Real-time tracking of parts & material genealogy improves throughput and quality

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Total Production Optimization (TPO) software provides manufacturers with process automation and optimization. As a leading of Intelligent Automation Software for advanced manufacturers, Plataine developed a complete software solution which, combined with state-of-the-art sensors technology, enhances reliability and total quality control during composites parts manufacturing process.

Total Production Optimization (TPO)'s methodology/steps developed by Plataine are visually illustrated in the below pyramid illustration; Figure 1 illustrates the idea behind this sophisticated platform that turns data collected by various customer sources into knowledge, analyzes the knowledge to create insights, alerts and 'Digital Twins' for critical assets. Lastly, the platform uses mathematical-based software algorithms to automatically turn that knowledge into optimization decisions and real-time data driven actions. Here is the three principal steps detailed.

Step #1: Automatic data collection and digital tracking

Creating a real-time complete digital view for enhanced visibility and context-aware optimized action to regain control and visibility by backend systems' dashboards and reports, gain increased traceability and better costing evaluations.

Produced parts inherit quality-related information (such as expiration date, shelf life and ETL) from their 'parent' raw material, before they are even independently tracked. In cases where the traditional manual or semi-manual practices rule, delay of manufacturing process is a substantial threat as hours or even days could pass before the affected parts and assemblies are tracked and traced down. The risk a manufacturer faces is extremely concrete and real and may often lead to production delays assuming quality compromise is not an option.

The innovative technology involves both sophisticated software and IIoT sensor network to collect, store, track and manage vital production progress and data, including raw material, kits, assemblies, tools, labor and machines. Figure 2 illustrates how more and more context is collected, stored and analyzed along the lifecycle of manufactured parts, using the innovative technology.

This technology incorporates all relevant information (such as the roll/ kit/ assembly's dimensions, shelf life, material out time, location, status etc.), stores it in the software's database, monitors the status of each of those assets and stores all past and future actions relevant to each asset. A rich digital context is now automatically created, significantly upgrading the manufacturer's tracking capabilities by enabling complete view in real time. This digital database is fundamental to creating real-time visibility, historical reporting/ analysis, and serves as an historical repository for traceability and auditability.

Step #2: 'Digital thread' and 'Digital twin' for full genealogy, from raw material to finished product

Parts, assets and other resources are tracked throughout the production process while each change in context related to each item (such as: location, condition, status or exposure time), is logged into the system updating the 'digital twin' of the tracked item (i.e. a digital record of any physical asset, including

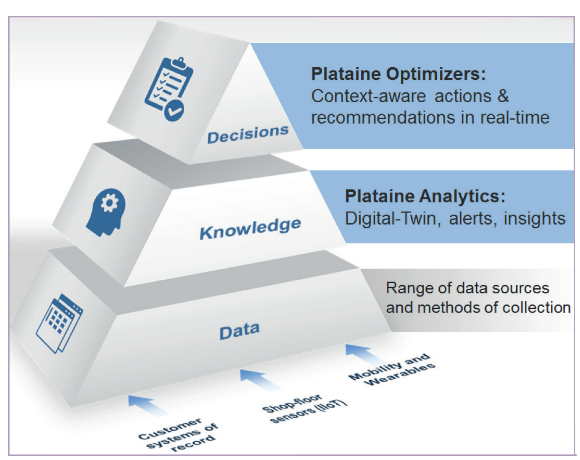


Fig. 1: sophisticated algorithm turn data into knowledge, and knowledge into decisions allowing real-time data driven actions

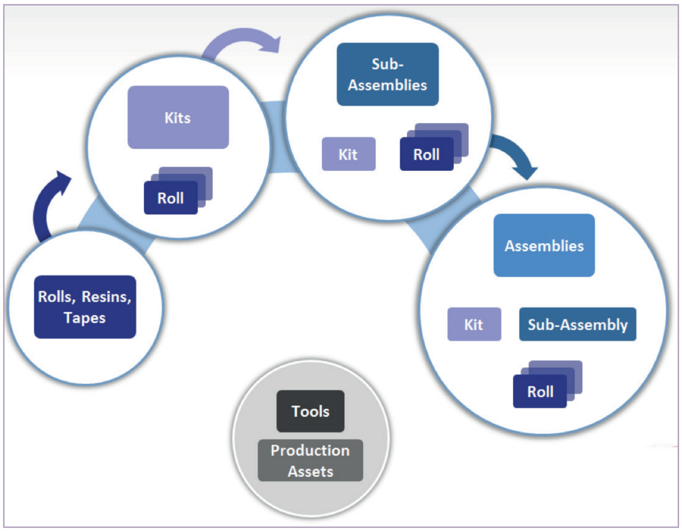


Fig. 2: Parts manufactured on the production floor inherit information from their 'parent' parts or materials before they are independently tracked

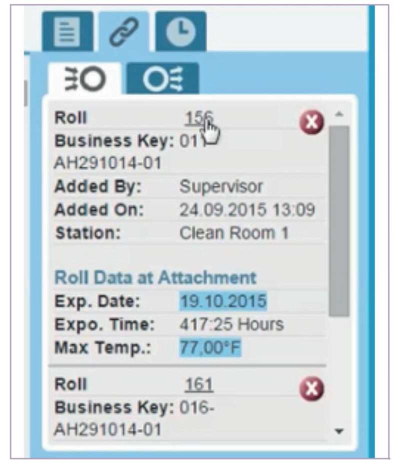


Fig. 3: Following the digital thread; all related information of a new roll is attributed to the existing kit and vice versa

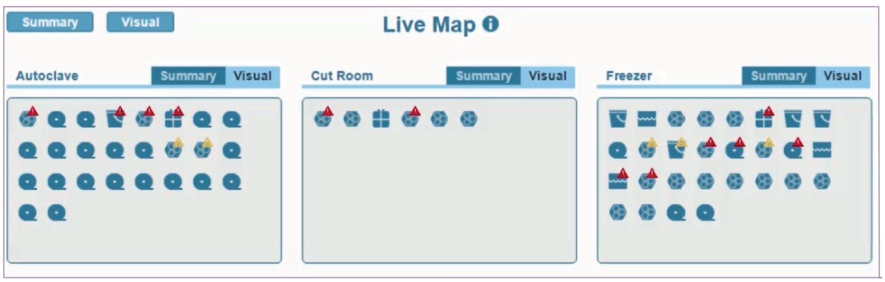
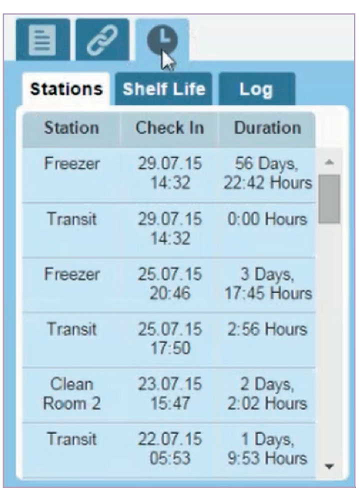


Fig. 4: Live map shows all assets location, highlighting assets in jeopardy

its history, time sensitive data, status, location as well as its relationship with other assets). Figure 3 below demonstrates how when new raw material (see below 'roll 156') is allocated to a specific kit, all its related information is attributed to it and vice versa, thus the new kit inherits its expiration date and ETL from the originating roll.

With a rich, digital data and view of actual and historical production information for each part created, there are several levels of increased value such as real-time visibility, insights and intelligent alerts. A Live map (figure 4) shows assets' locations and status, updated automatically and highlighting assets which reached thresholds with real time alerts and notifications for supervisors to allow real time data-driven actions (see step #3 to follow). Figures 5a & 5b represents how location and status changes for each asset are stored in the system creating a digital twin.

Doing so establishes wealth of information that could be integrated to backend systems for reporting, auditability and traceability. When new parts are fabricated or when a kit is added to an assembly a digital presentation of each step of the production process is recorded, creating full genealogy, visible to all stakeholders and stored in the system.



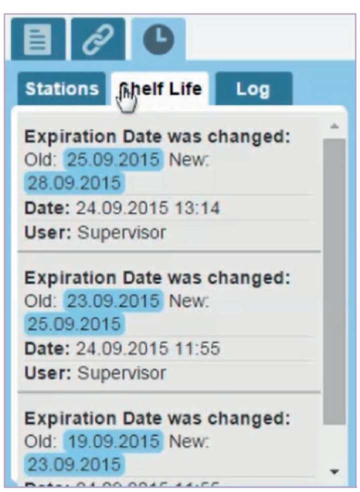


Fig. 5: Location changes are stored in the system (a), As well as time sensitive data, creating a quality oriented 'digital twin' (b)

Step #3: Optimized, automated, context-aware decisions and actions from production planning to execution whith the complete picture in real time

In any case of production failure - such as: damaged raw material, damaged tool, tool's availability, kit re-cut, freezer malfunction and its shelf-life impacts, or any other quality assurance failure - immediate action is enabled as all changes of each tracked asset are logged into the system, creating a digital 'twin' of it. TPO's algorithm automatically turn that knowledge into software-driven actions, optimization decisions and real-time data driven actions, using shop-floor sensors and RFID-based technology to track assets' movements and status on the production floor along its entire lifecycle.

Conclusion

Matching the order due date/quantity, actual material expiration date and size (width & length) while considering the full order plan for additional optimization opportunities, TPO drives significant cost savings and increased productivity. □

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