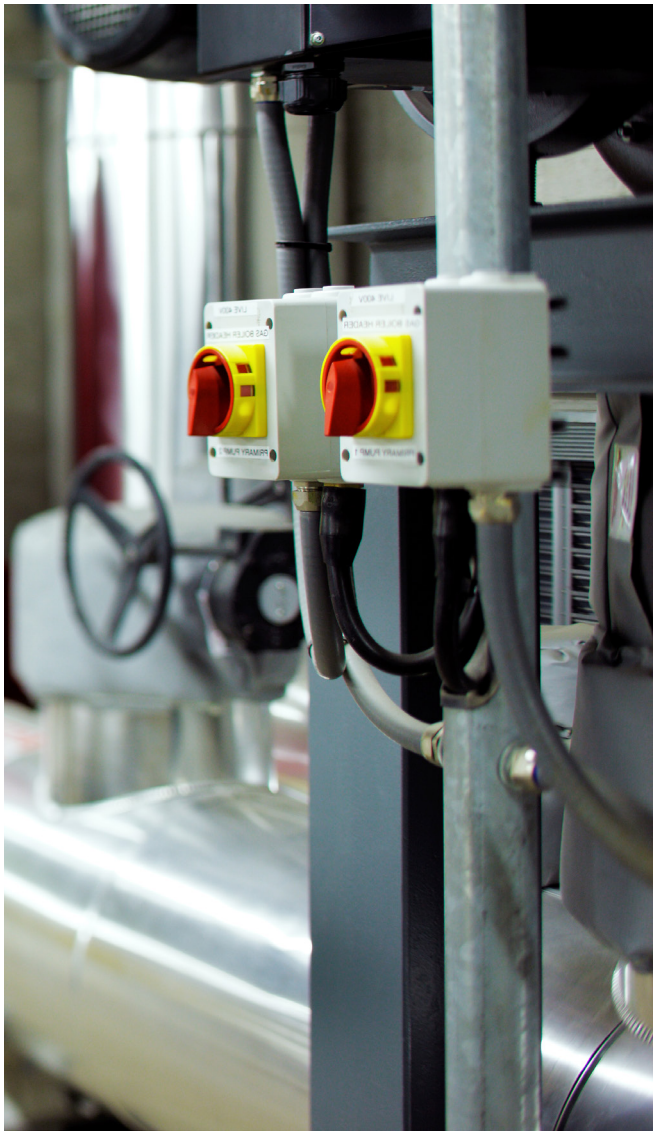
Simplifying and optimising HSE management in the chemical processing industry

IFS Ultimo

Strong risk focus

As an industry that regularly handles hazardous materials, in processes where lack of control can have potentially catastrophic results, the chemical processing sector needs a strong risk focus.



History of chemical processing accidents

This risk focus cannot be emphasised strongly enough as the history of chemical processing accidents continues to cast a shameful shadow over the entire sector. While accidents in the sector go back to the very beginning of industrialisation there have also been many more recent examples, that should and could have been avoided.

Industrial disasters

December 3, 1984: The Bhopal disaster in India is one of the largest industrial disasters on record. A runaway reaction in a tank containing poisonous methyl isocyanate caused the pressure relief system to vent large amounts to the atmosphere at a Union Carbide India Limited plant. Estimates of the death toll range from 3,700 to 16,000. The disaster caused the region's human and animal populations severe health problems that continue to the present day.

Such accidents cannot be dismissed either as being confined to the poorer areas on earth as there are numerous historical examples from the world’s wealthier nations. July 5, 1990: An explosion and fire occurred at the Arco Chemical Company complex in Channelview, Texas. 17 people were killed. Five were permanent employees and the remaining 12 were contractors. An area approximately the size of a city block was completely destroyed; no one in the area survived the explosion.

Continuing to the present day

These examples are continuing to the present day: May 7, 2020: Visakhapatnam gas leak. A gas leakage accident at LG Polymers chemical plant in Vizag, India. The leakage spread over a radius of about 3 km, affecting the nearby areas and villages. 11 were killed and more than 1000 people were injured.

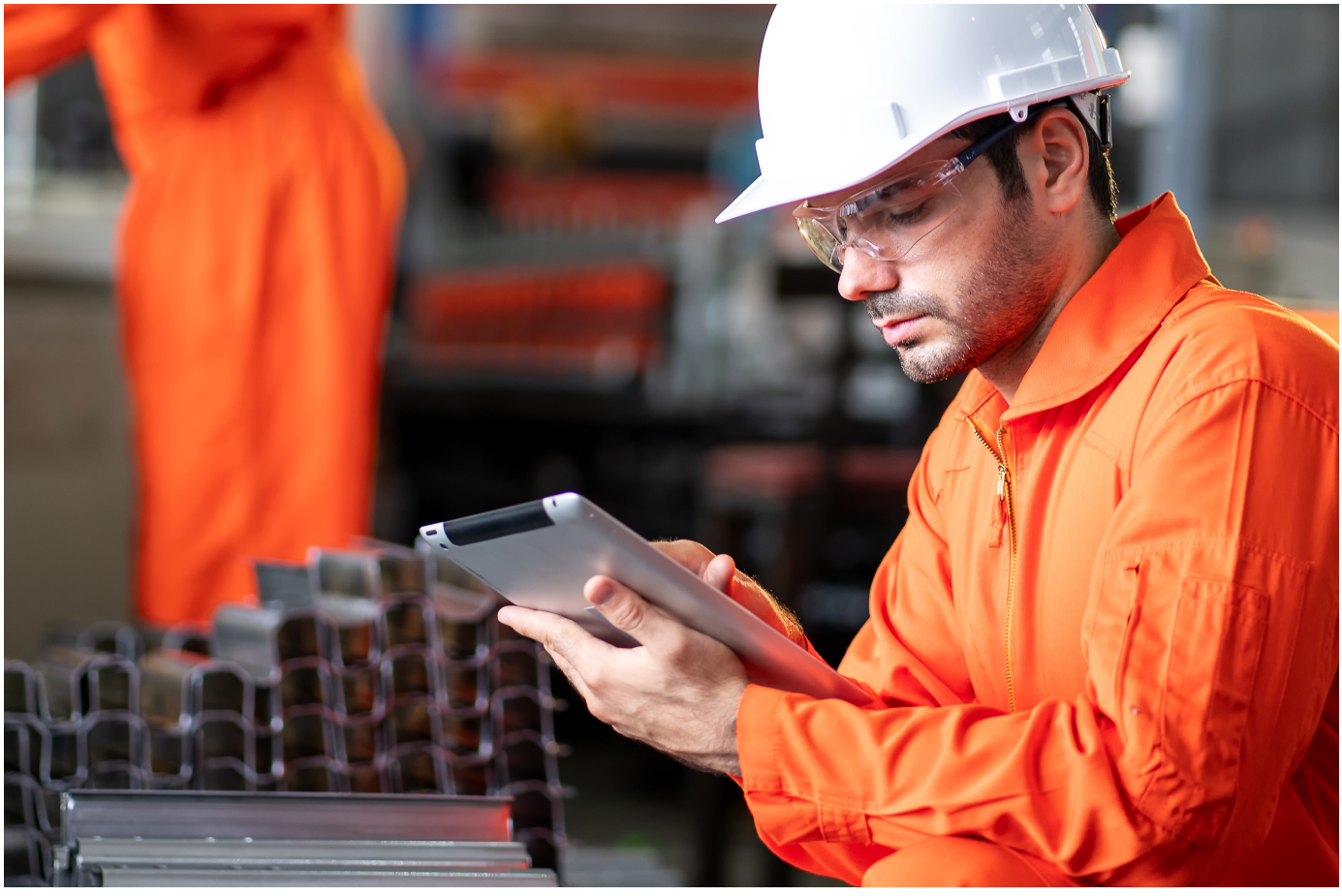
Not surprisingly, given the potential catastrophic consequences that such examples demonstrate, health, safety and environment (HSE) standards, regulations and legislation applied to the chemical processing sector – both nationally and regionally – are rigorous.

The integrated complexity involved in managing safety, occupational health and environmental impact risks in this sector are compounded by that of maintaining its many and varied physical assets. Maintenance activity is a major source of risk, and its correct execution in relation to HSE is essential to regulatory and legal compliance.

This complex situation is undoubtedly a difficult one for asset, facilities, plant and maintenance managers and others with some HSE responsibility to oversee. The same is true for all other manufacturing sectors, although the nature of the risks will vary. Food and pharma are amongst those which have most in common with chemical processing in this respect.

While safety is paramount and safeguarding of both workers' health and the environment is prioritised, businesses also have good economic reasons to manage HSE effectively. Accidents reduce productivity, through downtime for investigations, repairs and clear-ups. Further costs resulting from environmental health and safety failures may relate to equipment replacement, fines, compensation payments and sickness absence. Damage to company's reputation, when an HSE breach is highlighted, is another consideration.

To simplify HSE management and maximise both its effectiveness and efficiency, it can be integrated – along with maintenance – into an enterprise asset management (EAM) system.



Tackling the complexities of HSE in chemical processing

The enormous variety of chemical production subsectors, plant types, processes and products adds further complication. They include petrochemicals, polymers, inorganic chemicals, food ingredients, adhesives, paints and agrochemicals, to name but a few.

Considering the diversity of equipment used in these operations, there is much scope for chemical, mechanical and electrical hazards. Typical assets might include chemical storage tanks, pipework, pumps, conveying machinery, mixers, mills and agitators, reactor units, heating systems, kilns, dryers and coolers, and filtration, distillation and other separation equipment.

In addition to dangerous chemicals, processes can involve hot fluids and toxic or suffocating gases. Through their work on chemical processing assets, maintenance staff may be exposed to these dangers. There are also risks of harmful substances leaking out and affecting fellow workers or polluting the wider environment.

Fully aware of all hazards

Outcomes of exposure range from irritating rashes and allergic reactions to long-term respiratory illnesses and cancers. One of the more acute dangers is suffocation or toxic effects due to release of gases in confined or poorly ventilated spaces.

Managers and maintenance engineers need to be fully aware of all hazards relating to the plant and the chemicals it handles. More specifically, they need to know how each piece of equipment should be made safe before working on it.

Stopping the whole process

In the event of a plant failure or accident, chemical works suffer extra difficulty if they are running continuous flow processes. Unlike batch chemical production, or the shift-based activities of other manufacturing industries, large plants in particular tend to operate continuously. Stoppage of a single asset means stopping the whole process.

Cool down the plant

That abruptly halted process may comprise a complex collection of connecting subprocesses and high-temperature, high-pressure flows. Multiple solids, liquids and gases may be combining in chemical reactors to form other materials. Before remedial work can begin, it may be necessary to allow the plant to cool down. Next, the reactors and pipelines must be cleared of chemicals and intermediate products left behind by the unfinished process. Some of these may harden or solidify within the equipment.

It can take several days to clear up the plant, repair the asset and restart the process. The overall cost of this will include that of lost production, damage to equipment, repair, restoration and cleaning, disposal of hazardous materials and wastage of expensive chemicals.

Seveso III Directive

The key piece of European legislation addressing dangers in this industry is the Seveso III Directive, aimed at controlling major chemical accident hazards. This has been implemented through each EU nation's own laws. These continue to apply in the UK, post-Brexit, and the Directive is also seen as a benchmark for chemical safety policy in many other countries worldwide.

Most companies, of course, have corporate social responsibility and employee care principles which aim to do much more than simply 'meet' legal minimum requirements.

Implementing a responsible HSE regime through an EAM system

The first HSE problem that enterprise asset management software solves is that of maintaining a clear overview. Instead of using separate systems for information on the operation's assets, their maintenance and the related HSE processes, the Ultimo EAM cloud platform brings it all together in one place. HSE management becomes fully integrated and functionally linked to asset management, in a system which signals the condition and status of assets in real time. Digitalisation and integration avoid duplication, reduce effort, increase efficiency and give a clearer picture.

Ultimo simplifies your work

Crucially, Ultimo not only sets HSE processes and procedures but enforces them. The system is designed to permit maintenance tasks to go ahead only when all the required safety steps have been taken. In doing so it ensures automatic compliance.

This cloud-based system, which is a world apart from the inefficiencies and limitations of paper-based administration, can be easily accessed by authorised users in all relevant roles. The same easy-to-understand information, and the ability to progress activities and record information, is available to each user via desktop, laptop, tablet or smartphone.

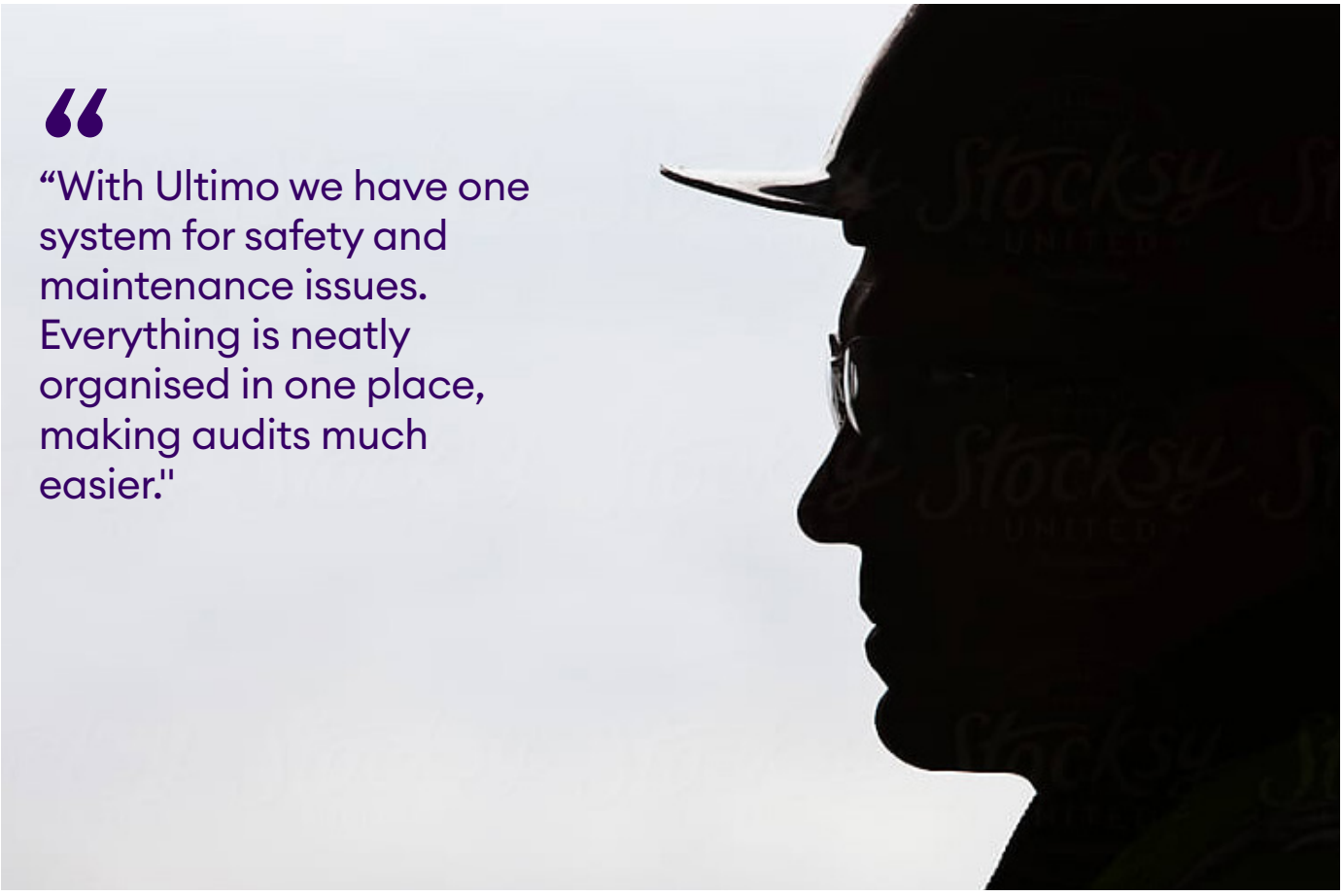
> “IFS Ultimo has been a major impulse to manage knowledge retention and work more efficiently. Ultimo meets our demands excellently."

In short, Ultimo simplifies their work and empowers them to carry out tasks safely, compliantly and on schedule.

Step-by-step functionality

The concept of ‘work permits’ is central to the step-by-step functionality of Ultimo’s HSE software. A work permit for a specific maintenance job is issued only when the conditions set for carrying out that task safely have been satisfied. A ‘job’ in this context could be, for example, replacing a worn bearing on a particular pump.

A work permit specifies – via joint decision – the necessary safety measures and who will take them. Digital administration of a work permit begins with receipt of a job request (sometimes referred to as a work order). Holders of the appropriate staff roles prepare the work permit and digitally validate it at each stage to confirm its issue, extension (if necessary) and, finally, completion of the job. Open work permits can be viewed at any time. Along with the information already mentioned, they show details of task risk analysis and lockout-tagout conditions applying to the jobs.



> “With Ultimo we have one system for safety and maintenance issues. Everything is neatly organised in one place, making audits much easier."

Quick and easy identification

Ultimo’s task risk assessment module can be used for quick and easy identification of potential risks and corresponding safety measures associated with a particular job. This is an add-on to the work permit module.

The system’s Lock Out Tag Out (LOTO) module prevents installations and equipment from starting up unexpectedly during maintenance work. Locks are placed on parts of the plant – or processes – that need to be isolated, along with tags which identify the member of staff who places them. Only that person can authorise tag removal and unlocking.

Isolation is required

The LOTO process, which precedes issuing of a work permit, begins with recognition that isolation is required for the job to be carried out safely.

The number and position of locks and tags is then determined by those holding the appropriate knowledge and responsibility. This may be aided by reference to digital templates and P&IDs (piping and instrument diagrams) on the system.

Finish the work

A notification of when and where the locks and tags have been set is broadcast. Once this has been done, a work permit can be issued and the task can start. The work permit process ensures that locks and tags cannot be removed until the work is finished.

Maximising HSE control at the process level

While the previous section focuses primarily on routine work relating to individual assets, such as replacing a worn bearing, there are other activities which bring about changes to a plant's equipment or processes. These can be introduced safely using processes governed by Ultimo's management of change (MoC) module.

Examples of change might include installation of a new type of pump, or altering the manufacturing process and product for which an existing item of plant is used.

Initiated by a request for modification, changes are managed from the earliest planning stage to completion. The work can be carried out as individual jobs or as a set of tasks combined to form a project. Like all Ultimo HSE software modules, MoC sets a structured process which is aided by checklists and enforced by validation procedures. Users need to consider the change's possible consequences in advance and determine how to reduce the associated risks. This module enables efficient and effective integration of modification projects with the existing flow, processing and management of maintenance jobs. After the changes have been implemented, the MoC process concludes with an evaluation of whether they have achieved the intended results.

As well as ensuring safety, the management of change module saves greatly on time and complexity compared to conventional paper-based MoC practices. All of the relevant information, documents and records of communication are saved in one location. The parties involved can carry out assessments, provide signatures for approval and take other actions simultaneously, rather than having to wait for paperwork to be passed to each in turn.

A tragic illustration of why the process-level and asset-level safeguards presented here are so important is provided by the 1988 Piper Alpha North Sea oil rig disaster. Fundamentally, deficiencies in management of change practices in one part of the plant, from oil to gas transport, allowed the new risks introduced to be underappreciated. A condensation pump shut down for maintenance work, and left with a safety valve removed, was brought back online before maintenance had been completed. Gas escaping from it caused an explosion, which initiated a series of explosions and fires that eventually destroyed the rig, killing 167 people.

Proper Lock Out Tag Out and work permit procedures would have prevented this. Effective communication at shift handover would also have highlighted the danger. In Ultimo, this is covered by a shift handover module which creates a digital logbook for recording and exchanging information between operators, maintenance staff and other stakeholders.

Why choose for IFS Ultimo Enterprise Asset Mangement software?

- Powerful out-of-the-box software with predefined industry solutions. High-end software that is also flexible and can be adjusted to your preferences.
- Based on world-class technology, IFS Ultimo can be seamlessly integrated with other applications. Step-by-step if you want.
- Our user-friendly platform can be used on desktop, tablet and smartphone.
- IFS Ultimo has default-certified links, like with SAP and AFAS, and realizes robust and maintainable customer-specific links.

Reducing the number and impact of future incidents

Incident management is another process-level activity optimised by Ultimo, this time through its HSE incidents module. When an incident or near miss is reported, the designated safety officer is immediately alerted and a process begins. Its aim is to enable learning – from the latest occurrence and any previous issues – so that the number and impact of future incidents can be reduced.

First, the safety officer ensures the incident is fully recorded, processed and correctly registered. EAM software cuts down the number of steps needed to achieve this. With much of the background information already on the system, less effort is needed to gather relevant details. An email reporting on the incident is sent to the reporter and supervisors, and the same detailed record is accessible to authorised users. Immediate safety measures taken are documented.

Connecting information

An initial risk analysis is carried out and the safety officer determines whether further analysis is needed. The incident's consequences are investigated and immediate and root causes are sought. By connecting information on the assets and their maintenance history with risk assessments and records of previous incidents, near misses and problem areas, Ultimo readily enables trend and root cause analysis. Based on its results, new safety measures are defined and follow-up work is planned. After their implementation, these measures are evaluated and an assessment of any residual risk is undertaken before their final approval as a permanent safety solution.

As a simple example of how the HSE incidents module interacts with others in Ultimo, consider a pump which has delivered an electric shock. An immediate safety measure would be to disable it. The incident report may indicate a need for repair or like-for-like replacement of the pump. Alternatively, analysis may reveal a pattern which suggests that a different type of pump is needed for safe operation in the intended application.

That would require a management of change process, which in turn might call for a task risk assessment and an LOTO procedure before a work permit could be issued to install the new pump.

Clear interaction

The interactions between Ultimo HSE modules are summarised graphically in the figure above. This may appear complicated, but in practice the flows are simple and logical. The system guides users through them and presents ‘action’ notes to remind specific managers and staff of important actions they must take. Above all, the system enforces the correct process flow by ensuring that no step is taken until the prior steps have been properly completed.

High-level functions

With its clear, easily understood and accurate overview of plant HSE, one of Ultimo’s many welcome high-level functions is its ability to produce instant reports and meet auditing needs. Managers can demonstrate that every aspect of health, safety and environment (HSE) management is under control, and that the system blocks unsafe practices.

Ultimo – your route to a more efficient HSE process

Managers in the chemical processing sector are subject to stringent standards in relation to health, safety and environment (HSE). Their difficulties in managing HSE risks, especially within maintenance activities, are compounded by the complexity of the plant equipment and processes involved.

In addition to the need for legal and regulatory HSE compliance, there are other strong drivers for chemical businesses to avoid accidents. Productivity losses and accident-related costs threaten profitability, especially when continuous flow processes are disrupted. Most important of all, however, is the responsibility of companies toward the safety and welfare of their employees and communities.

Integration of HSE and maintenance into the Ultimo enterprise asset management (EAM) system simplifies managers' lives, assures strict compliance and increases efficiency.

High-level functions

Ultimo's EAM software and cloud platform bring all of the necessary information together, digitally, into one place – giving a clear overview and enabling rapid functionality.

HSE processes are not only set but enforced by the system. It will not allow any activity to proceed until the necessary prior steps have been taken and required conditions have been met.

HSE software modules integrated into Ultimo include the following:

- Work permits – for each job, specifying what measures to take, and who must take them, to make the activity safe
- Task risk assessment – identifying potential risks associated with a job
- Lock Out Tag Out (LOTO) – preventing unexpected start-up of equipment during maintenance
- Management of change – enabling equipment or process modifications to be implemented in a structured and safe way
- Shift handover – digital logbook for communication between operators, managers and maintenance workers
- HSE incidents – reporting, analysing and acting upon information to reduce future accident numbers and impacts

On a day-to-day basis, Ultimo's information and functions are easy to access and use via mobile or desktop devices. The enterprise asset management system is also invaluable when it comes to producing HSE reports and satisfying the demands of auditors. It can be clearly demonstrated that managers are in full control of HSE, that all activities are compliant and that unsafe practices are blocked.

About IFS Ultimo

IFS Ultimo is a SaaS EAM solution from IFS, focused on maintenance & safety and well known for a rapid deployment, ease of use and an unparalleled time to value. Details about IFS Ultimo can be found at Ultimo.com.

About IFS

IFS develops and delivers cloud enterprise software for companies around the world who manufacture and distribute goods, build and maintain assets, and manage service-focused operations. Within our single platform, our industry specific products are innately connected to a single data model and use embedded digital innovation so that our customers can be their best when it really matters to their customers—at the Moment of Service™. The industry expertise of our people and of our growing ecosystem, together with a commitment to deliver value at every single step, has made IFS a recognized leader and the most recommended supplier in our sector. Our team of 5,000 employees every day live our values of agility, trustworthiness and collaboration in how we support our 10,000+ customers. Learn more about how our enterprise software solutions can help your business today at ifs.com.

www.ultimo.com