

Analysis over the Techniques to Improve the Manufacturing Automation

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Abstract— There is no limit to improve any system or design. The manufacturing automation is one of them. Now a days there are various type new techniques using to make the manufacturing easy, fast and flexible. The manufacturing flexibility is mostly responsible to make the automation advanced. Besides it we have to take attention over the other factors also for this as perfect material handling, perfect transportation, perfect assembling etc. There are so many provisions to improve the poor condition of any activity or working method. But we should select the such type method or activity that is less time consuming, stable, effective and flexible as far as possible. Generally we can select the following particular techniques for the improvements in manufacturing automation. 1. Techniques related to merge two or more different -2 cells in different -2 orders so that most flexibility is obtained. 2. Techniques to provide the fast alternative arrangements to recover from the breakdown. 3. Techniques to provide the fast material handling in critical and opposite conditions also. 4. Techniques to provide the perfect maintenance over the all machines and instruments of the cell in a very planned manner. 5. Techniques of integration of robots with the cell at required places as robotic stations so that the minor and costly work may be completed perfectly without using costly machines.

Keywords: Manufacturing Automation, Manufacturing Flexibility, Automation Integration, Automatic Storage and Retrieval and Robotic Automation

I. INTRODUCTION

Now a days the manufacturing is very important part of mechanical engineering. Due to higher requirements of equipments, machinery, and other required assisting tools, such type manufacturing cells are required which are extremely flexible and fast. For this we have required to set the various type machines and equipments in a mixed plant layout with the robots in a very planned manner in a flexible plant layout. Besides it, it is required that the various type operational and non-operational activities should be improved or optimized till an extreme limit.

A. Methodology Related To Merge the Two Different Type Cells -

If we merge the two different type cells together the overall working activities are reduced and it well set serially. Besides it the overall time required to obtain the finished product is reduced sufficiently. Here we can understand it by an example of merging of the following cells -

- 1) Casting and manufacturing cells
- 2) Casting and heat treatment cells
- 3) Manufacturing and heat treatment cells
- 4) Casting, manufacturing and heat treatment cells
- 5) Manufacturing and assembly cells
- 6) Assembly and storage cells
- 7) Storage and packaging cells etc.

Generally we perform the different - 2 type activities in different - 2 type cells separately. But if we merge the two or three cells together in a mixed layout and in group technology we can achieve the good flexibility and in resultant good automation.

B. Methodology Related To the Fast Alternative Arrangements to Recover From the Breakdown -

The maintenance arrangement should be better and well planned as far as possible so that less time is consumed in maintenance. For this we can use a robot. According the maintenance problem and its location in the machine we can feed the various type different - 2 programs previously in the robot. In starting there will be some difficulty but after repeating the same problems two or three times a well set maintenance activities are performed by the robot. Besides it a extra tool head and a extra working table should be attached with the machine so that the working is uninterrupted due to maintenance problems developed in tool head or working table. Means an alternative solution should be ready always to replace the non-working part of the machine or robot.

C. Methodology Related To the Fast Material Handling In Critical and Opposite Conditions Also -

If the material handling is provided with the help of robots in place of AGV(Automated guided vehicles) the material handling will be fast and advance. Here by using the robots the material not only shifted quickly at critical path but also put quickly at right place. Besides it we can provide a good storage and retrieval arrangement by using the intelligent robots. These important changes in material handling and storage/retrieval a better and well planned automation is obtained related to the material handling and storage. Sometimes the material transfer becomes very critical due to coming a big hindrance in the way like a wall, a big station, height or depth etc. like fig.(1). Here the use of drone is a very good technique to transfer the material from one place to another next place easily.

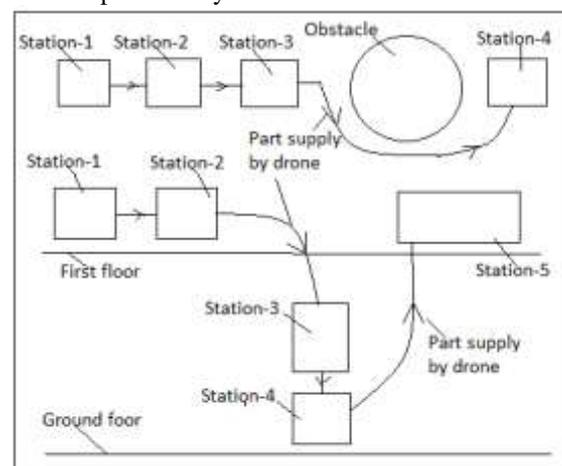


Fig. 1:

D. Methodology Related To Perfect Maintenance over the All Machines and Instruments of the Cell in a Very Planned Manner -

A well planned maintenance is very necessary for a better automation in the industrial plant. For this we should have a list of maximum chances that may be occurred. According the type of failure occurred a better preplanning should be provided for the proper automatic maintenance so that the work may be completed in less time period. For better maintenance planning the following techniques should be included →

1) Computer Aided Maintenance Planning –

A logical software should be used in the computer for better planning of maintenance activities. Besides it an automatic robot should be used for fast and good maintenance which should be derived by computer programming like cnc machine.

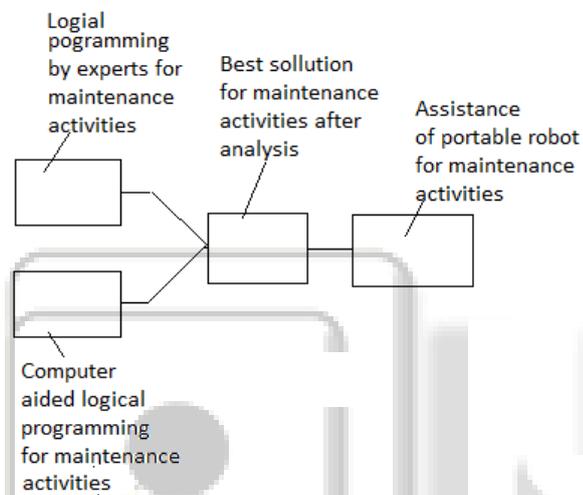


Fig. 2:

2) Short Way Planning of Maintenance –

Means shortest maintenance plan should be developed so that the lowest time is consumed in maintenance. For this it is necessary that we should use limited maintenance activities to clear the problem as far as possible. For example if a assembly is made of many no. of subassemblies and this assembly is stopped due to damage of any subassembly fitted in it. Then here we should try that the damaged subassembly is replaced without disturbing other subassemblies as far as possible.

3) Skilled Maintenance Planning –

A proper team of experts should be organized for proper discussion over selection of best solution. Besides it, it should be compared with the logical planning prepared by the computer software.

4) Vision Technique –

For better precautions various type vision cameras should be placed over the most preferable points of failures for the detection of any disturbance in the working activities. It will be very helpful in reducing the failure problems and in improvement in the performance of the machine.

E. Methodology Related To Integration of Robots with the Cell at Required Places as Robotic Stations So That the

Minor and Costly Work May Be Completed Perfectly Without Using Costly Machines -

By integrating the robots with the machines at the required places the manufacturing automation becomes fast and efficient. Besides it the workpiece is completed fastely with good quality. Here the robotic stations not only complete the work easily and fastely but also the costly and fine work is performed efficiently. For example if we want to machine a metal rod to convert it in a precious multipurpose gauge. Here the unwanted time is wasted if we use only the cnc machines for its manufacturing while by integrating the robots for fine and minor work the same product may be manufactured in about 30% to 60% less time consumption.

II. ANALYSIS -

A. Analysis of Optimization over the Following Activities for Good Automation -

1) Optimization Related To the Operational Activities –

There are various type factors responsible in the selection of a perfect operational activity like good flexibility, low cycle time, good surface finish and accuracy etc. Good flexibility means the operational activity may be performed by using various type machines and various type techniques easily. For example the taper turning may be performed by using three type techniques. In other words we can say that the operational activities selected should be easy and common type activities. For this an extra effort is required over the design of the product also. Besides it the surface finish, cycle time and accuracy all may be improved by providing the point to point machining operations. Means here we will use the machining operations in such a way that the cycle time is reduced sufficiently and the accuracy and surface finish both are improved significantly.

2) Optimization Related To the Inspection Activities –

The inspection activities should be perfect and easy as far as possible. Besides it the inspection methods should be easy and inspection instruments should be simple as far as possible so that the fast and efficient measurement is achieved. Besides it to reduce the wastage of time in inspection the inspection should be provided on the station simultaneously step by step automatically. Means an automatic inspection device should be mounted already over the machine like other operational mechanisms. Besides it, it should be operated according the programming fixed in computer. For example let an example of machining over the cnc machine where the programming should be given for all operational, nonoperational and inspectional activities as required. Here it is clear that the inspection also should be the activity of cnc machine like operational activity. Besides it for critical inspection a separate robotic inspection station/cell should be placed near the operational machine without any gap. By using the robotic inspection station or cell good automation is stabilized sufficiently.

3) Optimization Related To the Material Handling Activities –

The material handling activity should be provided in such a way that it is started and followed serially just after finishing the operational activity. By this the wastage of time is reduced till a sufficient limit. For this easy, stable, flexible and automatic material handling devices should be used as far as

possible. Further we can make such type automatic material handling devices which are attached with the drone devices to air lift the material from one place to another place easily and fastely. It will enhance the automation sufficiently in the manufacturing cell.

4) *Optimization Related To the Assembly Activities* –

The assembly activities should be selected according the facility available. Means the assembly activity should not be selected out of sources available in the assembly plant. Hence the assembly design of product should be provided best according the resources available. It enhances the assembly automation activities and makes the assembly cell dependable.

5) *Optimization Related To the Maintenance Activities* –

There should be arranged a perfect flexible and movable maintenance cell in which various automatic machines, robots, sensors and inspection devices should be placed in a well-defined manner. Besides it the various proper plans should be prepared for the proper maintenance according the maintenance problem created.

B. Analysis over the Capacity, Performance and Stability of Machines –

The automation effectiveness surely depends on the relation between capacity, performance and stability of machines used in the manufacturing cell. It is very essential thing that we should operate the machine according its capacity. By this the machine gives the better performance and good efficiency also and good stability is achieved. These all things greatly avoid the chances of failure or breakdown of the machines of the manufacturing cell. In other words we can say that the perfect automation is achieved. Here the machining parameters used should be under the limit given for the particular machine. Generally it becomes the main cause of failure of the machine.

III. CONCLUSION

Here it is clear that we can improve the manufacturing automation till significant level by providing some important integration techniques and methods.

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