

## **Equipment Remanufacturing How much change should one implement.**

By Antonio Reis.

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All manufacturing companies have to make this decision at some point- upgrade their existing equipment or manufacturing process or build an entirely new one. Over time the market forces a manufacturer to improve or change his processes in order to stay competitive. Whatever it is a simple modification to meet customer demand or upgraded equipment to manufacture new products; the manufacturer has the opportunity to compare the overall economical impact of new equipment versus used equipment.

Today most equipment manufacturers are flexible enough to accommodate their customer needs and provide customized manufacturing systems that can be integrated with minimum suffer. However this have a premium cost that often discourage manufacturers to initiate change.

The manufacturer senses a need for changes in equipment and initiates to gather information as to evaluate various approaches. The criteria is usually concentrated around capability, output, quality and safety/environment. The order of priority may vary but the variables remain the same.

*In my opinion, cost of the equipment is not a variable unless the equipment designer/builder is able to provide the manufacturer with absolute assurance that the variance in cost is directly proportional to ROI. Usually the manufacturer has a defined budget for a project and cost proposals above those budgeted are rejected, at least in the initial phase.*

In order for a manufacturer to evaluate the option of remanufacturing existing equipment, the approach needs to show that the end result will provide solutions that can compete with those possible with new equipment. Rebuilding old equipment to its original configuration usually can't compete with buying new equipment because old equipment in its best days is far inferior to today's equipment. One must start by establishing that the effort will involve substantial engineering resources.

Rebuilding equipment can be very disruptive to other plant's manufacturing processes. In a sense it is a challenge because the plant is usually functioning while equipment is being worked-on. The initial steps should include meetings where all relevant members can provide input, identify their responsibilities and priorities and assure that all efforts are aligned with the project goals. Safety of everyone in the premises must be a priority.

The main advantages of remanufacturing existing equipment are delivery time, equipment cost and easy of process integration. However careful planning and good project management are essential. The manufacturer needs assurance that the equipment will perform after the remanufacturing effort with equal or better OEE. The time from "shutdown to rebuild" to "ready for production" needs to be optimized. The planning activities necessary to assure that the end user is able to schedule and meet product delivery after the remanufacturing effort are of most importance.

In the process to determine if a piece of equipment or manufacturing process is a good candidate for a remanufacturing effort one should consider the following:

- The economical impact of having the equipment or process down for a determined amount of time.
  - Can the manufacturer build inventory or temporarily distribute the load to other manufacturing centers?
  - Will there be any personnel issues?
- The level of documentation that exists about the equipment or process. If the equipment is fairly well documented, the re-engineering task is much easier.
- The required performance of the equipment. One needs to have concise knowledge of the process requirements and understand the methods and systems that make those possible. New equipment suppliers almost assure a specified level of performance. Since the manufacturer is purchasing components and integration services the choice of components needs careful consideration.
- The strengths and weakness of the existing equipment. One must maintain the continuous improvement of the equipment characteristics. Safety, health and environment issues need to be carefully considered and leveraged against those presented by new equipment.

Once comfortable with the points above the manufacturer can investigate the resource requirements and establish an estimate for the costs involved in the effort. In general one can count on replacing all drive system and control wiring. Bearings, heaters, sensors and safety related electrical devices should also be considered depending on the level of reliability that those components offer to the remanufactured system.

The manufacturer must gain the capability to evaluate the resource requirements prior to make any decision on pursuing the equipment remanufacturing option. I suggest that such activity is done in conjunction with procurement of new equipment. Hiring a consultant with substantial knowledge in the manufacturing field to aid on the decision-making is a wise investment.

Once the manufacturer opts to investigate remanufacture of his equipment, the manufacturer must take a gate approach to the project. The following shows the approach I use:

- ***Create a broad layout of the current and future equipment configurations.*** Analyze the layouts for functionality; discuss them with personnel directly involved in the manufacturing process (operators); update to reflect new knowledge. *Deliverables: Systems overall specifications. It should include power/pressure/temperature/speed/etc requirements, integrated safety requirements and overall process methodology.*
- ***Break the layout down to understandable systems.*** Management and workers (operators, supervisors, quality techs, etc.) less familiar with the details of new systems and technologies need to understand the proposal in order to provide useful feedback.
- ***Draft a list for all major components in the system.*** Evaluate cost and availability of the major components. This is a procurement effort and is necessary to define the major suppliers in the project. A project that is

automation intensive needs special attention regarding logic controllers. As an example PLC control integration with motion control has many variables that if not properly addresses can substantially increase not only component costs but also integration time, design time etc. The manufacturer also has the opportunity to voice his opinion and preferences towards component types and brands. Issues related to technical support and service for those components need to be addressed. *Deliverables: A complete list of component vendors and cost of major components.*

- ***Create a broad list of machined parts as blocks.*** Often the parts are similar to those in the current machine. Estimate individual part costs. Consultants tend to adjust estimates in relation to the manufacturing field. The same part as different price used in two different manufacturing fields (ie. pharmaceuticals and metal working). If one adjusts the estimate than it may guide management to a path not aligned to the objectives of the effort. Discussion of this list and the part's respective estimated cost causes the design complexity to be exposed. With adequate examination one can optimize the configuration and reduce the system's complexity. *Deliverables: A reasonable description of the system in terms of components and theoretical capability. The decision makers can at this point zero on a final set of specifications for the system requirements in terms of capability and functionality. One can evaluate if those are in line with the process needs and continue the evaluation or proceed with the new equipment option.*
- ***Finalize a component configuration proposal with enough detail as to calculate manpower requirements.***
- ***Presentation of estimated cost analyses.*** The manufacturer has the opportunity to evaluate the proposal ask the right questions and adjust the proposal, time of delivery, etc. This is the time to compare and define clear paths toward a final decision. *Deliverables: Documentation in detail that allows for RFQ requests either to remanufacture and new.*

This approach offers a process were the manufacturer has the opportunity to tailor the type and degree of upgrade he needs. In this manner, the good features on the old equipment are kept and new technology is integrated to meet the manufacturing needs.

The main objective is to provide equipment that is customized to the manufacturing process while sharing the technical support benefits of new equipment.

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