

Precision manufacturing meets precise data

A NORWEGIAN MANUFACTURER'S PATH TOWARDS INDUSTRY 4.0

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Client

HTS maskinteknikk

Leading manufacturer and global supplier of high quality mechanical precision components to the subsea, aerospace and defense industries.

Equipment

38	CNC machines
5	Robots and robotic cells
13	monitored environments

Facility Size

200.000m²

01

The need for digital transformation

The manufacturing sector is heavily affected by technological advancements, and Norwegian companies pride themselves in being early adopters of the latest technologies. In an increasingly competitive market, digital transformation seems to be the only way forward in order to reduce costs and increase productivity.

From workshop to automated industry

HTS Maskinteknikk was founded in 1981 as a precision machining workshop for the medicine-technical sector. They were early adopters of CNC machinery, lean management principles and computerized measuring machines to provide clients with the latest production technology solutions. As the demand for high precision machining increased, in the 1990s the company advanced into new industries, such as subsea, aerospace and defence, to which now, they are a key supplier.

With a team of around 100 people, they specialize in critical machining and welding of advanced materials and offer a wide range of parts and advisory services. One of the key enablers to the success of the company is a highly skilled workforce on all levels, from operators to top management. They have also counted on a production technology advisory

team with solid experience in advanced programming, machining, and inspection which added value to their offer to clients and provided them with competitive advantages. However, like many other companies in the Scandinavian manufacturing sector, HTS was lagging behind due to high production costs, reduced internal market, and inefficiencies in their processes.

The region, after all, has been facing “desindustrialisation” over the past three decades with many trends converging to reduce the number of jobs available in lower skill activities and to mercilessly drive away businesses that shy away from innovation. Norway, HTS’s home country, is characterized by a highly developed infrastructure, high levels of IT-competence, and strong incentives to reduce labour costs, what makes it one of the ideal places to implement digital innovation strategies.

Expected results

At the same time, many of the country's industries, such as subsea, are heavily reliant on the world economy – specifically, on the highly volatile oil prices. This means its digital readiness needs to be used by companies to make the shift towards digital business models as a way to guard against disruption, improve cost-efficiency and to maintain their competitive edge.

Not only digital technologies allow for leaps forward in labour productivity performance, they bring companies closer to suppliers and customers, making it easier to adjust for shifts in demand and to control inventory, ultimately optimizing resource use, maintenance, and energy consumption. In this regard, HTS joined forces with the Upkip team to boost and accelerate their digitalization.

Even though they already presented a high level of automation, in general, they were still not working efficiently due to a lack of method knowledge, more digital experts, and digital integration.

Moreover, there were processes yet to be streamlined in terms of manual and automated operations. Their high-cost workforce should be focused on value-added and knowledge-based tasks, while the handling of papers, parts, operations, and quality checks could be delegated to automation.

Finally, the company wanted to gain more knowledge about key production processes and performance so that they could set KPIs and know if their improvement measures actually did have the effect they initially intended.

HTS Maskinteknikk Headquarters in Drammen, Norway



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From pilot to full-scale implementation

Close cooperation between HTS and the Upkip team was a key ingredient for the project's success. From an executive decision to getting all staff onboard, introducing a new technology must take into account the company's culture and work philosophy. Upkip was slowly incorporated in the client's reality in an incremental way to allow for a truly integrated and effective solution.

Doing the groundwork

To prepare for the Upkip installation, and lead the Industry 4.0 work, HTS set aside funds and established strategic partnerships with stakeholders that would assist in the transition. They also hired a production engineer with experience in similar initiatives for the manufacturing sector. Having this kind of innovative leadership was a central element of the initiative's success, and, today, he is the company's CTO.

Together, we came up with a pilot implementation plan, which included connecting up to 10 of their most important CNC machines (Mazak, Nakamura, Hermle, and DMG) and robots combined with the integration of the ERP system. Additionally, we anticipated some potential risks to implementation, such as: resistance from employees, digital skills concentrated in a handful of people, and deviations from plan in terms of

time and cost. To mitigate these possible threats to the project's effectiveness, the pilot included a training module for operators and mid-managers in charge of overseeing production throughout the factory floor.

There were four main elements in the company's roadmap to Industry 4.0. While the first two were tackled entirely by them, we could join efforts and bring it home on the second half of the plan.

1. AUTOMATED PRODUCTION

2. THE "DIGITAL WORKER" PILOT

3. REAL-TIME MONITORING OF PRODUCTION

4. PARTICIPATING IN THE UPKIP PROJECT

HTS's roadmap to Industry 4.0

1. AUTOMATED PRODUCTION

Acquiring more robots and collaborative robots (cobots) to establish more automated production cells.

2. THE "DIGITAL WORKER" PILOT

The digital worker operates during night-time and conducts repetitive organizational tasks related to tendering and contracts, for example preparing documents.

3. REAL-TIME MONITORING OF PRODUCTION

Connecting to and integrating data from each machine combined with data from the ERP system enables the company to gain new knowledge about their performance and profitability.

4. PARTICIPATING IN THE UPKIP PROJECT

The company joined a EU consortium researching how predictive maintenance could reduce costs for manufacturing companies. This would eventually transform into the Upkip project. This included testing of various external sensors monitoring temperature and vibration was used to monitor key parameters. Thresholds were set and anomalies monitored to gain knowledge about production processes and how key parts and tools break down.



Scaling-up fast

With the positive results from the pilot HTS approved scaling up the real-time production monitoring. This allowed us to integrate the maintenance module into the Industry 4.0 platform and connect almost all remaining CNC machines and robots in all departments (welding, turning, milling, assembly, and facility) in the Upkip cloud environment, built on Microsoft Azure. These machine connections were configured using the developed adapters for data collection and support of the key system functionalities. Throughout this phase, the development team put all efforts in optimizing the cloud environment's cost and in securing privacy of the client's data.



After the pilot, HTS knew exactly what they wanted to monitor and could install the sensors to make it happen.

HTS could make use of Upkip's unlimited sensor connectivity



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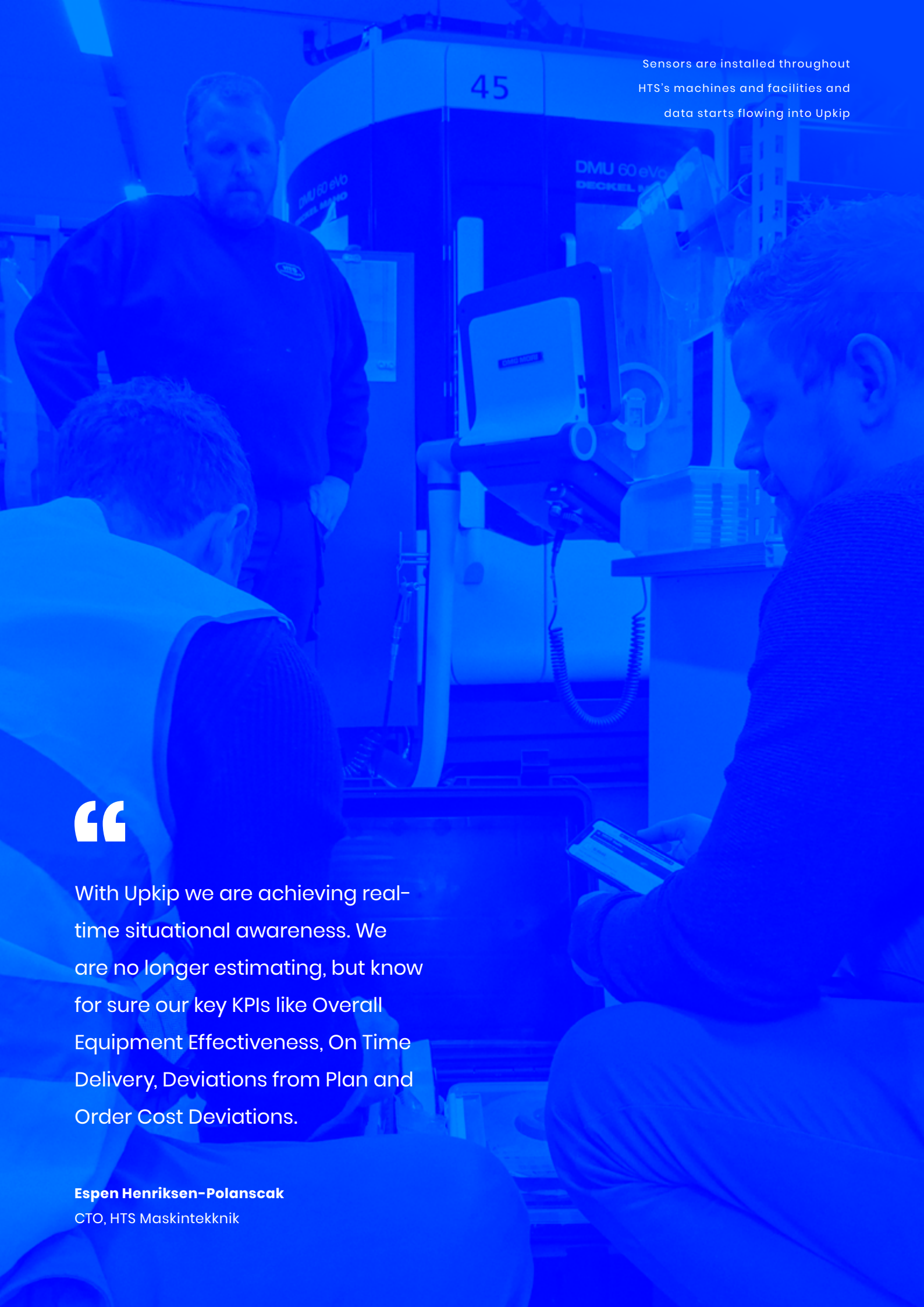
13



CNC MACHINES

ROBOTS AND ROBOTIC CELLS

MONITORED ENVIRONMENTS



Sensors are installed throughout
HTS's machines and facilities and
data starts flowing into Upkip

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With Upkip we are achieving real-time situational awareness. We are no longer estimating, but know for sure our key KPIs like Overall Equipment Effectiveness, On Time Delivery, Deviations from Plan and Order Cost Deviations.

Espen Henriksen-Polanscak
CTO, HTS Maskinteknik

03

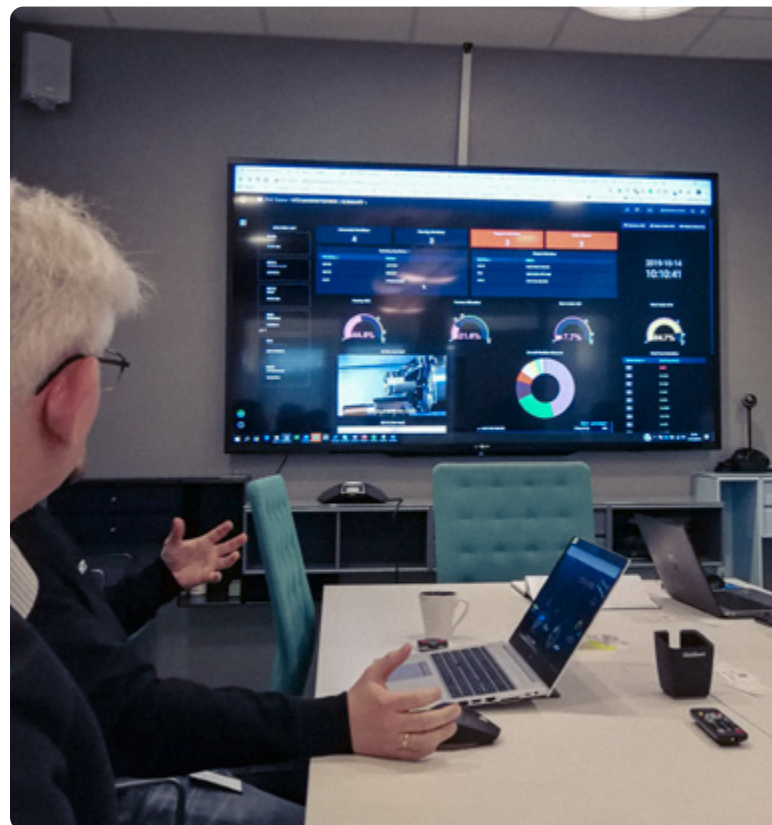
Seeing the results

With the systems put in place, data started flowing in and HTS could see its production through the eyes of real-time data. With additional dashboards and other customizations, the platform centralized information from different sectors and was accessible to everyone. Now, high precision manufacturing can count with precise data to define priorities and plan the way forward.

Collaborate and iterate

Through an agile process – where the needs from HTS and their people were always at the centre – we customized Upkip with specific dashboards, KPIs and integrations to provide business value to different levels within the organization. A key component for our success in doing this was a great working relationship, built on mutual trust and fluid communication. From this collaboration, many of the platform's built-in dashboards were modified and tuned to deliver the most relevant data analytics.

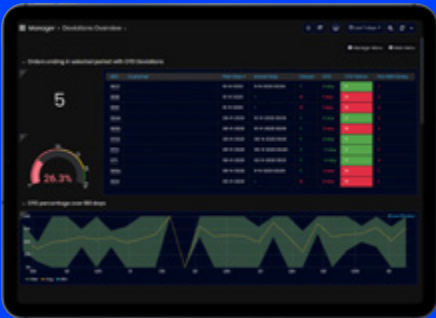
All reports were imbued with a set of relevant filters, like time frame, department, machine, machine type, order, operator, and others. As some improvements proposed by HTS could be useful for other manufacturers, various dashboards were included in the template deployment, making this a truly win-win, long-term relationship.



The team discusses dashboard improvements

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**CUSTOM EVENTS AND
NOTIFICATIONS WERE CREATED
BY THE TEAM AT HTS**



Flexibility is the word of order when implementing Upkip on a new facility. The better it suits and improves the business results of our clients, the more robust it grows as a solution. Amidst the customizations developed for the HTS, some were noted to be especially relevant:

DEVIATIONS OVERVIEW

A manager summary of deviations from the plan (i.e. on-time delivery (OTD), low OEE, scrap, planned vs estimated, alarms, budget exceeded, etc).

FANUC ROBOT R-30IB

A specific dashboard for Fanuc robot controller.

DEBURRING CELL

UR ROBOT

A specific dashboard for a custom robot developed especially for HTS.

CUSTOM EVENTS AND NOTIFICATIONS

A number of events and messages were configured to reflect specific events of interest for HTS Maskinteknikk.

SUMMARY DASHBOARD

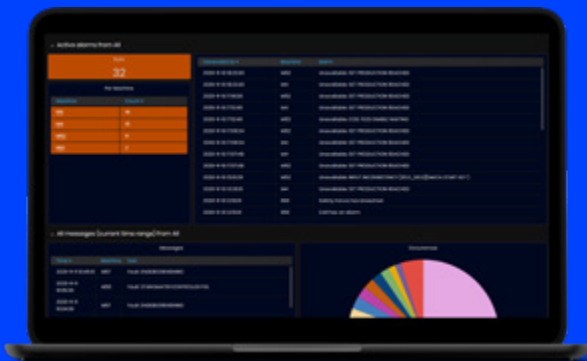
A summary live dashboard that shows the state of the equipment in the entire facility on an operational level.

REGISTER PROGRESS

An input dashboard designated for operators and quality control engineers to provide feedback for quality checks.

1.5x

**MORE MACHINES CAN BE HANDLED
BY A SINGLE PRODUCTION
OPERATOR OR TECHNICIAN**





Caring about production means caring about people

Introducing a new platform with far-reaching oversight of production did provoke some resistance among collaborators. We needed to be completely transparent about which data we were collecting, what were the motivations behind this move, and how it would be a tool adapted to our work philosophy, and not the contrary. From this, we learned that no digital transformation initiative can be successful if people aren't onboard – or have reasons to mistrust the system.

On the other hand, once everyone got to know the software's possibilities, and there were trained people in-house, the space was open for people to start getting creative with what they could do with Upkip. People became more collaborative and flexible, understanding that now they could also do more with less and would have the data to make their jobs better and more efficient.

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Upkip helps us achieve higher asset utilization by having all needed data in one place. We make changes in our processes and assess the effect learning from the data we get. We are enabling operators to service more machines simultaneously, having the right data and monitoring instrument in place

Ole Arne Kristiansen

CMO, HTS Maskinteknik

04

What were the key achievements and benefits of implementing Upkip?

Digital transformation is not only about the tools you use, but about the people involved in the process. Fundamentally, it is about liberating people from repetitive tasks and allowing them to focus on how to add creative value to operations.

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Being exposed to maintenance processes, methodologies, and tools. We have conducted two comprehensive FMECA analysis which were very beneficial for further PdM planning. This has led us to incorporate the FMECA in our long-term strategy as part of our goal to become more proactive and predictive in our work and thinking. This is an important part of developing a data-driven decision process. Even our meeting structure has been affected and changed and now we see that the remaining meetings are much more fruitful and fact-based.

Executive

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Overall, we are seeing that we can deliver more with the same structure. With increased awareness over machine downtime – and its reasons – we can understand how much that affects us in terms of cost. Moreover, we can save on supplies by connecting sensors to Upkip that already led to the predictive maintenance of clogged filters. With these kinds of improvements, account managers can now give more precise quotes and estimated deadlines to clients, which ultimately improves their perception of us.

Supervisor

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The task of monitoring the machines has been pretty much eliminated. Statuses, events and alarms are now displayed in Upkip and are accessible from any device with an active internet connection. This allows the shop floor experts to become more mobile and flexible when it comes to what to do and where to do it. With the time we saved, personnel can now, for example, focus more on training and competence transfer to other colleagues. Supervisors are enjoying being able to detect delays early-on and when an alarm is activated the proper people are notified and can act fast upon this issue.

Supervisor

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In parallel developing and integrating Upkip, HTS has installed and integrated a separate CMMS. This system is mainly used to report incidents manually from various internal users as well as maintenance planning. The interesting part here is that Upkip has been integrated with the CMMS sharing and getting data to allow both systems to become more valuable when it comes to data delivery to the users. This is a clear advantage of Upkip, that it allows for easy integration using API to core line of business SW-tools like a CMMS.

Salesperson

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PLI as a KPI has really got us thinking about the iceberg of hidden losses and wastes. When focusing only on the big events, a large number of small ones slip through the cracks and aren't accounted for. Calculating PLI for some major events, as well as the day-to-day losses, makes us more aware of our production efficiency and help us design improvements. As a company that wants to grow, knowing PLI really helps in identifying which loss and waste needs to be prioritized

Executive

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By having a real-time dashboard easily accessible, we see an improvement in how and how fast we are making operational decisions. Before we would rely on mails with information and several meetings. Now people can access the dashboard and get the required information when they need it.

Operator

Final Thoughts

The collaboration between HTS and the Upkip team will continue to generate mutual benefits. As part of the partner network, the people at HTS became true ambassadors for the system and are giving all of the support to make Upkip reach other companies. This says a lot about the kind of relationship the Upkip team aims to cultivate with an increasing number of companies, agents, resellers and integrators. As manufacturers get ready to take the next step towards digitalization, Upkip is continuously improving to provide a simple, affordable, and effective way to support them in the process.

Upkip is a cloud-based industrial IoT solution for manufacturers of all sizes that boosts productivity with powerful analytics in a pay-as-you-go package.

LEARN MORE AT

upkip.cloud

