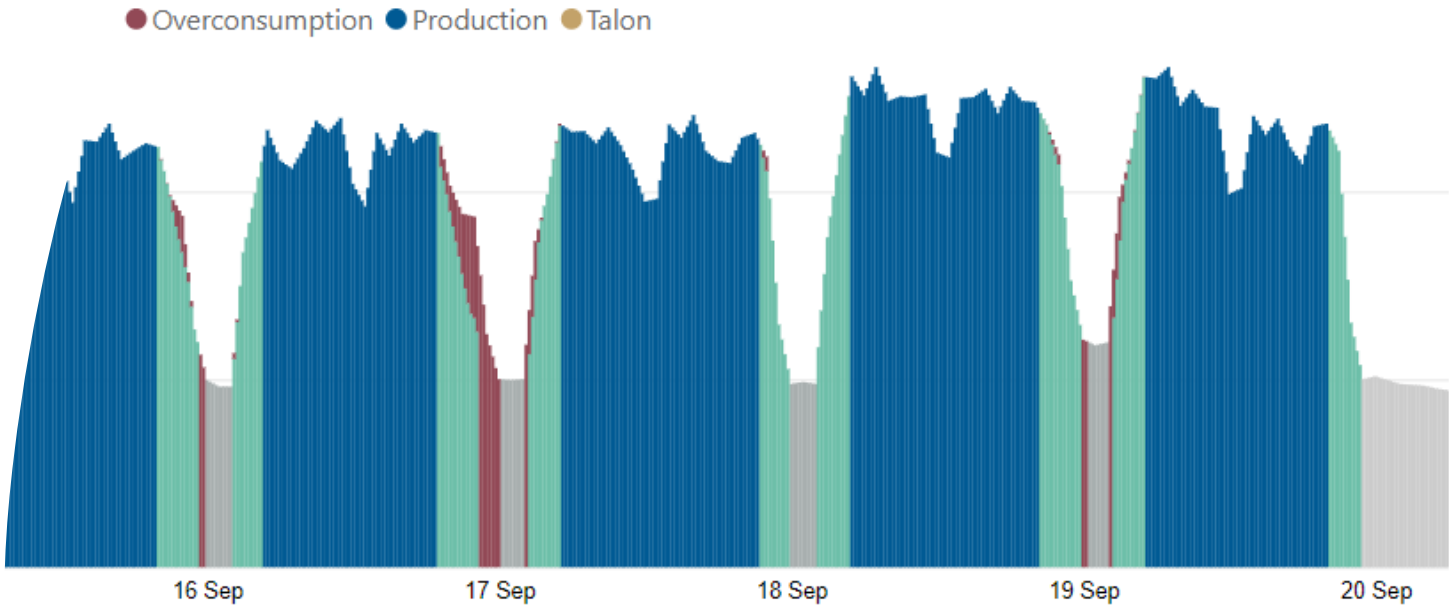
Smart Energy Monitoring

Context

- Talos – is our software for smart energy monitoring and optimization
- The Idea is to find potential optimization points using energy consumption measured on different points in a plant over time



14.09.2020			15.09.2020			16.09.2020			17.09.2020			18.09.2020		
Monday			Tuesday			Wednesday			Thursday			Friday		
kWh	ΔkWh	NPLR	kWh	ΔkWh	NPLR	kWh	ΔkWh	NPLR	kWh	ΔkWh	NPLR	kWh	ΔkW
6660		100%	6782		100%	6376		100%	7250		100%	7667	
4	0	40%	1076	65	39%	867	2	42%	1114	97	39%	1059	0
	176	38%	1377	146	39%	1767	569	36%	877	56	40%	1369	6
		-	-		-	-		-	-		-	-	
		45%	406		43%	436		45%	399		40%	441	

User Story 0

Automatic activity detection for advanced energy consumption analysis

Problem

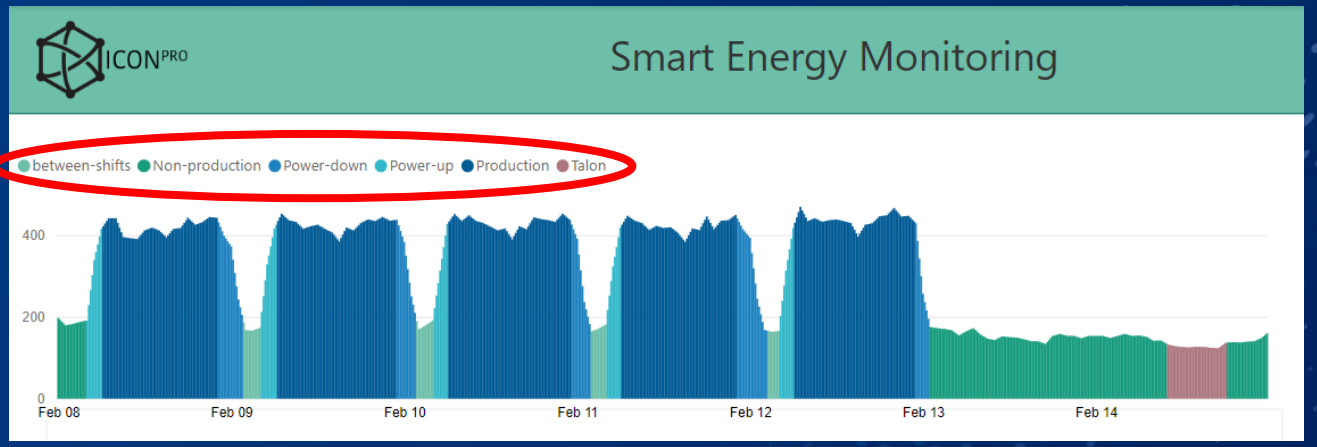
To accurately analyze energy consumption in a plant, it is important to classify energy consumption data into different activity states, such as production, powering-up, powering-down, and non-production. This can be challenging and time-consuming to do manually.

Solution

Our software automatically classifies energy consumption data into the aforementioned activity states, enabling advanced energy consumption analysis without the need for manual labeling or production counters.

Added value

By providing automatic activity state detection, our software can help streamline the energy consumption analysis process and improve its accuracy. This eliminates the need for manual labeling, saving time and resources. The ability to accurately classify energy consumption into different activity states enables more detailed and advanced analysis, leading to optimized energy usage and reduced costs.



User Story 1

Automated energy consumption optimization for all activity states

Problem

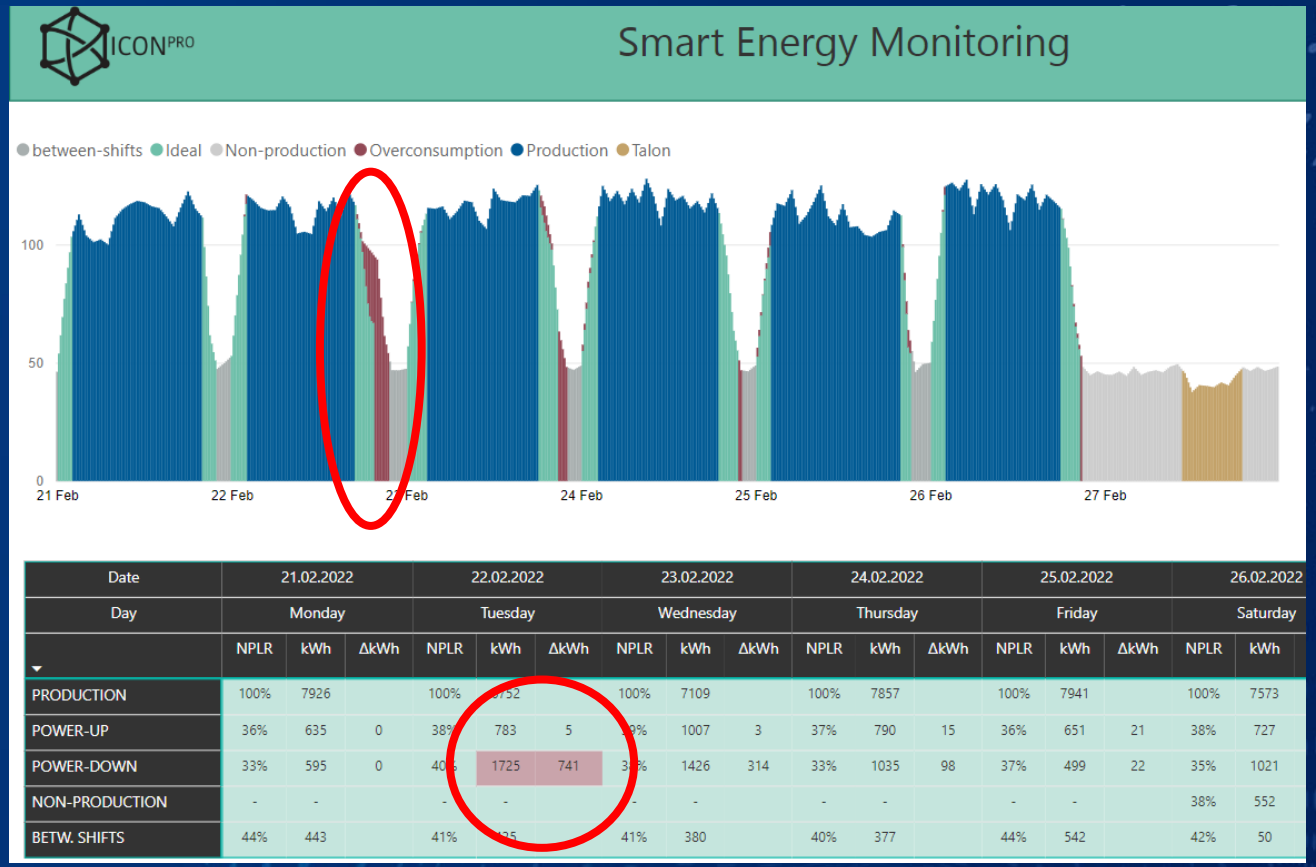
Manual identification of anomalous energy consumption events can be challenging, time-consuming, and prone to error. Additionally, "invisible" factors like outside temperature and previous consumption can have a significant impact on energy usage patterns, especially on gas consumption. This requires advanced analysis methods to effectively detect anomalies during all activity states, including production, non-production, and ramping-up and -down phases.

Solution

Our software provides automated detection and evaluation of anomalous energy consumption events during all activity states. Real-time alerts enable energy managers to take proactive measures to adjust energy usage and prevent overconsumption events.

Added value

By providing automated energy consumption optimization during all activity states, our software can help optimize energy usage and reduce costs. The need for manual identification is eliminated, saving time and resources. The inclusion of factors like outside temperature and previous consumption improves the accuracy of the predictions and ensures that energy usage is optimized based on external factors.



Date	21.02.2022			22.02.2022			23.02.2022			24.02.2022			25.02.2022			26.02.2022	
Day	Monday			Tuesday			Wednesday			Thursday			Friday			Saturday	
	NPLR	kWh	ΔkWh	NPLR	kWh	ΔkWh	NPLR	kWh	ΔkWh	NPLR	kWh	ΔkWh	NPLR	kWh	ΔkWh	NPLR	kWh
PRODUCTION	100%	7926		100%	8752		100%	7109		100%	7857		100%	7941		100%	7573
POWER-UP	36%	635	0	38%	783	5	39%	1007	3	37%	790	15	36%	651	21	38%	727
POWER-DOWN	33%	595	0	40%	1725	741	38%	1426	314	33%	1035	98	37%	499	22	35%	1021
NON-PRODUCTION	-	-		-	-		-	-		-	-		-	-		38%	552
BETW. SHIFTS	44%	443		41%	435		41%	380		40%	377		44%	542		42%	50

User Story 2

Optimize plant heating start-up and shut-down time based on outside temperature

Problem

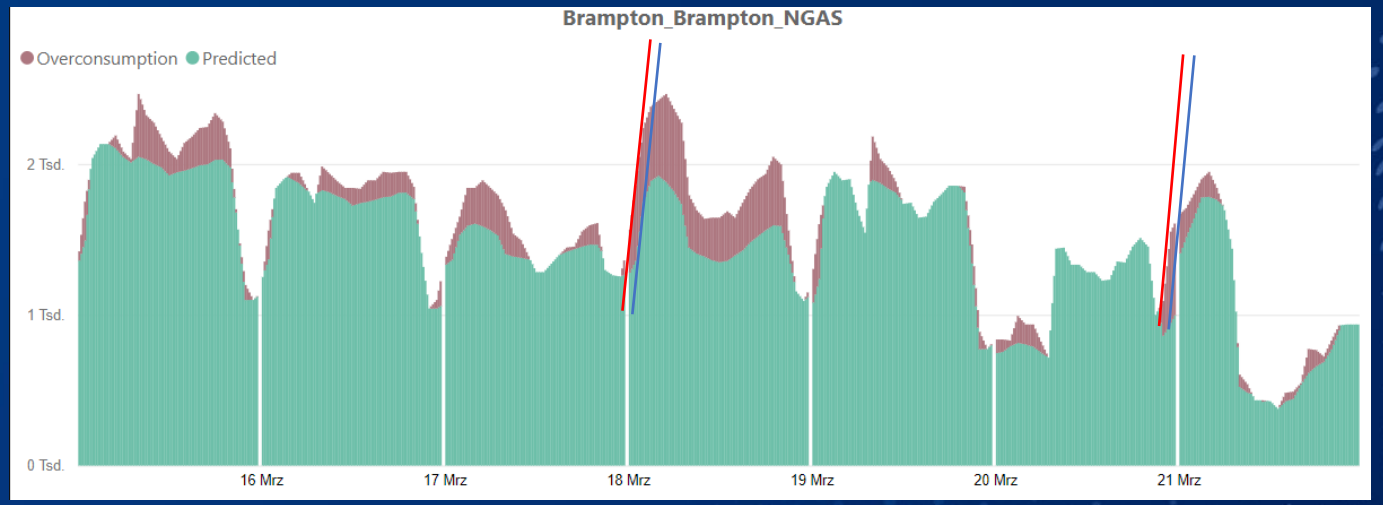
Currently, plant heating is turned on and off either at fixed times or manually, without considering the optimal time based on the outside temperature. This results in inefficient heating usage and unnecessary energy consumption.

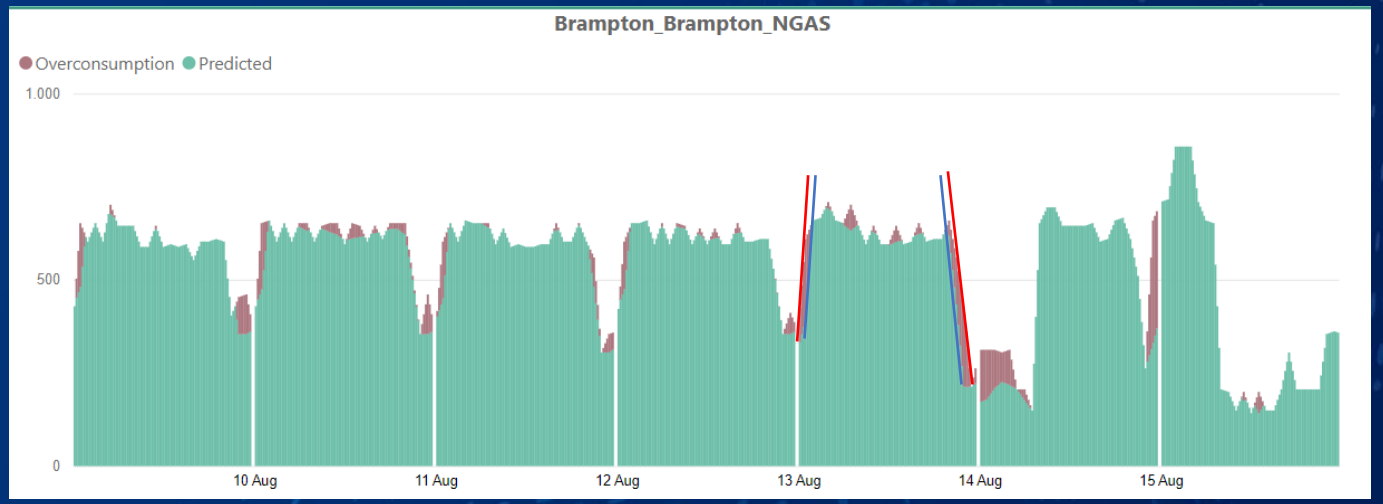
Solution

Our software calculates the optimal heating powering-up and shut-down times based on the outside temperature and other influencing factors using historical data. Every day it provides the optimal times to the energy manager.
Moreover, our software monitors the load curve to ensure it follows the expected trajectory and reports any deviations from it taking into account “hidden” variables like outside temperature and previous consumption.

Added value

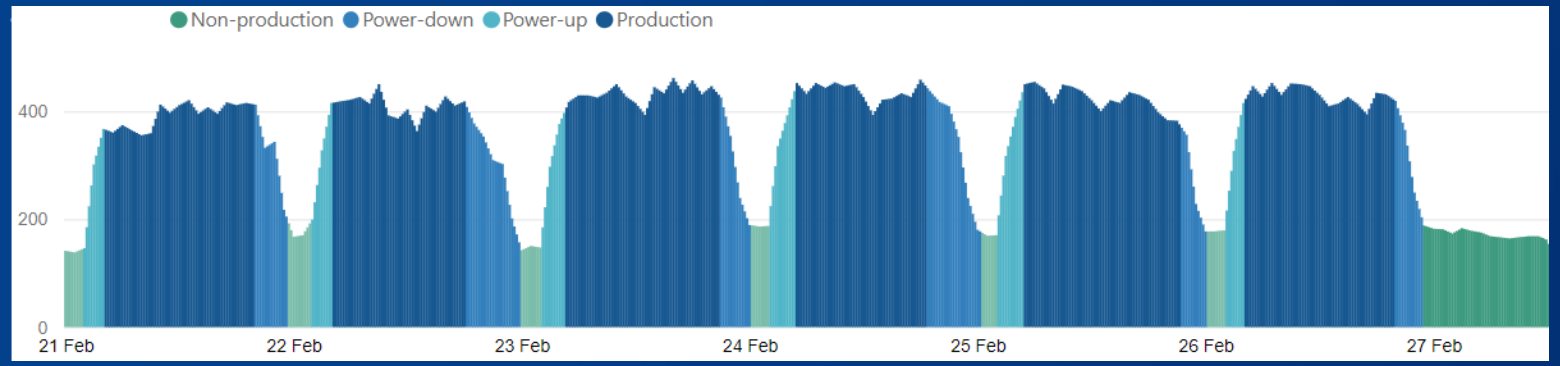
The plant's heating system will consume only as much energy as necessary to reach the desired temperature at the start of the shift and to maintain it during the shift, leading to more efficient heating usage and reduced energy costs.





Task description

Our current solution



Main Task (US1)

- Develop an algorithm for classification of energy consumption data (time-series) into activity states
- Only a part of the data is labeled
- => We suggest to use non-supervised or semi-supervised learning techniques

Bonus Task (US2-3)

- Develop an algorithm for detecting anomalies in energy consumption
- Either point-wise anomalies or activity-state-wise anomaly detection

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Good luck!