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IMPLEMENTATION OF RTMDC SYSTEM AS A STEP TOWARD INDUSTRY 4.0 TO INCREASE PRODUCTIVITY, OVERALL EQUIPMENT EFFECTIVENESS IN A COMPANY

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Abstract

Modern manufacturing system produce lot amount of data that, if it collected properly and utilized, can provide important information that can help the organizations in making strategic business decisions and lead to significant competitive advantage n the market. It is always challenging to collect and record all the relevant data that you might be available to you so that it become useful. In this paper it is explain that how RTMDC system is most important technique and some basic tools at our hand which can help your company solve upcoming challenging problem. Some of the tools & techniques integrated with RTMDC can use to capture data include as: PLC integration, Remote Terminal Units integration, SCADA, digital pen and paper solutions, RFID, bar codes, etc. RTMDC is such type of system that can integrate with all such types of tool and provide a better way to solve the industrial problem.

Keywords: industry4.0, MDC system, overall equipment effectiveness(OEE), RTMDC

1.Introduction

Real Time Manufacturing Data Collection (RTMDC) system generally being used for real-time machine monitoring in the machine shop of an organization, it can be used to track jobs, operations, procedures, personnel activities and with hundreds of customizable reports and charts and can evaluate the overall equipment efficiency (OEE), production costs, able to record scrap, to determine downtime and reasons for downtime. RTMDC technique can provide the largest benefit to the organization while having the smallest impact on your existing processes. It is not helpful to set the company targets but also able to meet and exceed their business goals [1].

Implementation of real time manufacturing data collection system is generally done to collect machine running status with their program executing information, cycle time information, operator efficiency, tool life cycle. Collection, analyzing and making record of all such data in paper form is very difficult and may undergo highly error condition due to manual handling [2,3]. RTMDC system provide the data in soft form which can be easily available to anyone without any error. Importance of the RTMDC system can be understood only after knowing their advantage listed as:

- Real time traceability of production.
- Key performance indicator, Key activity indicator (result).
- Detailed reporting ShiftWise/ month wise/ year wise.
- Data recording facility available as a backup.
- Efficient way to improve Overall Equipment Effectiveness (OEE).
- Smart Process flow system help to control the production run and scheduling.
- Instant Alarms for any error or fault to higher level.

- PLC, RFID, Sensors, I/O Device Integration for traceability.

1. Methodology

RTMDC (Real Time Manufacturing Data Collection) system is based on Industry 4.0 i.e., Information or data collection is an important key for the analysis of any manufacturing system. Now a days every decision is taken based on the previous result for this Companies wants to collect the data not only to maintain as a record, but they do analysis in order to meet the target production [4]. They also make the upcoming plan by observing the available previous online results in customize form. Many Companies deploying greater data collection systems in the Machine Shop [5,6,7]in order to gain the benefits listed as:

- Reduction in waste and NVAA (Non-Valve Added Activities)
- Help in decision making
- Quicker response times to fault
- Process flow improvements
- Product flow improvements
- Smart manufacturing

2. Implementation procedure:

In the implementation of RTMDC can be done anywhere with some hardware requirements:

- HMI touch screen
- Monitoring terminal
- Software for data collection like (MDC Plus)
- Barcode scanner
- RFID reader and tag
- Ethernet availability
- Current sensor
- Vibration sensor

MDC (Machine Data Collection) adapter is a kind of hardware module which is attach to the machine unit to collect the information at an off-line stage when the software is not running in the system. Sensors (like current, voltage, vibration) also attach to the machine unit to monitor the real time power consumption as well as vibration condition of the machine unit [8]. First. software is installed in computer system, that is programmed set up to collect machine unit to collect the all detailed information and make Ethernet connectivity with the machine unit on which machining operation being done and by making a local network so that data can be collected in the computer unit, it can keep the record of data and can observe in real time basis with the help of the systematic machine data collection software [9,10].With the help of RFID reader, RFID tag is read and attach to the machine component after machining to maintain the record and tracking the component on real time basis [11].

The manufacturing data collection system is designed to collect the no. of information related to machine unit. It can be divided in to different data unit listed as:

3.1:Production Monitoring Data-

I. Keep the record of manufactured output and scrap.
II. Observe the time taken for the execution of technological operations [12].
III. Generate checklist details, S.O.P, instruction as per machine condition may be related to safety or maintenance.
IV. Generate reports on manufactured product items vs rated time and calculate KPIs and OEE.

3.2:Vibration Monitoring Data-

1. Measure key parameters indicator like vibration state under the running state of machine unit.
2. Compare machine parameter with permissible limits and generate alerts when permissible levels are exceeded with permissible.
3. Detect crashes and impacts and issue machine shutdown signals[13,14].

3.3: CNC Program/ Operator Data-

1. Storage of the CNC programs& sub programs as a backup.
2. Collection of actual data (related to operation/machine operation/equipment/employee)

3.4: Downtime Management Data-

1. Collect information related to non-scheduled (emergency) repair and maintenance.
2. Schedule maintenance operations based on working hours and actual states of the machine[15,16].
3. Help to Control execution of the scheduled repairs.
4. Documentation support of maintenance and repair operations.

3.5: Analytic Data (for evaluation of progress of Machine Shop)-

1. 100+ customize data and graph / chart representation
2. Overall Equipment Efficiency (OEE) evaluator on real time basis
3. Cycle time per part for Machine.
4. Number of parts produced / manufactured, per shift/operator
5. Data recording related to types and number of scrapped parts
6. Scheduled & Unscheduled maintenance
7. Setup time / idle time per part

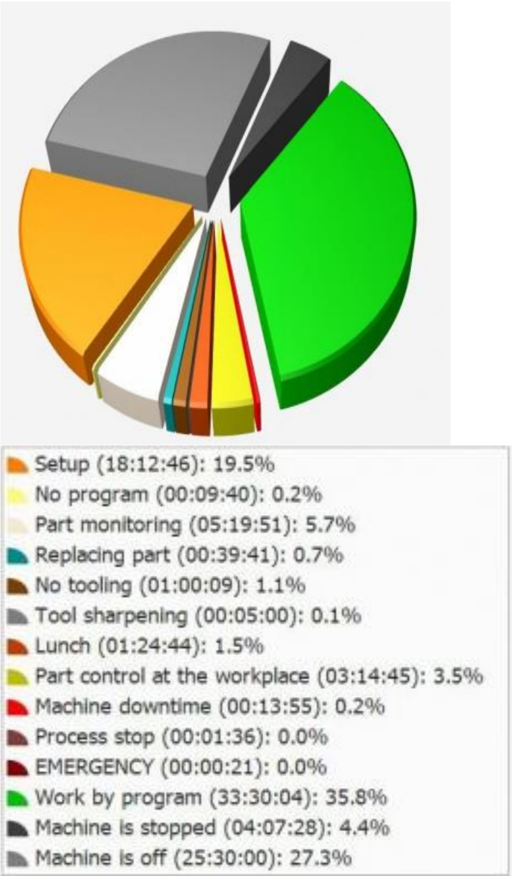

Fig 1.: customize chart related to status of machine

Such types of charts help to analyze the working environments as well as machine utilization capacity etc.

5. OEE (OVERALL EQUIPMENT EFFECTIVENESS)

OEE is mainly depends upon the three factors i.e., availability, performance and quality. It is an indicator denotes the human resource & machine capacity utilization. It can be calculated by using a formula:

OEE = Availability x Performance x Quality ……. [17,18]

The Availability generally denoted the unplanned downtime losses. It is actual machine or process running time divided by the total available time. Planned downtime events such as break for lunch are not partof the OEE calculation [19].

The Performance can be calculated as ratio of the number of products produced over the specific period (shift, day, etc.) to the theoretical maximum number of products that could be produced if the machine run at the highest possible speed [20].

The Quality aspects can be analyzed as the ratio of good parts to total parts produced [21].

RTMDC system not only helps to increase the availability of machine by decreasing the downtime i.e., by removing the cause of unplanned breakdown by acting based on previous data collection but also helps to improve the product quality as well as performance of machine by taking proactive actions [22].

6. Additional features of RTMDC System

1. Reduce Setup time
2. Eliminate Downtime
3. Decreased Scrap
4. Reduce Energy costs
5. Help to improve Job planning and quoting accuracy
6. Help to increase employee productivity
7. Increase machine and human resource efficiency
8. Proactive Maintenance planning
9. Reduce reaction time for failures.
10. Quality improvements

6.Conclusion:

Industry 4.0 is a big revolution in technological innovation. The paper mainly focused on the concept ofIndustry 4.0 and RTMDC (Real Time Manufacturing Data Collection) that allows smooth, smart& efficient manufacturing with the help of faster computers, smarter machines, smaller sensors and cheaper data storage from the machine with the software. All data collected with the help of software (under RTMDC system) on real time basis not only help to analysis the machine shop condition but also help to make positive effort in different area to improve the productivity and OEE of the production system.

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