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FREE GUIDE

PROCESS MINING FOR THE FACTORY FLOOR

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Introduction

The manufacturing world is quite different now than it was 50 years ago. It's even different than it was 10 years ago! Increasing adoption of digital technology has revolutionized how you source, produce, track, and even ship your products. Each stage in the supply chain can be streamlined; scaled up or down; and made more efficient by the strategic use of new technology.

One of the technologies that is revolutionizing manufacturing is process mining. By collecting and analyzing data breadcrumbs left by most IT systems, process mining can highlight areas of your production facility that are operating smoothly, and those that might need some tweaking to boost ROI.

Even the old stand-bys of manufacturing like Overall Equipment Effectiveness (OEE) and process visibility are evolving at an ever quickening pace. Is your company ready to keep up?

#2

Benefits of Process Mining in Manufacturing

Process mining is the use of data mining techniques and algorithms to map existing business processes. Most processes that involve IT systems (for example, CRM, ERP) leave behind event logs that are accessible on your network. Process mining simply uses these logs to map processes, giving you a visual representation of the production line from start to finish. This allows you to easily find and remedy any bottlenecks, gaps, or other sticky points in the manufacturing process.

Process mining is a standalone technology that sits on top of, or if you like, in tandem with, your existing IT systems. Since it does not have to tax your infrastructure (logs can be dumped during off hours, for example), it won't necessarily have any effect on production. Once the software is installed and configured, it's a simple matter of running it against your event logs, and you'll have your process maps.

For example, your inventory tracking system, your production management system, and your customer relationship management (CRM) system all have data relating to your production timeline. Process mining is a powerful way to see how these systems interact. This can allow you to see how the inventory system is causing delays in production runs, while at the same time a particular customer is late on their invoice every month, leading to further delays while you wait for this capital to come in.

A SHORT LIST OF BENEFITS WILL INCLUDE

1. Shorter lead times

By streamlining your inventory and stock processes, you can eliminate the bottlenecks often caused by inefficiencies in these systems.

2. Improved efficiency

By finding those bottlenecks quickly, you can eliminate redundancies and clear out extraneous steps.

3. Better use of manpower

With process mining, there's no need for operations teams to take time away from their day to collect the data manually.

4. More effective process mapping

Since it's automated, process mining can combine data from multiple systems into one visualization.

ALL OF THESE INEFFICIENCIES ARE LOWERING YOUR OEE, BUT PROCESS MINING CAN HELP BRING IT BACK UP.

OEE? Just What is That?

Before we get into the details, here's a quick primer on OEE for anyone unfamiliar with the concept. Overall Equipment Effectiveness, or OEE, is calculated by taking three metrics from the manufacturing floor:

Quality
The ratio of the number of good products to bad products that come out at the end of the manufacturing process.

Performance
The speed at which these good products are created.

Availability
The overall up-time of the manufacturing equipment involved.

The OEE equation then turns these three statistics into a single percentage rating of your manufacturing efficiency. Facilities use this rating to determine the effectiveness and efficiency of their manufacturing processes as a whole.

Questions to ask about your OEE

Q: Is the data you're using to calculate OEE readily available when you need it? Or do you have to schedule downtime so the production team can collect the information you need?

A: We'd wager the second scenario is more likely, since data on things like machine availability is generally only known to the people who fix that machinery when it breaks down. Meanwhile, it's the QA department who have the knowledge about the quality of your products, and operations who are most likely to have the performance metric.

That's a lot of people to coordinate.

Q: Think about your current OEE number. Are you happy with it?

A: Unless a facility is operating at 90% or better, there is probably room for improvement. How much of an impact would it make to your bottom line if you could stop relying on a cross-departmental group to collect the data you need to start calculating your OEE? Pretty huge, huh? This is where process mining can help you maximize OEE for your manufacturing business.

How process mining can help you maximize OEE

When it comes to maximizing your OEE, you need to have a baseline for your operation. That way, as you institute changes, you have something to compare your new numbers to. Process mining is there to help with both the initial scan and establishing that baseline, as well as continual monitoring and rechecking going forward.

Help identify bottlenecks that delay production. Eliminating these bottlenecks will speed up your production time and can lead to fewer bad units being created.

Speed up production processes by locating gaps. This one affects all three aspects of OEE: quality goes up if the gaps are causing flaws in manufacturing, performance goes up because every gap causes slow downs, and availability goes up because gaps can cause machinery to sit idle.

Reduce inventory costs. By identifying when stock is needed, unnecessary spending as well as excess inventory sitting idle are eliminated.

Identify flaws in your inventory system. Process mining may reveal that your vendors are not holding up their delivery commitments, thereby affecting your ability to finish a production run on time, and therefore affecting your performance metric when calculating OEE.

Process mining and OEE are indeed made for each other. Or more accurately, OEE has been waiting for process mining to come along and complete it. Process mining can streamline your process data collection, cutting out the rote manual collection of days past. This in turn means your production line analysis will be quicker, cause less interruption in production, and raise your OEE rating in no time!

As you dig into the ways process mining can drive your OEE up, you may stumble upon other areas of your business that seem to need attention. One of the things you may uncover is what's called an "hidden factory."

A hidden factory is the name given to processes that run, seemingly off the map, alongside the known production processes. These processes can lead to increases in overhead costs, and with no breadcrumbs to trace, you may not be able to eliminate them without costly investigations.

VISIBILITY INTO YOUR PROCESSES IS THE KEY TO AVOIDING THIS BUSINESS PITFALL.

#3

End-to-End Visibility is the Key

End-to-end production line visibility. Definitely a worthy goal. And if you were to attempt to achieve this full level of visibility all at once, it would be a monumental undertaking. But by breaking it down into smaller, more attainable milestones, you can reach your desired level of transparency without it being as painful as you're imagining, thus eliminating your hidden factory and driving costs down.

There are additional reasons for a manufacturing company to seek end-to-end visibility:

Social compliance: Customers are demanding more transparency, and many manufacturers are complying with that market pressure.

Regulatory compliance: Depending on your industry, the government may require extensive reporting.

Return on investment: End-to-end visibility can contribute to decreased downtime, increased productivity, and the ability to conduct predictive maintenance on your equipment.

4 Types of Visibility

Before you take on a transparency project, it's important to know what you're trying to see. In a production environment, there are four key areas of visibility.

Asset Process Product Customer

ASSET
Being able to track supplies from the warehouse to the factory floor.

PROCESS
Tracking your assets as they go from supplies to end product.

PRODUCT
Tracking products from your factory to your client's door.

CUSTOMER
Giving your customers a portal where they can view the status of their order or support request.

Once you have an outline of your current situation, and a direction for the necessary improvements, it's time to start developing your plan.
How to accomplish this level of visibility? By starting one step at a time
Given the complexity of a manufacturing facility, and the sheer number of processes, people, and machines involved,it can be cost prohibitive to go all-in. With some careful work and planning, however, it is possible to reap the benefits of increased transparency while working on the necessary upgrades in stages.

Start by assembling a list of current issues. Whether it's inventory tracking, shipping and returns, or customer service backlogs, the more complete this list, the better start you'll have.

Second, map the processes for each scenario. This gives you a handle on the departments, personnel, and equipment involved.

Next, assess which of these processes offer the necessary level of transparency, and which do not.

And finally, address the areas that lack visibility. Either by integrating them into a process that has attained the required transparency, or by developing a plan to automate or redesign the process so it addresses the cause of the problems found.

Start Upgrades from the System's Backbone

Before you can add hardware or software that will draw on existing IT resources, you'll want to evaluate your network infrastructure, to ensure it's ready. Every one of the systems you'll be bringing online in your efforts to increase visibility will rely on this infrastructure:

IIoT (Industrial Internet of Things) sensors rely on a connection to the cloud to report their data.

CRM systems are only as powerful as their ability to transmit data to customer service reps and customers.

Process mining software needs access to your existing systems to compile data on your as-is status.

You will ultimately need visibility into all these segments of your network.

Questions

Where is your infrastructure?

> Whether it's on premises or in the cloud, your infrastructure needs to be scalable to support your future use of IIoT assets and process mining software.

Where do you need to focus resources?

> Look back at where the problems cropped up when you were assessing your existing network. Is the priority your contact call center? The network hardware (routers, access points, and so on) at your factory? Or is the network at the main office the primary source of your problems right now? Focus energy and resources as appropriate.

STARTING WITH A ROBUST AND SCALABLE NETWORK INFRASTRUCTURE IS A NECESSARY FIRST STEP.

Deploy IIoT Sensors on Your Factory Floor

Fitting sensors to your existing production machinery is a great next step. These sensors collect and transmit real-time information, from the status of production levels, to reporting the health of the equipment on the factory floor.

IIoT sensors monitor the production of your line by tracking the raw material entering your line, and the number of finished good units that come out the other end.

Along with this increased visibility, IIoT sensors can alert your technicians when a piece of equipment is beginning to operate outside optimal parameters, so they can perform proactive maintenance and avoid downtime.

On top of these benefits, IIoT sensors are a necessary step in developing a digital twin of your business. Digital twins provide many advantages to a manufacturing company, including prototyping and process development. You can test new design ideas and processes in the digital environment before deploying them in the real world. This cuts expenses by bringing to light any potential areas of failure, design flaws, or process gaps before they can cause production to halt.

Strive to Integrate Systems

Once you have a robust network infrastructure in place and your production-line sensors are up and running, it's time to ensure that the right data is indeed visible to all necessary stakeholders. Aside from allowing needed access to ensure transparency, this step gives you easier access to the combined data available from these systems. In the past, you would have had to do manual exports and analysis of each disparate system to achieve this.

CMS, CAD/CAM, MES. All of these systems rely on that IT infrastructure discussed above. This also means that to at least some extent, they can be integrated. It may involve custom ETLs or APIs, but the results will make it worth the initial effort.

Don't overlook your CRM and trouble ticket systems. These are an endless source of insights into your customers and their satisfaction with your company. These systems can also give you a glimpse into the workings of your customer facing teams that you might not otherwise get.

The overall benefit to this step is to decrease the number of places someone will have to look to find the information they need. Since the goal is end-to-end transparency, this is an integral piece of the puzzle.

Creating end-to-end visibility of your production environment is no small feat. With advance planning and a measured approach, however, it doesn't have to be painful. And the benefits your company will reap well into the future will be a boon to your bottom line, compliance, and customer satisfaction.

#4

Case Study: Manufacturing Project

Our client is a global fashion group with manufacturing facilities around the world. Their annual revenue is in the $3 Billion range and they employ more than 100,000 people. The process mining was run on SAP ERP.

Problem Statement

There are three areas the client wanted to explore with process mining:

1. Hidden opportunities in the end-to-end manufacturing process. They believed there to be areas of deviation from regulations that may have been influencing the overall performance of their manufacturing processes.
2. They had a long-term goal of lowering the time their design-to-scale process takes to under 4 months. The fact that this process was taking longer than this directly impacted their ability to transfer between product seasons, leading to additional logistics expenses.
3. They needed to analyze their product families in greater detail. In order to focus on the products that bring in the highest revenue, they needed greater visibility into their processes and the overhead associated with each.

Baseline Information

The timeframe for cases mined was 8/21/2015 through 8/17/2017. At the end of the initial run of process mining, a total of 6015 cases were analyzed. Of these, 4704 were complete, end-to-end production runs. The median case duration came to 5 months, 28 days, and 5 hours. Total number of events analyzed was 62916 spread over 11 activities.

In the end, 1467 variants of the process were discovered, plus 1628 cases where changes to the initial order occured.

Initial analysis showed that, as expected, cases with additional logistics (transfers) and other forms of non-compliant process variations had a significant impact on process duration. What was not expected was that these cases made up the majority of total orders.

ROI Increases Realized by the Client

Upon further analysis, the client determined that these cases were leading to production runs taking nearly 50% longer than their goal of 4 months. They also discovered a far larger number of non-compliant processes and overall low standardization of production activities. They developed a 4-fold set of goals moving forward:

Elimination of additional logistics costs
By optimizing logistics, costs can be cut and delivery times improved.

Shortening of process cycle
By streamlining the processes for the product families specified, overall performance of the facilities can be improved.

Process standardization
Once processes are standardized, they are easier to manage and maintain, leading to additional overhead savings.

Ensure process compliance
Compliance allows customers to see their order in process, along with further cutting of overhead.

#5

Summary

As you can see in that client case study, the potential savings that can be found through process mining are substantial. By implementing the infrastructure improvements outlined, along with process mining software operations, you can see these increases to ROI, decreases in overhead spending, and overall improved performance of your manufacturing business processes.

Try Minit

Minit is robust enterprise-grade Process Mining software with a rich 360° collection of dashboards and process performance indicators. Whether you are focused on reducing operational costs, shortening customer feedback time, taking advantage of new revenue streams, or optimizing old ones, Minit Process Mining reveals an otherwise invisible map towards process improvement. Get in touch with our team to learn how it can help deliver effective business process improvement at your organization.

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