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TMS Resonant Acoustic Method (RAM) NDT-SEMI System: Return on Investment Study

ABS Control Bracket Production Line

Top Tier Parts Company

Peoria, IL Plant

Executive Summary

Automotive manufacturers are currently pulling double duty on parts suppliers. On the one hand, they expect zero defects and 100% parts inspection prior to shipment and are increasingly contractually requiring it, effectively pushing the cost of inspection down to the supplier. On the other hand, they want lower costs on parts. It is imperative for parts suppliers to find tools to help them maintain high quality while keeping costs low. The combination of high quality/low cost parts will result in increased sales and profits to automotive parts suppliers.

This business case looks at detecting quality problems with the powdered metal ABS Control Bracket produced at Top Tier Parts Co.'s Peoria, IL facility for B3 Auto using The Modal Shop's RAM NDT-SEMI system as an end-of-line test station.

The financial justification presented here derives from Top Tier's stated business objective for investing in NDT technology of cost avoidance associated with shipping bad parts. Using conservative cost data for potential recall costs and savings resulting from process improvements, the following net cash flow impact, IRR and ROI was determined. As can be seen from the figures in the tables, even when recall costs are excluded from the analysis, the system's process improvement benefits alone allow for a substantial 5-year ROI and 13-month payback period. When recall costs are included, the ROI and IRR escalate substantially and the payback period is less than 1 year.

Base Scenario	
Estimated net benefit (cost) over the evaluation period:	
	<i>\$ in 1000s</i>
Net Incremental Cash Flow	\$1,107.3
Simple Return on Investment (ROI)	2922%
Internal Rate of Return (IRR)	852%
Payback Period (in Years)	<1
Cash Flow Discounted at 9.0%	\$888.4
Cash Flow Discounted at 15.0%	\$779.4
Analysis Period Start Date:	1-Oct-03
Analysis Period End Date:	30-Sep-08
Evaluation period length:	60 Months
Major Assumptions: \$400,000 recall, \$14,000 sorting, process improvements, labor savings, no contract loss, no new business hold	

Sensitivity Scenario 1	
Estimated net benefit (cost) over the evaluation period:	
	<i>\$ in 1000s</i>
Net Incremental Cash Flow	\$181.7
Simple Return on Investment (ROI)	479%
Internal Rate of Return (IRR)	103%
Payback Period	1.1
Cash Flow Discounted at 9.0%	\$131.0
Cash Flow Discounted at 15.0%	\$106.6
Analysis Period Start Date:	1-Oct-03
Analysis Period End Date:	30-Sep-08
Evaluation period length:	60 Months
Major Assumptions: \$0 recall, \$14,000 sorting, 1/2 process improvements of base scenario, no labor savings, no contract loss, no new business hold	

The system's process monitoring capabilities are enough to financially justify the RAM NDT-SEMI system, the added benefit of insuring against recall and other quality related costs imposed by customers makes the financial decision to invest in the technology clear.

Before the financial justification can be relevant, the RAM NDT-SEMI system's technical ability to reliably and quickly inspect for quality problems must be established. Top Tier's engineers have identified the system as being technically feasible and time efficient in testing for inherent quality problems on the ABS Control Bracket.

A number of non-financially quantified benefits of shipping good parts are identified in the report and are important considerations when weighing the decision to implement an NDT test system for end-of-line part quality testing. These benefits have long term financial impacts on Top Tier and include: improved corporate image related to being known as a supplier of consistently good quality parts, competitive advantages related to high quality/low cost production ability, manufacturing process monitoring which helps keep the manufacturing process running as efficiently as possible thereby reducing overall production costs, marketing and sales benefits by being able to highlight quality achievements and recognition awards related to good quality parts, and cost savings or process improvement information that can be shared with other Top Tier facilities or parts lines as a result of using the system.

The system's high ROI and low cost of ownership per part make it ideally suited for accomplishing the business objectives of zero defects and low cost necessary to maintain competitive advantage and profitability in the highly competitive powdered metal automotive parts market.

Reasons for preparing a business case

1. To put financial justification behind the decision to invest in RAM NDT technology.
2. To document both the financial and non-financial expected results of the investment.

Note: The system's ability to technically test the part needs to be established prior to undertaking a business case analysis.

Benefits to Top Tier

- Shows awareness of financial aspects of investment decisions through quantitative analysis
- RAM NDT acts as insurance policy against shipping bad parts. Objective measurement.
 - Business objective: **improving part quality shipped**
 - Important because it avoids costs associated with shipping poor quality parts
 - tangible measure: **100% parts inspection** by reliable, objective means
 - tangible result: **No quality reject and recall orders** from customers for part flaws
 - target for the *objective*: **zero defects**
 - target for the *benefit impact*: having no recall orders and maintaining current parts contracts
 - value of reaching the objective's target: **avoid recall and sorting costs** that can be extremely expensive
- Also used as de facto process monitoring system. If reject rate suddenly jumps, something in the process has changed and can be investigated.
- Has use as a process improvement tool. Can easily measure results of process improvement tweaks.
 - Business objective: **improving manufacturing process**
 - Important because it **reduces manufacturing costs** by making the manufacturing process more efficient
 - tangible measure: variance in scrap rates
 - tangible result: **maximized manufacturing efficiency**
 - target for the *objective*: **no process related defects**
 - target for the *benefit impact*: reduce scrap rate
 - value of reaching the objective's target: reducing scrap rate will result in a **reduction in production costs**
- Also reduces secondary operations costs by eliminating secondary operations on flawed parts
 - Business objective: **improving efficiency of secondary operations**
 - Important because it reduces overall manufacturing costs by eliminating secondary operations performed on flawed parts
 - tangible measure: **reduced machining costs**
 - tangible result: **extended machine tool life**
 - target for the *objective*: no secondary operations on flawed parts
 - target for the *benefit impact*: reduce overall tool wear
 - value of reaching the objective's target: reducing flawed parts receiving secondary operations will result in a reduction of machining costs.
- Acceptable tool to use for 100% inspection, increasingly contractually required.
- Can be used in concert with other methods of NDT or stand-alone depending on the fault being tested for.
- Dynamic measurements in the manufacturing process, like those achieved with the use of the RAM NDT-AUTO, puts Top Tier at the forefront of six sigma quality measurement. What gets measured improves. The system allows Top Tier to mitigate risk while aiding in process improvement capability.
- Inexpensive on-going maintenance costs (no continuous supplies to be purchased to run system)
- Acquisition cost is relatively low especially when considered in terms of end product recall costs.

Results obtained

- High ROI (2922% over 5 years) and short payback period (< 1 year) when potential recall costs of \$400,000 are included
- Financially justified (ROI of 479% over 5 years) and short payback period (~13 months) based on process improvement/ monitoring capability of system even when potential recall costs are ignored.
- Numerous non-financial benefits of utilizing RAM NDT:
 - improved corporate image related to being known as a supplier of consistently good parts
 - competitive advantage related to high quality/low cost production ability
 - process monitoring to keep the manufacturing process running efficiently
 - marketing and sales benefits by being able to highlight quality achievements and awards
 - shared information with other Top Tier facilities for process improvement and cost saving ideas

Relevance of results to Top Tier

- The decision by Top Tier to add RAM NDT technology is a financially based business decision predicated on the business objective to avoid quality related costs.
- The purpose of the business case is to objectively quantify the financial results of avoiding those costs by the addition of the RAM NDT system.
- It provides a basis for decision-making based primarily on financial numbers, while also considering non-financial impact.

Conclusions

- Utilizing RAM NDT-SEMI as an end of line test stand has numerous advantages whether the manufacturing line is operating flawlessly or is turning out bad parts.
- When the manufacturing process is operating error free, it protects the integrity of the process and exposes variations.
- When the process generates a bad part occasionally, it identifies and contains the faulty ones before they get shipped to the customer and cause bigger headaches and costs for everyone.
- When the process becomes non-conforming, producing a larger number of bad parts, it acts as a sentry alerting the line personnel there is a problem and can help determine when the process is back in normal operating mode.

Recommendations

As can be seen from the **high ROI's** and **short payback period** of adding TMS' RAM NDT-SEMI system, as long as the system is technically able to determine the part fault being tested for, then investment in the system is a strong business decision with low financial risk. Avoid shipping bad parts, avoid recall expenses, avoid contract cancellation, avoid increased scrutiny on quality by customers, avoid new business hold, and the system has easily paid for itself.

Combine the **lowered financial risk** of being able to positively 100% inspect the ABS Control Bracket for part faults with the **process improvements** and the **process monitoring** uses for the system and the investment decision becomes even easier.

In the current market environment of automotive customers contractually requiring 100% parts inspection and zero defects becoming the de facto standard to remain competitive in the powdered metal parts market, a financially justified, reliable, repeatable, objective, low cost of ownership, NDT system is a required manufacturing tool.