PADME - Implemented Use Cases
Improved Customer and Business Value

2019-10-31

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PADME Use Cases

Striving for Customer and Business Value

* **Digitalization** is a revolutionary new area of technology. New technologies often attract attention from early adopters, to whom the actual customer or business value may be of less importance than new cool functions or technology.

* There is virtually infinite potential for developing new and "cool" functions of a **digital twin**, but only relying on "cool" technology as such will have less probability of supporting a successful **business model** and generating **real value**.

* **PADME** has strived to identify **Use Cases** that will generate actual Customer and **Business Value**, resulting in measurable improvements of identified **KPI's**.

* These presented Use Cases are a few **possible ways of using a Digital Twin** to generate value for customers and businesses. As the Digital Twin technology is further developed, many more Use Cases are expected to be identified.

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UC1: Real time update of location of products

Summary

To ensure fast and **preventive reaction** to ongoing and imminent **process stops**, every product will in real time communicate it's exact position in the process and compare this to its planned position on the process map.

This will lead to faster reaction times, and in turn **less disturbances**.

Current Situation

Process stops are often identified as a queue builds. **ERP** and **visual checks** are needed to locate specific products in the flow.
This is time consuming and may **delay necessary countermeasures**.

New features

* Real time **location** (process step or buffer) compared to expected location
* Calculation of potential **process stops**
* **Real time** presentation on a process map
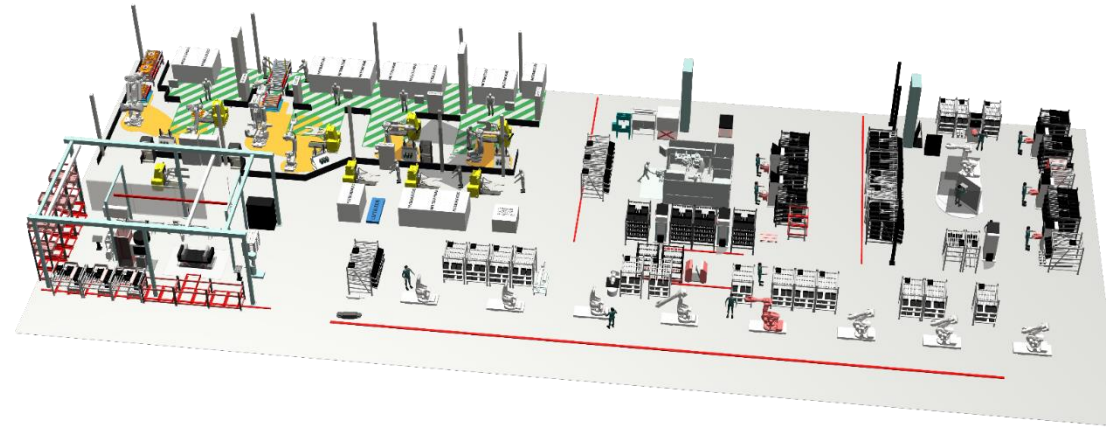
Solution

Real time presentation of **work station content**, i.e. what order is in a cell, and comparison to planned location and actual **warnings** for imminent process stop.

KPI improvements

* Decreased **Process Stop Time**
* Decreased **Lead Time**
* Increased **On Time Delivery (OTD)**

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UC2: Real time update of status of factory

Summary

To ensure fast and **preventive reactions** to ongoing and imminent **process deviations**, every product and process step will in real time communicate its status, incl. error codes etc, on process map.

This will lead to an improved overview of the status of production, leading to faster mitigating actions and **fewer deviations**.

Current Situation

Process deviations will generate problem solving actions, but often as a result of an ongoing deviation. Multiple deviations in the process cause difficulties in obtaining an overview and in prioritizing issues.

New features

* Real time **status** (time, position, quality etc.)
* **Real time** presentation in a process map
* Comprehensive picture of **complete factory**

Solution

Real time presentation of **workstation content**, i.e. what order number is in cell. Compare to **planned location** and present **status warnings**.

KPI improvements

* Decreased **Process Stop Time**
* Decreased **Lead Time**
* Increased **OTD**

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UC3: AI planning of mixed-model production

Summary

Optimization of **Mixed-Model production sequencing** by an Artificial Narrow Intelligence (ANI) testing different sequencing solutions of a digital twin until an **optimal sequence** is found.

To further improve sequencing, cycle times are updated in real time with frequent intervals.

Current Situation

Due to very **high numbers of sequencing alternatives**, common manual planning methods by humans **cannot** in reality identify the **best possible sequence**.

New features

* **Simulation** of sequences with static data
* **Real time** updated cycle times
* Identification of **optimal Mixed-Model sequence**
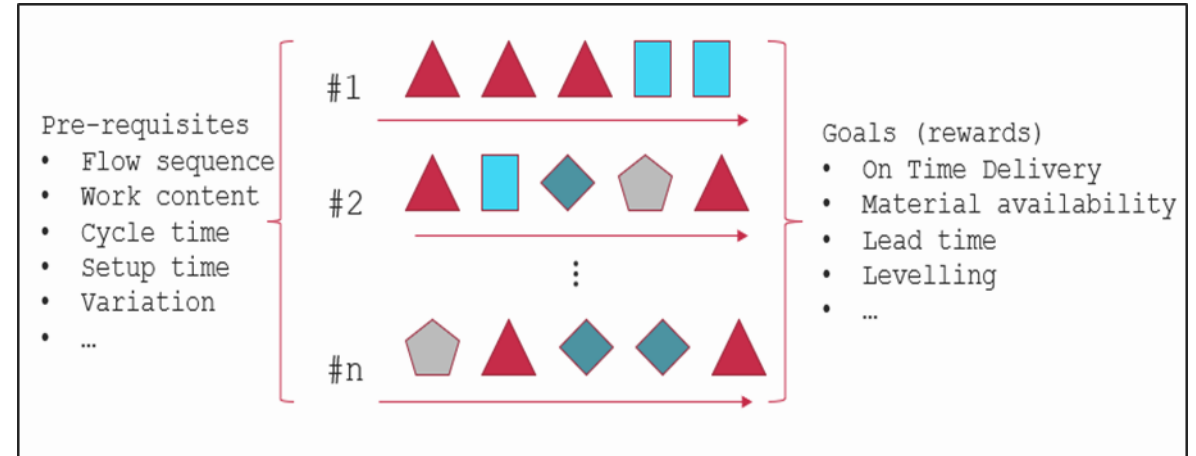
Solution

An ANI algorithm tests **all potential production sequences** until the optimal production sequence, based on critical KPIs, is identified.

KPI improvements

* Decreased **Lead Time**
* Reduced **Workstation Idle Time**
* Improved **Levelling of Production**
* Increased **OTD**

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UC4: Predictive Maintenance by Digital Twin

Summary

By supervising the machine status and performance, **errors** may be predicted and **avoided** by planned and **preventive maintenance activities**.

Current Situation

Maintenance causes **unnecessary downtime** due to needless stops (overestimated worn out) or failures (underestimated worn out).

Solution

Continuous supervision of machine status and quality results to identify **optimal time for** maintenance **activities**.

New features

* Collect **performance data** from equipment
* **Trend analysis** of data and comparison to specification and limits.

KPI improvements

* Decreased **Process Stop Time**
* Decreased **Costs**
* Increased **OTD**

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UC5: Continuous Time Studies

Summary

To improve the **accuracy** of **planning** and forecasting, time studies will be done **continuously** and will be automated instead of manually performed in infrequent intervals.

ACTIVITY LOG

	ACTIVITY TYPE	START TIME	END TIME	DURATION	
WS10	Bolt Axis 1 gearbox on foot	12:50:12	12:51:50	90s	>
☑ WS10	Vision system task 1	12:51:50	12:55:56	20s	>
WS10	Bolt Axis 1 gearbox in stand	12:56:21	12:59:26	80s	>
WS10	Vision system task 2	12:59:26	12:59:26	10s	>

Current Situation

Time studies are often performed seldomly and often manually. The time study may also contain biased and unrealistic data, which may cause **inaccuracy** in all kind of **forecasting and calculations**.

New features

* **Collect** start and stop process **signals** for workstations and for individual order numbers.
* **Analyze** Cycle Time and update average, median, trends etc.

Solution

Real standard times are **continuously** updated and **variations** (process and human) **identified**, enabling corrective and preventive actions.

KPI improvements

* Decreased **Process Stop Time**
* Increased **OTD**

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UC6: Support in problem resolution

Summary

Combining data of UC1 (location of product), UC2 (status of process) and UC4 (predictive maintenance) a **comprehensive picture** of the **production process** will be available.

This will **support the problem resolution**, with less and shorter stop times.

Current Situation

As a problem occurs and production may be stopped, operators and technicians start troubleshooting by checking visual signs and error codes. This may be a **time-consuming** task, with a risk of being performed in an unstructured manner.

Solution

Predictive maintenance minimizes unexpected down time. **Real time warnings** give instant status of product for immediate **counter measure**.

New features

* **Real time** monitoring
* **Predictive** maintenance

KPI improvements

* Decreased **Process Stop Time**
* Decreased **Cost**
* Increased **OTD**

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