INVESTIGATIONS OF ALTERNATIVE METHODS OF PRODUCT MARKING SYSTEMS

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Abstract

Industrial marking systems are used for various applications in the manufacturing environment. Many companies require essential information to be marked on the products they manufacture. Some of that information may include but not be limited to date codes, model series numbers, product identification codes, and documented process log information for component traceability. Some of the information listed can be critical for a company to retain uniformity in product development as well as maintaining accurate logistics. As the need for product marking become more essential and marking requirements become more stringent, the integration of autonomous product marking begins to prove more advantageous than previous manual marking systems.

I. INTRODUCTION

Manual marking machines for engraving metal parts have four problems including lengthy changeover time, human error, slower cycle times, and limitation for production integration. As manual engraving machines prove sufficient for many application, there are many constraints that limit capabilities for effective product marking. While having some advantages such as lower installation costs, and minimal skill requirements for operation, manual marking systems lack the ability to become easily automated, thus requiring additional human interaction for successful operation. An automated marking system would reduce production costs, improve production capabilities, and limit safety concerns.

In a struggling economy many manufacturers are searching for methods to reduce production costs, while maintaining or improving process quality, thus resulting in sustainability and possible profit increase. Any opportunity to lean a production process becomes an increased priority to proactive companies looking to capitalize on reduced production costs. There are many methods of production improvement in manufacturing, automating manual processes being a substantial one. While generally requiring capital investment costs initially, increasing plant wide automation can be a substantial cost savings endeavor.

A global small engine manufacturing company has realized the benefits of automation ever since the downturn of the economy. The company has implemented various improvement projects throughout its manufacturing plants specifically one located in Alabama. The Alabama plant has utilized industrial robotics and automated equipment to replace many manual assembly tasks within the facility. This not only reduces costs of manual labor costs but liability for injuries, and improved safe work environments. While keeping with the initiative to make their plant more automated, they have recognized a deficiency in there manual marking process that prints a date stamp and model number on the engine valve cover plate.

Currently the valve plate is being stamped by a hydraulic roll stamping machine. While the machine is somewhat automatic in its cycle, it still requires human interaction to load and unload the part being stamped. Not only does it require manual loading and unloading, but it also proves to be a lengthy changeover time each time the production line changes product models. The production line is designed to run multiple model engines thus requiring a different stamp code. The existing machine is not designed to easily make this change. It requires a technician to shut the machine down, lock it out, and replace the roll dies with the appropriate dies for the new model.

The changeover process not only consumes production time due to lengthy changeovers between runs. It also impedes the technician from performing other production tasks. It is also important to take into consideration the fact of human error, such as replacing the incorrect die, or improper set-up resulting in poor quality marks. While you may feel your employee performing the changeover task is trained and capable, there is always the exception for mistakes. The risk for this type of mistake could result in large lots of completed engines with improper codes, consequently resulting in the possibility of manually re-stamping the code resulting in a catastrophic loss of downtime.

II. TECHNOLOGY REVIEW

While recognizing the need for improvement to the current marking system, a question is posed as to what is the enhanced alternative? There is a wide range of marking systems on the market today each having unique characteristics, with specific advantages as related to application. Not only do these systems have unique advantages to application, but also disadvantages that must be weighed when addressing the solution to the problem.

Although the methods of marking and available systems span a wide range, it must relate specifically to the application. This marking application would require direct stamping or engraving of a galvanized metal park that is attached to a small engine subassembly. Because of the requirements of the product environment labeling or ink printing would be an infeasible solution. Some of the proposed marking techniques that fit the applications criteria could involve; pneumatic impact markers, dot peen markers, roll markers, hydraulic marking presses, hot stamping, or laser engraving.

Evaluating all of the intricacies of each applicable method of marking is essential to successful implementation to an automated process. Some of the considerations to be considered relay on several factors directly related to the part it's self. One of which is the parts material composition. Ask the question whether the material can withstand an impact or abrasive type of mark without damaging the part? What is the malleability of the metal? Would the impact mark result in an inconsistent mark due to the metal being too soft or too hard? It may be worthwhile to conduct hardness tests on the material to evaluate this issue before a marking product selection is made.

The parts dimensions must also be a taken to account. Does the part's marking location have flat or round surface areas? Many marking systems only function accurately on a flat surface. If a round surface is being marked it may be necessary to weigh in on roll stamping, or laser engraving products that can adapt easier to rounded surfaces.

The part marking environment will also be a factor. If the part has a possibility of having oil, dirt, or metal shavings on the surface it could affect the quality of the mark significantly depending on the type of marking system. An example may be to study the effects of laser marking on various oily surfaces to evaluate the mark quality. Eliminating the oil may not be feasible to the production process.

Considering how the results of the mark may be evaluated is also an aspect to measure. Does the mark need to be scanned by a barcode reader? Does the mark need to photograph by a computer vision system? The material surface reflection will be a key consideration in this determination.

Because of the requirement to have a fully automated marking process the adaptability of a marking system must be weighed. What are the options for initiating the marking sequence? What types of electrical or communication control interfaces does the marking controller offer? When interfacing the marker to the production line the automation control system must be ensured the option to interface with the selected marker. Is the markers control interface compatible with your existing control system? Ensure the marking controller has interfaces that are adaptable to the lines electrical controls. The part presenting fixture equipment must be capable to initiate the marking sequence, and possibly return or change marking data.

III. CONCLUSIONS

While evaluating the constraints of different marking systems and limiting to specific requirements of the part that is being marked automating a part marking system can be successfully achieved. While the benefits of automating a marking process and integrating to an existing production system may vary, it is going to be a generally clear result in improvement. The driving force that will justify this automation upgrade can result in cost savings from reduced part handling, reduced production downtime from lengthy changeover, and reduced safety risks to employees.

REFERENCES

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