REMAIN AHEAD

THE BENEFITS OF PLANNED MAINTENANCE

MOVE THE WORLD FORWARD

MITSUBISHI HEAVY INDUSTRIES GROUP

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MITSUBISHI HEAVY INDUSTRIES COMPRESSOR INTERNATIONAL

STICKING TO PLANNED MAINTENANCE SCHEDULES ENSURES RELIABILITY

Unexpected equipment emergencies happen. However, some emergencies can be averted with the proper maintenance and planning. During the COVID-19 pandemic, a significant proportion of regularly scheduled equipment overhauls and turnarounds were postponed. As a result, a major trend of projects in 2020 shifted towards emergency shutdowns due to machine failures, exacerbated by an unusually active hurricane season and other natural disasters. With so many operators delaying scheduled maintenance, MCO-I encourages customers to plan well in advance, as demand for labor and other supporting resources are projected to be approximately 33% higher than usual in the next few years. Mitsubishi Heavy Industries Compressor International (MCO-I) can mobilize to your site to support those needs. In addition to standard overhauls, upgrades and turnaround services, MCO-I's Field Service group offers proactive and reactive service solutions to customers, including supplying manpower and supervision required for new installations, and emergency breakdowns.

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THE VALUE OF FORWARD PLANNING

Prioritizing proactive maintenance is vital for long-term plant profitability. Implications for delaying machine maintenance can include losses to production even pre-outage. If a machine experiences an unexpected vibration problem, being forced to run at a reduced capacity for many months severely limits production and profitability. Furthermore, postponing scheduled machine maintenance results in a larger workload during an outage timeframe.

Forward planning enables the customer, alongside MCO-I's field service support group, to highlight any issues to mitigate risk before a turnaround begins, such as consumable requirements and special tools shortages. Once the work scope is defined, a simple deck walk of the work area provides an understanding of how much laydown area is available, the capacity of any overhead cranes, tool and rigging locations, along with the condition of these items. This exercise decreases the time required to perform the turnaround, which in turn reduces downtime and production losses for the customer.

If certain tasks can be allocated to either pre-outage or post-outage time frames, where expenses are typically less, overall costs can be reduced by up to 20%. By properly placing inventories, operators ensure components, tradesmen and machinery are on hand if equipment needs to be replaced, thus saving a huge degree of downtime during the main overhaul.

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SERVICE CAPABILITIES

DELIVERING TURNKEY SERVICES

MCO-I has the engineering expertise, repair facility, labor forces, technical field advisors and project management capabilities to handle all types of overhauls for both OEM and non-OEM equipment. Additional issues can be discovered during the disassembly and removal process. Further findings are often made as inspections are performed onsite and at the repair facility.

Scheduled outages offer the luxury of collaboration across many departments, such as engineering, commercial, logistics and repair facility personnel. Including project planning in the scope enables a complete inventory of possible parts and special tools required for the work to be performed, allowing for any shortages to be sourced. Emergency outages, however, do not allow for any pre-outage inventories, labor force planning or site inspections. All items alter the timeline in unpredictable ways from start to finish, increasing cost and outage time frames.

EFFECTIVELY MANAGING PERSONNEL

MCO-I recommends customers implement a contingency plan for emergency support, including conveying the site requirements to get onto the plant, determining crew size and a cohort of pre-selected Technical Field Advisor (TFA) support. Instead of days being occupied with admin, MCO-I can pre-select individuals with the necessary health and safety requirements to be present on site, who are familiar with the equipment requirements.

Since most emergencies result from unexpected equipment failure, MCO-I offers onsite training before equipment is delivered via the local Pearland Works training center to ensure efficient installation. New installations should have operations personnel undergo training six months in advance in order to establish familiarity with site operations.

ATTENTION TO DETAILED PROCEDURE PLANNING

Detailed procedure planning is significantly different from turnaround planning, and is too often overlooked. The plan includes checkpoints, documentation to record as-founds and as-lefts, and it also guides the user step-by-step in identifying drawings, tools and equipment required to perform that particular operation. MCO-I provides detailed planning procedures to the customer before and after the overhaul and identifies any modifications or revisions needed to refine the plan ahead of the next scheduled overhaul. This information is particularly useful ahead of any future staff changeovers, in order to preserve and perpetuate the company's tribal knowledge about its own specific equipment overhaul procedures.

PROVIDING ORGANIZED ASSET MANAGEMENT

In pre-execution or pre-shutdown planning, MCO-I recommends customers carry kitting boxes for both special tools and spare parts. This 'kitting service' supports asset management onsite. All tools are inventoried ahead of time, and added in kit boxes when the equipment is initially purchased. The large kitting boxes allow users to effectively see all components, complete with tag numbers and locations. The kitting service increases efficiencies during overhauls by having these specified tools readily available, eliminating the need for them to be made onsite. Typically, crews would be idle awaiting an item to be manufactured. An hour delay on an overhaul, depending on crew size, can cost upwards of $3,500 per hour per crew. Frequently, if a required tool is found to be missing during the turnaround, an excessive spend has to be outlaid to retrieve one quickly as workarounds are not typically available. Being unprepared can potentially result in millions of dollars a day in labor costs and lost production time.

ESTABLISHING REALISTIC TIMELINES

Typically, MCO-I will be involved in the installation planning of OEM and non-OEM equipment 18 months prior for a greenfield project or a brownfield improvement project. Once engineering is agreed upon, the project progresses to manufacturing. Dependent upon complexity, the project may require upwards of nine months manufacturing time plus overhaul time. A suitable lead time allows MCO-I project managers and planners to effectively work on site logistics. For project planning through execution, MCO-I recommends a minimum of six months be allocated, involving either a direct planner positioned onsite consistently or a project manager mobilizing between site and the office. This role is to ensure all site logistics, scaffolding requirements and internal work orders are pre-aligned and financial contingency packages are accounted for in the customer's procurement system. Ensuring procurement issues align with field execution during an overhaul can occupy an inordinate amount of time, especially in an emergency.

ACCESS TO A STATE-OF-THE-ART SERVICE SUPPORT FACILITY

MCO-I developed a state-of-the-art service support facility capable of carrying out much of the standard work performed in the field. A compressor or steam turbine can be removed, brought to the controlled environment of the shop, upgraded to 'as new' condition and returned to site for installation. Those efforts require advance planning to coordinate field assets, execution, removal and installation as well as the logistics involved in moving heavy freight between two locations. MCO-I has performed this type of work throughout the Gulf Coast, as well as in Iowa region, and across North America, providing 24-hour daily coverage.

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PROOF IN PLANNING
COMPARING OVERHAUL PROJECTS

Across several months, three centrifugal compressor overhauls were undertaken in planned conditions at MCO-I's Pearland Works facility. The comparative outcomes of the project overhauls highlight the benefits of having detailed planning procedures in place, and demonstrated how engaging MCO-I's TFA team and complete resources leads to a significant reduction in labor resources and downtime during an outage.

PROJECT 1 EMERGENCY OVERHAUL—UNEXPECTED OUTAGE WITHOUT PLANNING PROCEDURES

The service team arrived with no detailed planning procedures. The compressor overhaul took almost six days to complete, beginning on a Monday morning and finishing Saturday afternoon.

PROJECT 2 MIDPOINT OVERHAUL—WITH DETAILED PLANNING PROCEDURES

The service team operated with detailed planning procedures, which they utilized themselves. The compressor overhaul took almost five days to complete, beginning on a Monday morning and finishing Friday morning.

PROJECT 3 COMPREHENSIVE OVERHAUL—WITH DETAILED PLANNING PROCEDURES AND EXPERT SUPPORT

MCO-I provided continuous service from plan to execution. The service team was fully staffed with TFA guidance and supervisory support, along with detailed planning procedures. The compressor overhaul took three days to complete, beginning on a Monday morning and finishing Wednesday evening.

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THE COMBINED VALUE OF DETAILED PLANNING PROCEDURES AND EXPERT SUPPORT

Due to the service team's unfamiliarity with the site and equipment in Projects 1 & 2, they expended a valuable amount of time acquainting themselves with the demands of the situation. In an outage, the costs incurred in just one hour's delay in action equates to a significant expenditure. Once the overhaul demands were understood, the service team was called upon to execute maneuvers that they were unaccustomed with. In these situations, especially when detailed planning procedures are not in place, crews that encounter modest issues such as immovable nuts and bolts, have the potential to unwittingly adopt an unsafe work strategy, make mistakes and cause delays. The emergency outages, where no detailed planning procedures have been established, tend to be a common overhaul scenario across the industry.

The TFA supervisory support team consists of five personnel per shift, plus leadership. This equates to a crew of between 10–12 experts on site, who will remain with the project until completion. Since most problems tend to occur at crew changeover times, both the day and night teams work together in careful cohesive alignment, with standardized, well-rehearsed methods for how to perform all maneuvers, critical lifts and measurements. The procedures put in place by TFA supervisory support reduces potential mistakes that happen during a standard overhaul, and enables crews to plan to such an extent that hazardous tasks can be executed during daylight hours to minimize risk. Labor efficiency, quality and safety are greatly improved by working in tune with one another in this way. The added cost of engaging the TFA supervisory support team in Project 3 was entirely mitigated by the reduction in time required to complete the project. TFA supervisory support were able to employ their resources, expertise and preparedness to complete the overhaul in half the time of an emergency scenario and two days faster than a service team with detailed planning procedures, potentially saving millions of dollars in outage time.

Detailed planning procedures are tailored for the customer's specific operational requirements on their equipment, and MCO-I is often instrumental in devising innovative solutions to help customers tackle their operational pain points. MCO-I's engineering capabilities continue to drive innovations both from a technological and operational perspective, and provide customers with decades of continuity and planning through the lifetime of their equipment.

SUMMARY—SHARING LESSONS LEARNED

MCO-I believes its customers are undoubtedly the experts in their individual plant and processes. However, the customer typically performs an overhaul approximately once every six to eight years. Indeed, during an individual's career lifetime, they may only witness one or two overhauls. Conversely, during one month, MCO-I may manage four or five overhauls, accumulating in the process a vast amount of experience understanding what does, and does not, work in practice. Skilled, experienced and knowledgeable MCO-I engineering personnel, who are proven and respected in their field, are available 24 hours a day, seven days a week to share a wealth of learned best practices.