



WHITEPAPER

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Optimising uptime and cost control in the chemical processing industry

 Live-link your assets and facilities.

ULTIMO



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MAINTAIN, REPAIR, OPERATE.

LOOK INSIDE ANY PRODUCTION OR MANUFACTURING FACILITY, AND YOU'LL SEE A COMPLEX ARRAY OF PLANT AND MACHINERY WORKING. MOTORS, PUMPS, SENSORS, INDUSTRIAL ROBOTS, ACTUATORS, AND MANY MORE ASSET TYPES UNDERTAKE A SPECIFIC ROLE EITHER CONTINUOUSLY OR FOR A PRE-DETERMINED DURATION. AS WITH MOST MOVING PARTS, MAINTENANCE IS UNAVOIDABLE. PUMP BEARINGS WEAR, SENSOR APERTURES MAY NEED CLEANING, EVEN INDUSTRIAL AUTOMATION SOFTWARE NEEDS UPDATING.

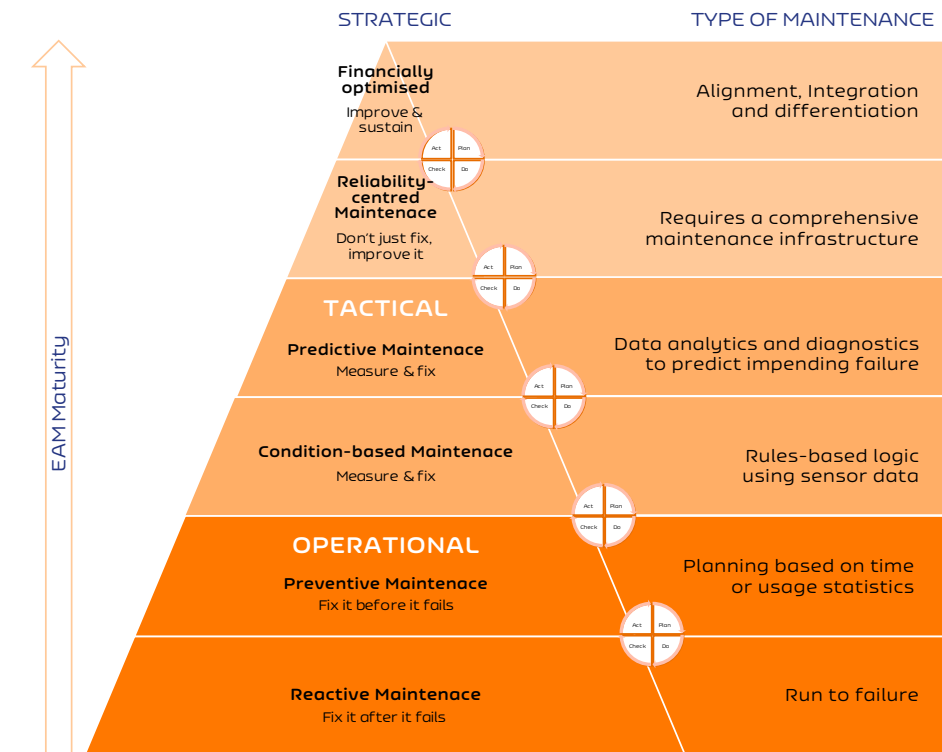


Figure 1 - Type of maintenance (source Ultimo 2020 EAM Trends Report)

Different maintenance strategies

Plant and asset maintenance staff are responsible for keeping production lines and processes operating with minimum downtime. Downtime, whether planned or unplanned, is disruptive and costly. Over the years, different maintenance regimes have been established to guide maintenance schedules and asset management best practice.

Each form of maintenance has its pros and cons. For example, corrective or reactive maintenance approach - see Figure 1 - involves fixing a fault when it occurs. Ongoing maintenance costs can be kept low; however, the consequential losses can be significant when a production asset fails. A preventative maintenance regime establishes a service schedule for each production asset and is the approach taken by many industrial plant managers. Although this approach reduces the risk of a potential asset failure occurring, it does involve ongoing maintenance labour and material costs. Since the approach is based on a calculated operating frequency rather than actual,

it is highly possible service is performed, and parts replaced unnecessarily.

Technology initiatives such as the Industrial Internet of Things and Industry 4.0 are introducing a maintenance approach based on condition monitoring crucial production assets. For example, monitoring a pump's vibration characteristics using a compact micro-electromechanical system (MEMS) sensor can highlight an impending failure or unexpected impeller cavitation. Increasingly artificial intelligence and machine learning techniques are employed to process condition monitoring data to predict when a failure might occur.

With an ever-increasing focus on building resilience into a manufacturing process, asset managers, maintenance directors, and health of safety personnel need to look at ways to future-proof their business against unprecedented challenges. An emphasis on maintaining high levels of uptime and controlling cost is paramount.

ASSET MANAGEMENT IN THE CHEMICAL PROCESSING INDUSTRY.

THERE ARE SOME INDUSTRIAL MANUFACTURING PROCESSES WHERE THE IMPACT OF UNPLANNED DOWNTIME IS CONSIDERABLY MORE THAN IN OTHER PROCESSES.

For example, a manufacturing line where parts undergo a single batch process or operator shift, are collected at the end of the line before moving to the next operation is relatively resilient. In this process example, a failure does not interrupt or impact the whole production facility. Once the asset failure has been repaired, production can quickly recommence.

However, a chemical process, particularly in large manufacturing operations, is run as a continuous operation. Assets involved can also be complicated, such as chemical reactors with multiple gases and liquid flows at high temperatures and pressure. A plant failure will result in unfinished chemical reactor operations. Once the failure is repaired, reactors will need to be cleaned of potentially hot and hazardous waste products and pipelines cleaned before production staff can restart the process.

The likelihood that product may harden or solidify in reactors or within pipelines is also of significant concern. For many chemical processes, it might take days for the entire process to recommence.

Health and safety are paramount

Another aspect of any chemical process is that they will typically involve dangerous chemicals in addition to fluids at high temperatures and gases. Health and safety are paramount in the chemical processing industry, and stringent safety regulations exist to protect workers and the environment.

For any business involved in chemical processing, the total cost impact from lost production, material waste, asset cleaning, and restarting production can be significant.

"My experience is that the ROI of the Ultimo software is about two years. This is mainly because of the considerable time we have saved in work preparation and the more efficient execution of the maintenance activities."

René Baron, Lead Asset Manager, BASF Resins & Additives.



CRITICAL CHALLENGES TO OPTIMISING UPTIME AND COST CONTROL.

UPTIME AND COST CONTROL ARE TWO CRUCIAL FACTORS ASSET MANAGERS, AND DIRECTORS NEED TO EMBRACE THEM IN THEIR OPERATIONS. THE ULTIMO 2020 ENTERPRISE ASSET MANAGEMENT (EAM) TREND REPORT HIGHLIGHTED BOTH THE TOP TWO AND TOP THREE MOST IMPORTANT ISSUES BOTH NOW AND IN THE FUTURE.

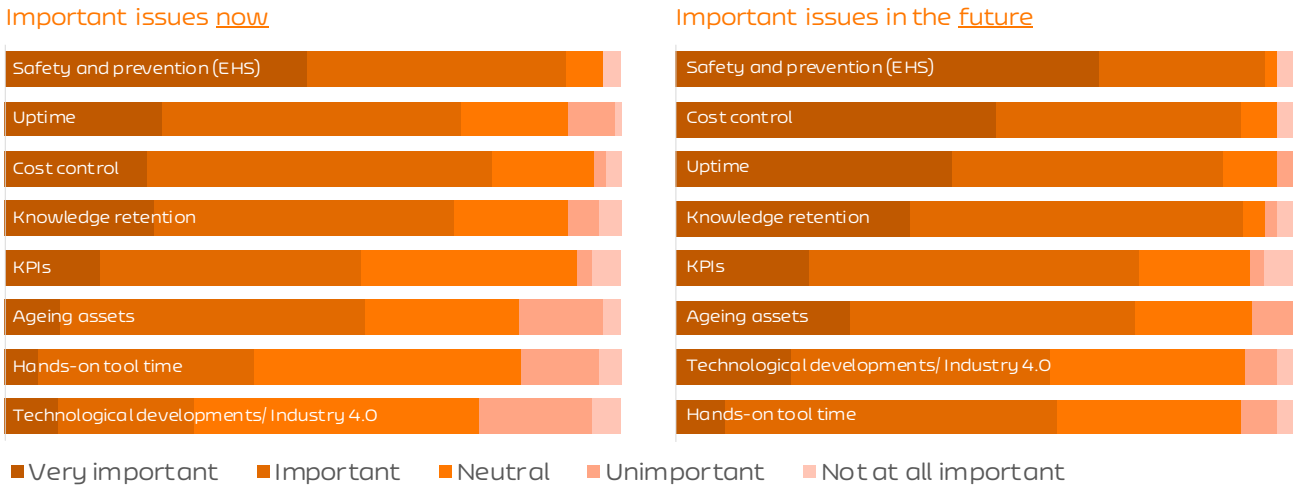


Figure 2 - Uptime and cost control rankings both now and in the future (source Ultimo 2020 EAM Report)

As discussed previously, adopting a formal structured maintenance method is the first step in turning maintenance from a reactive discipline to a proactive one. The organisation will see the benefit of more effectively and efficiently using maintenance staff, and asset managers will feel more in control. Implementing an enterprise asset management (EAM) system will aid asset managers in achieving their goals. An EAM can provide a central repository of asset data from which scheduled and planned maintenance can be organised to minimise costly downtime. EAM systems efficiently and effectively manage each asset's whole life cycle, from deployment to decommissioning.

Plant management often lacks the information to make informed decisions regarding when to schedule maintenance. In many cases, using a corrective maintenance regime and no register of production assets and their maintenance history results in a lack of actional data points to establish a more strategic maintenance approach. Paper- or spreadsheet-based maintenance records are difficult to manage and the data impossible to share effectively. Without the right data, asset managers and maintenance staff will potentially make the same flawed decisions on when maintenance actions should be undertaken without understanding asset dependency.

Controlling the cost of maintenance

It's essential to be in control of the cost of maintenance. Figure 3 highlights the cost advantages and disadvantages associated with the different maintenance methods.

There is a constant balancing act for asset managers regarding the optimal asset management and maintenance approach to take. The emphasis on cost control is never-ending too and requires close interaction and cooperation with colleagues in production. The more data available, the more likely that informed decisions can be made for chemical processing plants. For example, within an EAM system, individual assets can be categorised by asset

class, location, and production process. Accessing a complete list of assets involved with a specific process yields useful insight when contemplating shutting down the whole production process. A comprehensive review of which assets might require attention during the planned downtime and be scheduled accordingly, essentially taking a more holistic approach to the production process. Uncertainty of asset performance and its operational effectiveness can be eliminated by using an EAM system. Despite all the planning, unplanned asset failures may still occur, but a similar informed approach can be taken to mitigating expenditure and keeping downtime to a minimum.

	ADVANTAGES	DOWNSIDE
CORRECTIVE MAINTENAINCE	<ul style="list-style-type: none">• Less expensive• No initial costs	<ul style="list-style-type: none">• Can cost a lot because of unexpected failures and downtime
PREVENTIVE MAINTENAINCE	<ul style="list-style-type: none">• Reduces overtime expenses• Easier to plan• Less unexpected work	<ul style="list-style-type: none">• Sometimes more expensive• Long implementation lead time
PREDICTIVE MAINTENAINCE	<ul style="list-style-type: none">• Reduces unexpected downtime• Saves costs as a result• Maximises uptime	<ul style="list-style-type: none">• Purchase of software/installations and training costs• Higher upfront costs
RCM	<ul style="list-style-type: none">• Cost reduction due to eliminating unnecessary equipment maintenance	<ul style="list-style-type: none">• Start-up costs (training an equipment needs)• Longer payback time

Figure 3 - Controlling maintenance costs, the advantages and disadvantages of the different maintenance methods (source Ultimo 2020 Trends Report)

“With Ultimo we have one system for safety and maintenance issues, i.e. periodical maintenance, calibrations and inspections. Everything is neatly organised in one place, making audits much easier, and the interface with SAP helps with the efficient financial processing of our activities.”

Steven Permentier,
Production Manager,
Total (Ertvelde)

MANAGING HEALTH AND SAFETY.

AS ALREADY IDENTIFIED, ADHERENCE TO STRICT HEALTH AND SAFETY LEGISLATION IS ESSENTIAL FOR CHEMICAL PROCESSING ORGANISATIONS. THERE ARE SEVERAL ASPECTS TO THIS: PROTECTING MAINTENANCE STAFF FROM EXPOSURE TO HAZARDOUS CHEMICALS, A DANGEROUS WORK ENVIRONMENT (TEMPERATURES, HOT LIQUIDS ETC.,) AND RELEASING TOXIC CONTAMINANTS AND GASES INTO THE ENVIRONMENT.



Maintenance staff may find themselves exposed to hazardous substances within the assets they are working on or as part of the cleaning or servicing tasks. The health risks are many and varied, ranging from those that create allergies, or skin rashes, to those causing long term conditions such as respiratory problems and occupational cancers. Acute effects include suffocation in confined spaces or poorly vented containers. National and regional legislation stipulate required working conditions, desired levels of safety and the processes required to enforce them, such as conducting risk assessments, work permits, and plant shutdown procedures. For example, within Europe, this is covered by the OSH 89/391/EEC framework.

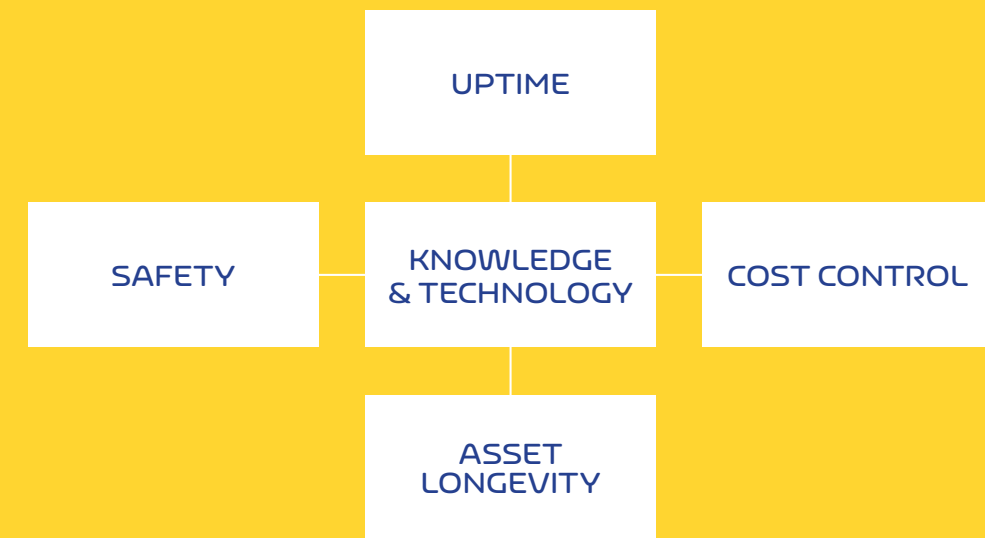
Assets themselves also need to be protected too so that they are not irreversibly damaged or destroyed due to a lack of understanding. Likewise, maintenance staff need to be aware of dangerous production assets that should be made safe before working on them.

Effective asset management operation

A suitably-equipped EAM system can significantly assist asset managers in navigating the complexities of the health and safety procedures and processes in the high-risk chemical processing industry. By formalising the health, safety, and environmental requirements and procedures for production assets will not only instil a regime of safety across the production facility but will also ensure the impact on uptime and costs are mitigated. Risks are contained through adherence to work permits and documented processes such as lock out, tag out (LOTO), allowing corrective actions to be conducted safely. Keeping all the work orders, permits and processes alongside the asset register and maintenance history within a single EAM system creates both an audit trail and efficient and effective asset management operation.

MANAGING ASSET COMPLEXITIES AND BIG DATA.

REVIEWING ALL THE FACTORS THAT INFLUENCE ASSET AVAILABILITY, UPTIME AND COST CONTROL, THE MOST SIGNIFICANT CONTRIBUTOR IS ACCESS TO ACTIONABLE INFORMATION. DATA WILL BE PRESENT FOR EVERY ASSET, PARTICULARLY THOSE THAT MAY ALREADY BE CONNECTED WITH SENSORS AS PART OF AN INDUSTRIAL INTERNET OF THINGS (IIOT) DEPLOYMENT.



ENTERPRISE ASSET MANAGEMENT

However, the capability to turn data into information that can be acted on is often missing within chemical processing operations. In time, actionable operational information, and the first-hand knowledge of asset management staff combine to create knowledge.

Technology deployment within the industry is advancing fast and shapes how asset management directors may implement a predictive maintenance regime. The smart factory concept's deployment is already mapped out through initiatives such as Industry 4.0 and the IIoT. Recent technology-based advances include creating digital twin replicas of physical assets. Digital twins open up the potential to simulate, model, and better predict assets' operation

across their whole life cycle. In this way, asset longevity is prolonged. Modelling assets digitally further advances the knowledge repository for all asset classes and optimising uptime and cost control. An increasing amount of data is being stored today, so much that it is fast becoming a 'Big Data' challenge. An EAM system will host all the data concerned with each asset, such as operational and maintenance data, and everything relating to safety. An EAM system will also function as the primary operational platform from which to organise and plan asset maintenance. Other 'Big Data' business intelligence (BI) platforms are becoming deployed throughout the organisation, so the ability for an EAM system to integrate with these is paramount.

Which (technological) developments do you expect to be most applicable in your organisation?

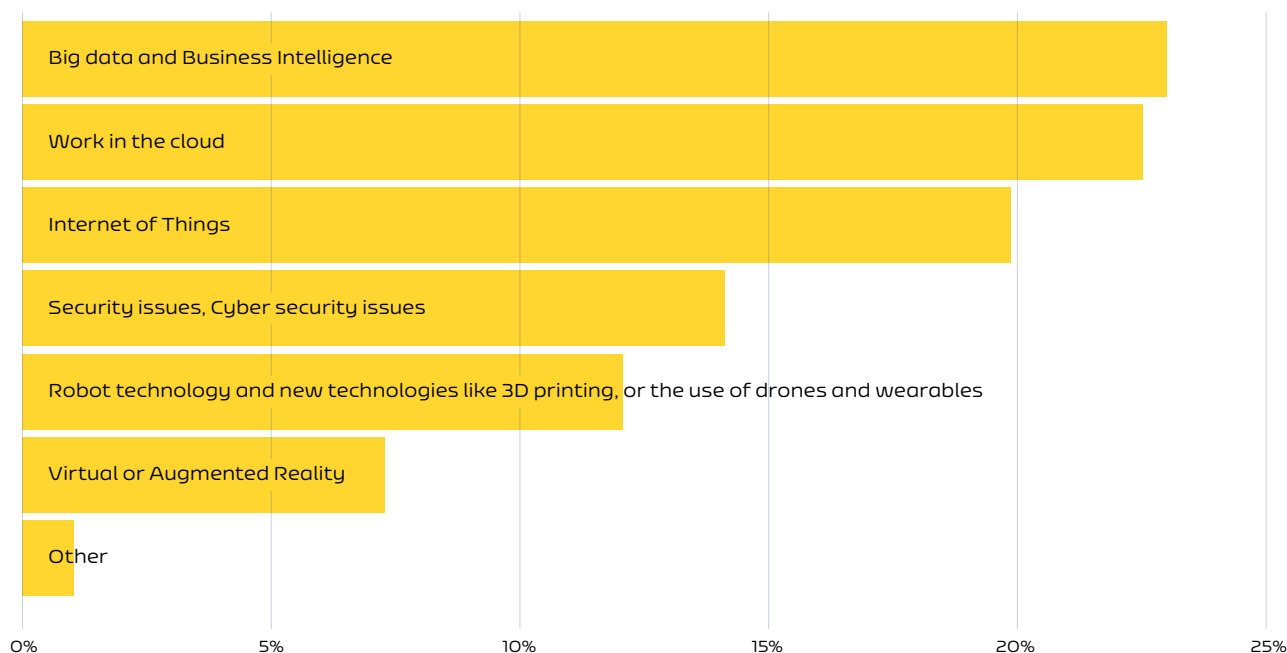


Figure 4 - Technology deployments to most applicable for use in production-based organisations - (source Ultimo 2020 EAM trends report)

When surveyed for the Ultimo 2020 Enterprise Asset Management trends report, 23 % of asset managers interviewed highlighted that they expect big data and business intelligence platforms to be applicable for their organisation.

The importance of knowledge retention and sharing

Another crucial aspect of asset management is not just about capturing digital knowledge about the asset but also practical and site-specific information from the workforce. This requirement

is of particular concern where the plant and asset management workforce is ageing. A workforce where the majority of the technical service staff are 45 years of age or older should have a plan to capture and retain valuable insights and practical experience to benefit younger staff. With commercial pressures to drive even more value from assets and reduce overall operating costs, the number of asset and plant maintenance staff is unlikely to increase, and probably reduce across most sites. Knowledge retention and sharing form a crucial component of any asset maintenance and management strategy.

ENTERPRISE ASSET MANAGEMENT

MOVING FORWARD WITH ASSET MANAGEMENT.

AN ENTERPRISE ASSET MANAGEMENT SYSTEM, SUCH AS ULTIMO, PROVIDES A SINGLE OPERATIONAL ASSET MANAGEMENT PLATFORM FOR ANY CHEMICAL PROCESSING ORGANISATION.

Capable of being deployed for a single processing site or across a whole organisation, an EAM system serves to maximise uptime, control costs, manage adherence to health, safety and environmental legislation, and prolong asset life.

By planning preventive maintenance and other asset management activities in a structured and organised manner, you begin the journey to being more in control of your asset management responsibilities. In turn, gathering data, you can start to turn actionable insights into knowledge, the route to predicting maintenance schedules. With a more informed approach to asset operational data and usage, it is easier to comprehend factors that impact asset lifespan and actions that can proactively influence asset longevity. Increasing the asset's return on investment will deliver significant operational value. Implementing an EAM system will also increase health and safety across the enterprise by

setting processes and procedures for asset and maintenance staff to follow. For chemical processing facilities, where hazardous chemicals and dangerous operations are the norm, compliance to regulatory health, safety, and environmental standards is essential. Ultimo manages work permits, planning and scheduling a chemical process shutdown, and capturing asset service and maintenance history. Integrated with handheld mobile devices such as smartphones and tablets, the asset management workforce has all the information they need in the palm of their hand and can quickly record and update asset information on the go.

Imagine an EAM system that helps you improve your asset uptime, control your asset management costs, comply with HSE regulations and future-proof your operation by retaining valuable knowledge, that's Ultimo.



IMPLEMENTING ULTIMO.

THE DECISION TO IMPLEMENT AN EAM SYSTEM FOR A CHEMICAL PROCESSING ORGANISATION CAN APPEAR DAUNTING AT FIRST. HOWEVER, HELP IS ON HAND WITH ULTIMO'S IMPLEMENTATION RESOURCES AND METHODOLOGIES.

Like undertaking any major project, the key resides in communicating and articulating the vision to all stakeholders and breaking deployment into manageable steps. Being mindful that the bulk of the implementation needs to be achieved by those already committed to a full working day requires sufficient budget and resources are allocated to allay fears of being overloaded.

Asset directors should set realistic goals, and an internal project leader assigned. Typically, initial tasks should be well defined and build on each other.

Small 'baby steps' such as building the asset register, on-boarding MRO spare parts, and maintenance schedules are ideal for building confidence and familiarity in using the EAM system.

Cloud-based system

For asset managers concerned about the IT requirements of an Ultimo implementation, they can relax safe in the knowledge that Ultimo is a cloud-based system that can be accessed from a desktop, laptop, smartphone or tablet.

ENTERPRISE ASSET MANAGEMENT

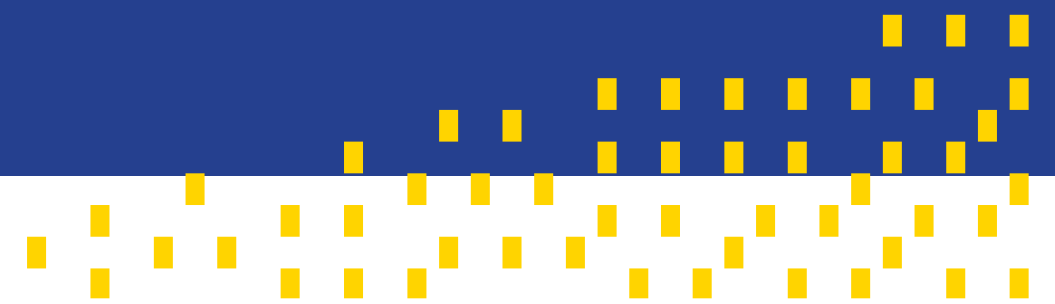
AN ESSENTIAL RESOURCE FOR THE FORWARD-THINKING CHEMICAL PROCESSING ORGANISATION.

CHEMICAL PROCESSING IS PERHAPS ONE OF THE MOST DEMANDING MANUFACTURING OPERATIONS.

Unlike many shift-based production processes, a chemical process operates continuously, with potentially multiple complex functions. In many cases, reaction chambers combine solids, liquids, and gases to form other materials. Extremes of temperature may also be highly likely. Together, these factors form the perfect storm for asset management professionals. A failure of a single asset will result in the whole process stopping abruptly. Access to the asset to effect repairs may be delayed to allow the plant to cool down, and potentially hazardous chemicals be appropriately disposed of.

It may take days for the flow process to restart, and the wasted chemicals might represent high additional costs in addition to production downtime.

Implementing an EAM system is a prudent step for any forward-thinking chemical processing organisation. Its single platform approach to managing asset information, planning maintenance work, providing actionable insights and capturing knowledge helps optimise uptime, manage costs, and ensure health, safety and environmental compliance.



Ultimo is the #1 EAM Cloud platform that provides its customers with control over their assets and an unmatched and proven Return On Investment. Its benefits include increased uptime; management of costs and an extension in the lifespan of equipment; reliable control information; ease of adherence to laws and regulations and the assurance of a safe working environment. With Ultimo you see vital signs and you take vital actions.

 Live-link your assets and facilities.



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