Vol 5 Issue 1 Feb 2015

ISSN No : 2230-7850

International Multidisciplinary Research Journal

Indian Streams Research Journal

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RNI MAHMUL/2011/38595 **ISSN No.2230-7850**

Indian Streams Research Journal is a multidisciplinary research journal, published monthly in English, Hindi & Marathi Language. All research papers submitted to the journal will be double - blind peer reviewed referred by members of the editorial board.Readers will include investigator in universities, research institutes government and industry with research interest in the general subjects.

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Indian Streams Research Journal
ISSN 2230-7850
Impact Factor : 3.1560(UIF)
Volume-5 | Issue-1 | Feb-2015
Available online at www.isrj.org

INCREASING THE OVERALL EFFICIENCY OF WOOD WORKING INDUSTRY BY USING MULTIPLE ATTRIBUTE DECISION MAKING (MADM) ANALYSIS

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Abstract:- Selection of machines, materials, tools & skilled labour for different engineering applications is very essential for achieving higher level of accuracy & productivity. It must be noted that generally there is more than a single definite criterion for selecting the best possible solution to a manufacturing problem. The designers and engineers have to take into account a large number of selection criteria for the same. Uusually high risk is involved in processes requiring considerably higher expenditure. Project resources (i.e. system analyst, programmers and computer etc.) are expensive and benefits arising from a new system may take time to materialize.

The success of the process depends largely on critical examination and evaluation of detailed data for each element in the process. In the present system things are done manually. The user needs certain application to monitor the efficiency of machine and worker properly.

A statistical approach carried out for evaluating overall efficiency of machines & workers by documenting the whole process is discussed in this paper by evaluating the daily operation of a CNC wood working industry, for a span of around three months.

Keywords: Manufacturing, Material selection, Decision making, Wood working.

INTRODUCTION

Manufacturing is the backbone of any industrialized nation. Its importance is emphasized by the fact that, as an economic activity, it comprises approximately 20 to 30% of the value of all goods and services produced. A country‘s level of manufacturing activity is directly related to its economic health. In general, the higher the level of manufacturing activity in a country, the higher the standard of living of its people.

In the present industrial scenario, the evaluation of the processes is done manually. The user needs certain application to monitor the efficiency of machine and worker properly. New system is needed because it is not possible to monitor the cumulative efficiency of machines and workers and is very time consuming and difficult to monitor the day to day efficiency. Thus, a new system is proposed in which one can monitor the cumulative efficiency of machines and workers.

If the monitoring of efficiency is done manually, it takes lot of time and also there are chances of errors. This results into loss of productive time. This study tries to remove the entire manual efficiency monitoring of machines and workers, so that focus is on trying to maintain the efficiency monitoring as efficient as possible. The need of this system is to create an efficient way to monitor the performance of machines and workers, to store the data and to take suitable action on the performance.

Introduction to Multiple Attribute Decision- Making Methods:

Multiple criterion decision making (MCDM) refers to making decisions in the presence of multiple, usually conflicting criteria.

The problems of MCDM can be broadly classified into two categories.

1.Multiple attribute decision making (MADM)
2.Multiple objective decision making (MODM)

Multiple objective decision making (MODM):

Depending on whether the problem is a selection problem or a design problem. MODM methods have decision variable values that are determined in a continuous or integer domain, with either an infinitive or a large number of choices, the best of which should satisfy the decision maker‘s constraints and preference priorities.

Multiple attribute decision making (MADM):

MADM methods, on the other hand, are generally discrete, with a limited number of predetermined alternatives. MADM is an approach employed to solve problems involving selection from among a finite number of alternatives. An MADM method specifies how attribute information is to be processed in order to arrive at a choice. MADM methods require both inter- and intra-attribute comparisons, and involve appropriate explicit tradeoffs.

PRELIMINARY INVESTIGATION:

In the preliminary investigation it has been found that there is no such method to find the proper performance of machines. Even there is no such method to monitor the cumulative performance of machines and workers. It was not possible for them to review the cumulative performance of machines and workers due to which decision making regarding production planning was difficult. It was not possible to see the cumulative performance and the losses occurring during the production.

Present System In Use:

In company one has to monitor the monthly performance of machines and workers to increase the productivity. In the present system one can monitor the performance of machine of limited to a day only and even there is no such method to know workers performance. It is not possible to monitor the cumulative performance of machines and workers. Presently, one can only monitor the output of the machines from the output card generated by the workers which is limited to a shift.

Problems In The Existing System:

The present system is complicated to use and has some limitations.

Following are the limitations which reduce the overall efficiency of various process and in turn the complete organization-

•Cumulative monitoring is not possible
•Sometimes manual calculation results into errors
•Collective data is not available
•It is time consuming process

Important Decision-Making Parameters:

Decision makers in the manufacturing sector frequently face the problem of assessing a wide range of alternative options, and selecting one based on a set of conflicting criteria. The huge amount of data available can be analyzed by focussing on some of the important parameters in the whole process. Some of the important decision-making parameters in the manufacturing environment are listed below:

•Material selection for a given application.
•Evaluation of alternative product designs.
•Machinability evaluation of work materials.
•Evaluation and selection of modern machining methods.
•Evaluation and selection of flexible manufacturing systems.
•Failures cause analysis of machine tools.
•Selection of automated inspection systems.
•Selection of material handling equipment.
•Evaluation of environmentally conscious manufacturing programs.
•Environmental impact assessment of manufacturing processes.
•Evaluation of aggregate risk in green manufacturing.

METHODOLOGY:

The solution was implemented on full scale by documenting the data for all the machines and the workers operating them. It was found that there were significant losses in effective cycle time and operation time of workers. The data generated from output card of every machine was entered systematically and also the unique identity code of the worker was linked to it.

The data was then analyzed for various time periods like; shift data, daily data, weekly data and monthly data. Also the workers were assigned to various machines for that time period.

The study was focused on following points:

•To increase overall equipment efficiency of equipment and trace out losses
•To study the production process
•To identify bottleneck machine
•To identify underutilized machine
•To improve man-power performance
•To find types of losses and its reasons.
•To find the overall equipment effectiveness.

CONCLUSION:

There was a significant rise in overall efficiency of worker as well as machines because of correct evaluation of loopholes in the process. This study explores the use of MADM method in solving the machine and worker selection problem and the results obtained can be valuable to the decision maker in framing the selection strategies for many similar processes. It is also observed that this MADM approach is a viable tool in solving the problems faced by most of the manufacturing organizations. It allows the management to rank the candidate more efficiently and easily. The cited real time industrial example demonstrates the computational process of the MADM method and the same can also be applied to other manufacturing and service provider organizations.

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