

While MRO systems streamline the MRO process, they must also record information and link related data and processes and manage the financial aspects of the MRO process. Human resources also need careful management. Systems for managing finance and HR are reviewed.

Systems for managing finance and human resources in MROs

Any airline organisation needs to carefully control budgets, even if most of their maintenance, repair and overhaul (MRO) activity is outsourced. Cost control can easily be lost, so a detailed understanding of cost structures and effective financial management can be crucial for a third-party maintenance provider.

Another side of the business equation concerns the training and certification of the airline's workforce, which must be carefully managed. Collecting data about people is one aspect of the task, but effective control is another.

Most specialist 'pure-play' MRO software vendors (*see Commercial MRO software vendor market survey, Aircraft Commerce, February/March 2008, page 63*) focus on providing the 'best of breed' functionality for maintenance, engineering and supply. They provide less coverage of human resources (HR) and finance, which are the traditional remit of the specialist enterprise resource planning (ERP) vendors. The pure-play market has sought to catch up and become mini-ERP systems, providing more specialist functionality in these areas. So which route is best?

Starting with finance, three groups of tasks and processes must be considered. First, there is the collection and accounting for material used, outside costs and labour data for the MRO process. Second, there is the general ledger type activity that includes stock valuation. Third, management accounting functions provide key performance indicators (KPIs).

Pure-play financial functions

The MRO software market broadly splits into specialist ERP solutions and 'pure-play' vendors. The functional

breadth of pure-play solutions has extended over time to cover more of the traditional territory of ERP solutions, driven by the demands and development dollars spent by the pure-play vendors' customers.

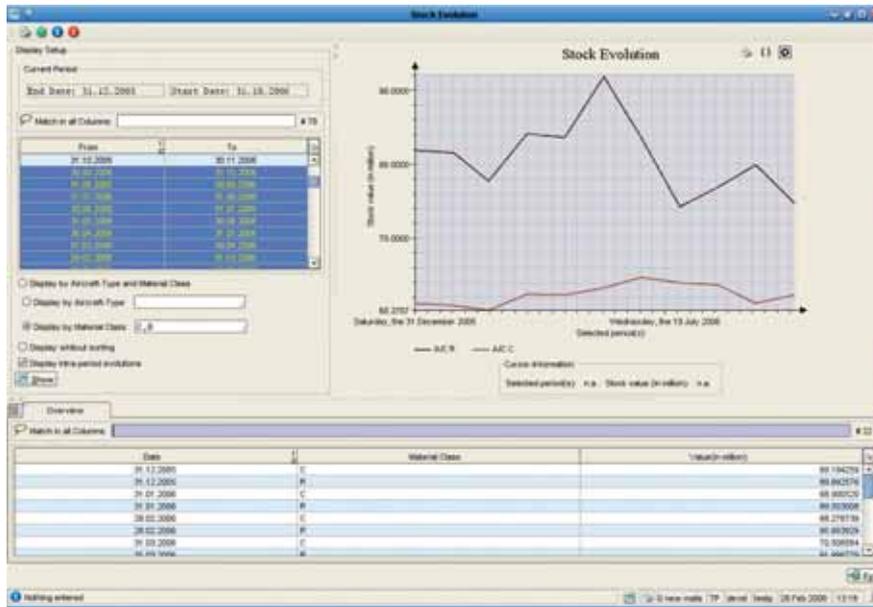
One vendor that has followed this extension path is SWISS AviationSoftware with its AMOS product. "The 'heart' of AMOS is the execution of maintenance activities," observes Ronald Schaeuffele, chief executive officer at Swiss Aviation Software. "However, financial data is collected in all areas throughout the system, which allows for more clarity and granularity of cost factors. We have enhanced many functions, including detailed billing functionality, finance-relevant reportings and key performance indicators (KPIs). These are accumulated and defined before being transferred to the customer's external financial system for invoice processing. A good example of the in-built functionality is third-party maintenance billing. Data is collected from the procurement process, which includes invoices for each component and the collection of figures for purchase, repair and loan orders, labour rates, surcharges and so on. All elements are combined and assembled for each respective contract in place between the provider and its customer."

The process of generating invoices does not differ between internal and external customers, whether it is the customers' own cost centre or that of a third party. Setting up an invoice is complex: a tracking number is assigned to a certain project in which any related working steps are accounted for and then allocated to a cost collector. "For large projects, such as heavy maintenance visits," continues Schaeuffele, "it is useful that multiple sub-project numbers are supported so that the related cost data

can be collected. Typically this is for material procurement, component exchanges, labour and man-hour (MH) rates which will be represented graphically in a 'tree-structure' in the AMOS billing module.

"It is possible to issue one invoice for the whole project once all elements have been properly assigned to the project number, or to issue partial invoices for individual billable items, which can be selected and de-selected by a mouse-click. This allows the user to track the exact status of the invoice at any time, and also compare its content with the respective contract. This comparison can be at an MH rate per skill, rules for sales or purchases of parts, and so on. Following the invoice calculation, it is possible to override, replace or delete each invoice element before transferring it to the financial system in a detailed, pre-defined manner for release to the customer. It is important to note that the MRO system has yet to take over the financial system's classic tasks, such as issuing invoices and collecting payments."

Other vendors agree with Schaeuffele. MXi is a leading pure-play solution that has also seen growth in the functional ability of its Maintenix solution. It offers detailed cost tracking of all activities undertaken by the maintenance department, such as labour, materials, outsourced repairs and exchanges. The software records detailed journal entries to account for all relevant financial transactions, such as material receipts, issues, turn-ins and component scrapping. This detailed journal log can then be fed to an airline's or MRO provider's general ledger or ERP system. The product also manages the receipt of vendor invoices, and provides full invoice matching and reconciliation features to ensure invoices are only cleared for payment upon receipt



Pure-play MRO solutions now include comprehensive financial management functionality. AMOS is a good example of this new capability.

type of part,” comments Hircock. “Every part in the system is classified as either a rotatable (a fixed asset), or a consumable (inventory asset). Our system tracks the value of each rotatable, which will initially be valued at its purchase price. It will then be depreciated to a final residual value. The system can depreciate the rotatable based on usage, hours and cycles, or calendar age.

“The system tracks consumable items based on their average unit price. When a new consumable item is received, the unit price of the part is recalculated based on the current value of the on-hand assets and the price of the new items. Consumable items are never depreciated.”

It is clear that the pure-play systems have developed a range of financial functions that can deal with most airlines’ and MRO organisations’ requirements.

ERP financial perspective

ERP vendors started out as finance solutions and enhanced and extended their capabilities. Several have invested heavily in re-structuring their solutions to meet the specialist requirements of aviation MRO processes. This is essential when competing with specialist pure-play solutions. One of the few successful ERP companies to make this transition is Ramco Aviation Solutions.

Finance management from Ramco covers all aspects of financials, as well as the specific needs of the aviation industry, comprising modules covering: enterprise set-up; general ledger accounting; payables management (AP); receivables management (AR); fixed asset management; and management accounting and reporting (cost centre accounting). These functions integrate with other business functional modules like maintenance and engineering, procurement and inventory, sales management and HR and payroll.

“This provides greater visibility and facilitates control over the organisation’s financial operations,” claims Jim Fitzgerald, president global A&D, aviation and MRO solutions at Ramco. “This pre-integrated solution is a one-stop-shop solution catering for all the needs of maintenance organisations. This allows the customers to help monitor and optimise costs and performance, without compromising on controls. Some of the aviation-specific features include invoicing for component repairs or exchange, invoicing for loans or exchange, end-to-

of all the items, and that the invoice prices are reconciled.

“Our system provides advanced functionality to gather costs for any particular MRO project,” claims Andrew Hircock, product design manager at MXi. “These include full costs for parts and labour, and other miscellaneous costs such as facilities and fees. Our solution also tracks the ‘passed on’ costs for a project, like outsourced component repairs, and contracted work. The software then provides tools and reports to generate a final invoice based on this cost information. The invoice can be generated, stored and sent to the customer. Each transaction is recorded as a journal entry, and MXi uses traditional accounting practices such as credits versus debits, or assets versus liabilities versus equity accounts to process the general ledger data. This journal log information is then extracted from our system and fed into the airline’s or MRO provider’s own corporate ledger, which is typically managed in a separate system. Normally, this information is transmitted using an automated integration, to reduce lags and promote data accuracy.”

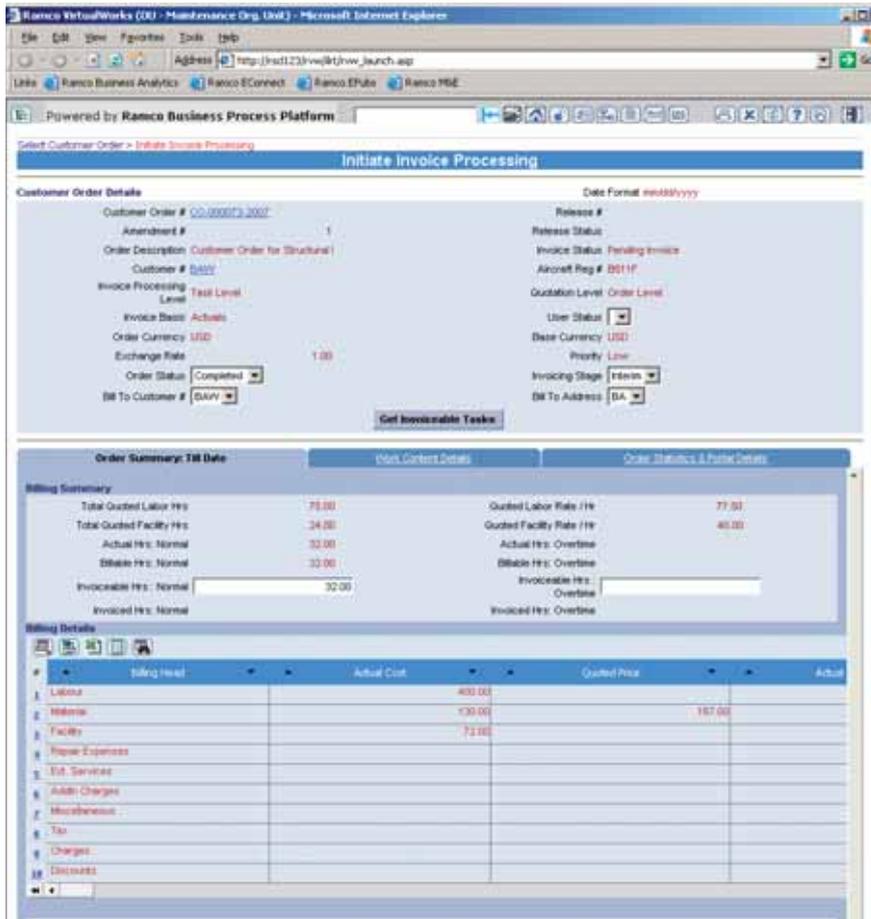
This method of financial integration is common to all the pure-play vendors for several reasons. First, selling a computer system globally means that software must adapt and work for many different local financial frameworks and regulations. Accounting practices differ from country to country and the specialist niche MRO software vendor would have to develop the applications to fit these processes. Second, and perhaps more importantly, a chief financial officer (CFO) will usually want to have a company-wide view and control of financial matters. A separate MRO financial solution would cut across this principle. Many airlines and MRO facilities have already invested in a core backbone finance and HR system, and

will not want to duplicate or overlap other IT systems. An exception to this would be small organisations that are looking for less sophisticated HR and financial management systems, and are happy to take whatever the MRO software vendor has to offer. Much larger companies want a monolithic solution to manage absolutely everything and provide the CFO with complete control. British Airways and Singapore Airlines, which opted for the SAP ERP system, including their MRO facilities, are testament to this. After many years of investment, their SAP implementations may finally be showing some returns.

Valuing stock

One element of financial management is stock valuation. This includes tracking and accounting for depreciation of parts owned by the organisation. Traditionally, stock and equipment depreciation are handled in the company’s financial system and not the MRO system, but some vendors have extended their functionality to cover this area. “We have recently developed a depreciation model for straight line or linear depreciation within our product,” says Schaeuffele. “It is aimed at those customers who decide to realise the task in our system, although none have implemented it to date. Our solution offers several ways of making price assessments for the same part number: weighted average price, asset value (including deductions for financially-relevant depreciation) and minimum sales price. The system provides various formulae so customers can pre-define their own mechanisms and parameters, such as higher weighting of newer prices compared to older ones.”

MXi takes a similar approach. “Maintenix handles stock and equipment valuation in two ways, depending on the



Coming from its ERP roots, Ramco offers comprehensive invoicing and financial management functions.

accruals for cost and revenue to facilitate financial closure are enabled in general ledger accounting.”

Ramco sees some big advantages with its approach. It believes the ERP vendors can offer seamlessly integrated financials and HR, and also supports integration of third-party Financial/HR Applications. Ramco has integrated various finance solutions like SAP in its MRO solution. It can therefore offer both stand-alone MRO, and integrated finance and HR options to customers. Inbuilt HR and finance options offer various advantages over integrating other third-party solutions. A pre-built finance capability achieves a truly ‘integrated enterprise’. The ERP solutions are specifically designed for seamless access, visibility and traceability of operational information related to aviation finance, and a rich repository of financial reports linked up with operations. This results in a more informed and empowered finance organisation, assisted in its operations towards more efficient analysis and decision-making.

“The order-to-cash process for a third-party MRO facility is a good case in point,” claims Fitzgerald. “Our MRO receivables business process can automatically generate customer service invoices, based on the billing and pricing terms of the contract, on completion and certification of a customer job. The invoice is instantly printable with the labour amounts on it, traceable right down to the cost of a mechanic’s timesheet entry across job locations. The material amounts are verifiable with the individual costs of parts physically issued on the job.

“We believe the disadvantages of not having your own financial and HR functionality in the software package are significant,” points out Fitzgerald. “Building such a high degree of integration with a third-party product is highly expensive for a customer in terms of development and maintenance. Due to this, integration usually covers the basic information exchange across systems and general ledger (GL) accounting for financial statements and reporting. This leaves end finance deprived of the information that would help improve the user’s efficiency, and also breaks the traceability matrix.

“Other disadvantages to the customer are the increased total cost of ownership, non-synchronised product roadmaps, upgrades, lack of standardised platforms, system administration practices, the need to manage multiple vendors, and the cost

end integrated solutions in receivables for MRO, which includes service sales or part sales invoicing. The system can integrate with third-party revenue management systems for airlines, and can capitalise overhaul expenses and provide automatic retirement of these at the next overhaul maintenance.

“The product can populate information to its data warehousing product, Ramco Aviation Analytics, to facilitate financial analytics reports and dashboard for the decision-makers and C level executives,” says Fitzgerald.

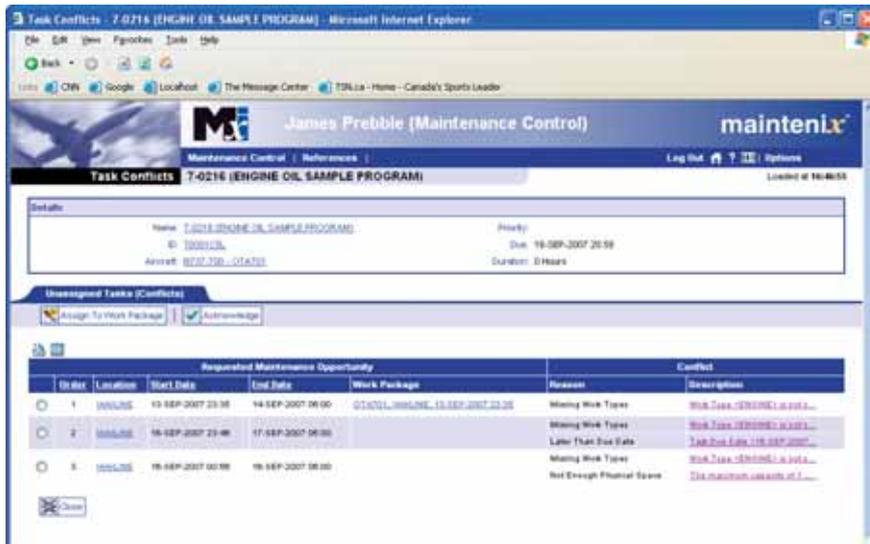
Other ERP vendors take a slightly different and somewhat surprising viewpoint. Axon is a specialist consulting company which packages and implements SAP for the MRO aviation market. “SAP typically invests \$1.5 billion into all its software products,” says Richard Minney, solution architect for SAP MRO. “About \$10 million of this goes into the Aerospace and Defence product. SAP has been used by major consulting companies to meet the needs of large airlines and MROs with relatively customised solutions. There has been a change in direction in the past two years. We have developed a more generic, out-of-the-box SAP solution for smaller airlines and MRO facilities, and reduced the implementation timescales. Our view is that most large airlines will have an HR and corporate finance backbone, whether in SAP or not. When the client is not

interested in replacing finance and HR, we still believe the SAP solution provides a strong offering and would not try to convince the client to change the finance and HR at the same time. This differs from our previous strategy.”

Cost control

One advantage of the ERP solution is that an organisation can potentially have an end-to-end, integrated solution for finance and MRO. For example, the general ledger, balance sheet and profit and loss account will all be contained within the application, which would be fed by the MRO modules.

“Our system posts accounting entries to the general ledger from all business functions,” continues Fitzgerald from Ramco. “This includes maintenance and engineering, procurement and inventory, and sales and finance in real time. Detailed analysis on the general ledger can be carried out with drill-down to the source documents to give better visibility to the finance function. The general ledger records all relevant details of the transaction in various business functions at source. This provides reliable data and minimises the allocation of cost by the finance function. Accounting entries are parameter-driven, which are pre-sets that allow consistent and error-free accounting. General Ledger also facilitates Budget Accounting. Automatic



Pure-play applications can assist in complex HR management scheduling. Resource and individual skill conflicts can be highlighted and resolved by the system.

The ERP view of training

Safety studies within aviation show that human factors and training play a crucial role, so this is a mandatory aspect of aircraft maintenance operations.

Typically aviation industry training requirements include vocational, job-oriented training and specialised knowledge enrichment education. Ramco's HR solution is much wider in scope than the pure-play systems due to its ERP heritage. It helps in identifying, monitoring and controlling the training requirements and related history for the maintenance and other staff. As training requirements are met, the system automatically recalculates the next due date, thereby allowing for a wide variety of reporting capabilities.

"Compliance with the regulatory requirements of aviation for certification and licences is easy," claims Fitzgerald. "Our system helps track the issue date, validity duration, and renewal data. Specific training requirements for pilots, cabin crew, engineers, mechanics and inspectors can be identified and nomination for each course can be recorded in the system. Training courses on aviation safety, aircraft structural training, avionics, powerplant, aircraft weighing and centre-of-gravity calculation, aircraft painting, and non-destructive tests can be defined, so that capable instructors or faculties can be identified in the system.

"The training process in Ramco starts by identifying competency and qualification gaps. Gap analysis forms the basis for a training plan, which is used to create internal and external training calendars. The system supports maintenance of these calendars, and creation of training budgets and getting allotments.

"Our training process follows a three-tier model for training: programmes, modules and courses. A course is granular and may be mapped to one or more modules and a module in turn to one or more programmes. Pre-requisites for attending certain courses, modules and programmes can be specified. New courses and programmes can be devised based on needs identified during appraisal process and general requests," says Fitzgerald.

"Employees can request training through Self Service, which allows

of upgrading one system due to a change in the other," says Fitzgerald.

The market seems split on the advantages and disadvantages of ERP and pure-play MRO software. Most ERP vendors, with the exception of Ramco and IFS, have not seen significant sales to the airline market recently, possibly because the large MRO shops and airlines have already bought large ERP solutions. So the market for the tier-one customers is somewhat saturated, but there still seems to be a steady stream of sales for the pure-play MRO software vendors. The disadvantages of a separate system for the MRO process management may not be so great after all.

Pure-play people watching

HR management is the other area of interest for most airline maintenance and MRO organisations. The pure-play MRO vendors have been extending their functionality to cover more and more of this area within their own application. This begins with the management of staff records, particularly for training and certification, which is critical for ensuring the highest standards of quality and safety, and implies that the airline or MRO provider has a system to control the assignment of work to appropriately qualified and trained staff. Such controls are a challenge to any software system.

"AMOS offers a comprehensive personnel qualification system (PQS) to deal with training and certification of employees," says Schaeuffele. "The system provides several capabilities for the administration and monitoring of technical staff's qualification licences, type-ratings and training courses. The first capability is an employee database in which all personal data are registered. Next the system provides records of licensed persons whenever new licences are obtained, or additional training courses have been successfully completed,

together with a history of all courses attended by staff members, and the licences that they have obtained. This means that the organisation can monitor the renewal of all personnel licences and courses."

Resource planning and management is one of the largest management 'levers' at the disposal of airline executives. Again the pure-play solutions have extended their functionality to cover these requirements. "The Maintainix system allows a user to prepare work schedules and rosters," says Hircoc. "This involves setting up a repeating shift schedule that can be as simple as a weekly day-shift pattern, or as complex as a rotating 30-day night-shift versus evening-shift schedule. Once the work schedules have been prepared, staff can be assigned to them, and overtime and downtime for holidays and training can be planned for each individual staff member as needed.

"Our system allows a supervisor to organise the individual resources on a shift into crews, which allows for better management and optimisation on a day-to-day basis. Work is allocated to these crews, which can be assigned to specific zones of the aircraft. At the shop-floor level, the system allows for detailed time tracking against every task in the system, representing both maintenance tasks and non-maintenance activities, such as training and meetings. Technicians can record the number of hours spent on every task they perform. Multiple technicians can record their hours against the same task, since many tasks need to be split across shifts and skills.

"The software provides technicians with a convenient stopwatch-style interface to improve the quality of time tracking. Features of the interface include start, stop, and pause buttons, which allow an employee to quickly and accurately record the number of hours spent on each activity."

managers and department heads to sponsor subordinates for training. The system supports a wait-list of employees for each training programme, and records trainee and faculty feedback on user-customisable parameters, such as course content, infrastructure, faculty, arrangement and trainee participation,” says Fitzgerald.

Certification and licensing

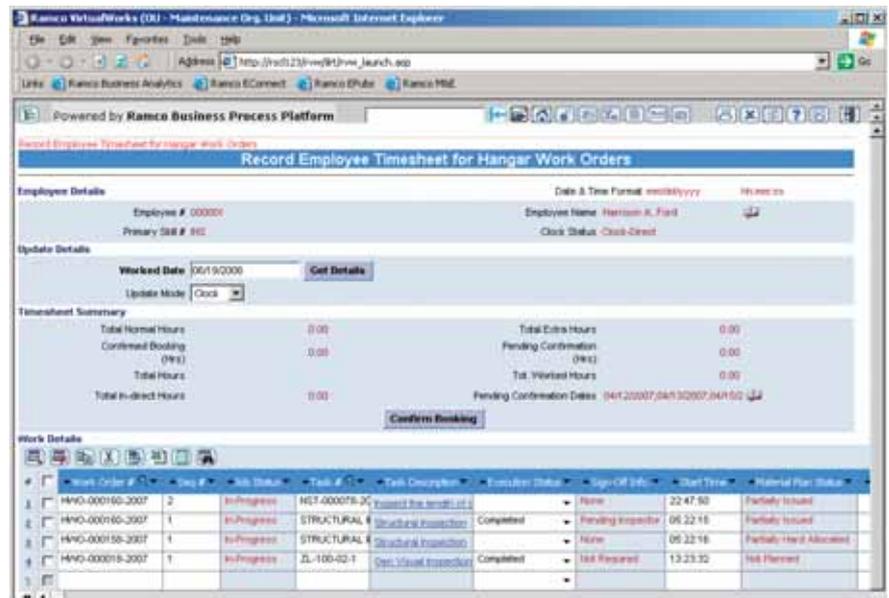
Aircraft mechanics and service technicians perform scheduled maintenance, repairs and inspections required by regulations. Specialist airframe and powerplant mechanics and avionics technicians inspect aircraft engines, landing gears, pressurised sections, brakes, valves, pumps, air conditioning systems and major systems parts on the aircraft during routine maintenance and replacement of parts.

Some mechanics work on only one aircraft type, while others inspect and repair a variety of types based on their certification and licence and its effectivity. For instance, the level 2 certificate issued for a non-destructive testing (NDT) inspector is valid for a particular method, like ultrasonic testing or radiography, and for a specific period, after which the certificate must be renewed by examination without necessarily undergoing the training.

The Ramco certification process identifies certification requirements and obtains and grants the certificates that allow mechanics and inspectors to work on the aircraft. It records training and post-training evaluation results for internal certifications, which will establish the effectiveness of the training and its impact on the employee's performance. The training and post-training evaluation results will form an input for competency updates. Ramco's employee records module also stores qualifications, primary and secondary skills, certifications and employees' licensing information.

Pure-play resource planning

Both AMOS and Maintenix have similar capabilities. Reference data are created and stored on working hours, overtime rules and holiday regulations. Customers are able to define an unlimited number of rules according to a customer's request, which are then also controlled by



the system. Both systems view the HR functionality as a complement to the core MRO functions of the system, and concentrate mainly on the sourcing and provision of relevant information for the maintenance functions. Information on new employees and their qualifications is transferred to the respective module in the MRO system, and information on worked hours is fed back to the HR system.

Most pure-play MRO software packages include a shift and capacity planning module. This starts with a creation of shift plans by setting up repetitive and exceptional shift patterns. Staff members are assigned, taking into consideration the availability of required skills. Limitations, such as maximum working times and public holidays, are then featured into the final plan. Impacts on future shift plans can be simulated, work-time models created and cross-checked against predefined work-time rules, and staff's attendance can be tracked and compared to the planned working time.

The pure-play vendors have a slight edge on the shop floor. Most systems have evolved a comprehensive shop-floor data collection capability. Maintenix allows for detailed time tracking against every task in the system. These tasks represent both maintenance tasks and non-maintenance activities, such as training sessions or meetings. Technicians are able to record the number of hours they spend on every task.

What does the future hold?

Is there a clear case for either ERP or extended pure-play? It depends on the business processes to be covered, and on the existence of other systems, like a local finance and HR package. It depends also on the organisation and how process

boundaries are defined, on cost/budget, speed of return on investment and business priorities. If the MRO/ERP project starts with the CFO, an ERP solution is the default answer. If it starts with the maintenance department, and the real business users, the answer will generally be 'pure-play', extended or not.

The latest developments in the MRO market indicate that it is increasingly important for software vendors to continue to extend finance and HR capabilities in the MRO system. In the technical financial area, direct access to financial information is essential to carry out controlling tasks, such as statistics, reporting and analysis, which are not traditionally found in the MRO sector.

Convergence is taking place: the ERP systems are developing MRO pure-play capabilities and the MRO specialist vendors are becoming more ERP-like. For the pure-play market, the trend will go further towards an approximation of a traditional finance system, while the focus will always be on the core MRO functions. But they still want to remain a 'best-of-breed MRO solution', because this is where their strengths lie.

With convergence comes more intense competition for this middle ground of functionality. Whether ERP vendors have the desire to continue investing substantially in what is a relatively small market is questionable, however.

Continuing to provide better tools for executive management to use is another key trend. Financial dashboards are now common with pure-play systems and ever-more sophisticated tools to mine a rich financial and HR database may be the key to long-term success for an airline or MRO facility in these tough times. **AC**

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