

A FUZZY LOGIC MAKING APPROACH FOR SUPPLIER SELECTION MANUFACTURING PROCESS USING MATLAB

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ABSTRACT

In the study of a fuzzy logic Decision Making approach for supplier selection manufacturing process, supplier selection has been proposed for quality, time period and performance appraisal in production. Supplier selection is a Multi-Criteria Decision Making (MCDM) problem. These criteria attributes may be both qualitative as well as quantitative factors. These factors and their interdependencies make the problem highly complex one. Fuzzy logic decision making with mat lab modeling support system has been developed for solving the supplier selection problem with multiple objectives. Basic important factors considered for supplier selection material, production and dispatch. Select suitable for materials are made (MCDM) method has been illustrated in this report through a case study.

Keywords: *Supplier selection Fuzzy based model, production process, multiple criteria decision making, and range.*

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1. INTRODUCTION

Iron and steel industry is an important basic industry for any industrial economy providing the primary material for construction, automobile machinery and other industries. The importance of maintenance function has increased due to its role in keeping and improving the availability, product quality cost-effectiveness levels. Maintenance costs constitute an important part of the operating budget of manufacturing firms. Maintenance selection is one of the most critical activities for many industries. The selection of an appropriate maintenance may reduce the purchasing cost and also improve competitiveness.

It is impossible for a company to successfully produce, low-cost, high-quality products without satisfactory maintenance. The selection of appropriate maintenance has been one of the most important functions for a industries. if the relationship between a supplier and a manufacturing industries. Many studies have pointed out that key is to set effective evaluation criteria for the supplier selection. Supplier selection is a common problem for acquiring the necessary materials to support the output of organizations. The problem is to find and evaluate periodically the best or most suitable vendor for the organization based on various supplier. Due to the fact that the evaluation always involves conflicting performance criteria of vendors. The techniques of multiple criteria decision making (MCDM) are coherently derived to manage the problem (Shyur &Shih, 2006).Evaluating vendors many criteria including quantitative, such as cost, price as well as qualitative, a considerable number of decision models have been developed based on the MCDM theory selection have determination of the perfect structure normal weight previous reached of the identification of criteria focused on products, services, and purchase situations determine whether these criteria are dependent on or independent to each other. To resolve the problem, this paper suggests evaluating using a multiple levels multiple criteria decision making method under fuzzy logic method maintenance alternative for industries planning of the basis of quantitative and qualitative factors formula are clearly displayed. Therefore, the most important factors like raw material, production dispatch are taken into account. Fuzzy logic toolbox with MATLAB is a tool for solving problems with fuzzy. The result shows that the selection of a supplier is acceptable and suitable for the case situation considered Classified to benefit and cost criteria has the larger the better, ratings of production and importance weights of all the criteria are assessed in linguistic values represented by fuzzy logic.

2.1 REVIEW OF CONCEPT OF FUZZY LOGIC SYSTEM

The human brain interprets imprecise and incomplete sensory information provided data perceptive organs. fuzzy set theory provides a systematic calculus to deal with such information linguistically and it performs numerical computation by using linguistic labels stipulated by membership functions. [1] the problem is how to select supplier that perform optimally on the desired dimensions.[2] Weber et al.(1991) reviewed 74 vendor(supplier) selection articles from 1966 to 1991 and showed that more than 63% of them were in a multi criteria decision making. other researchers also endorsed using a weighted linear method of multiple for the VSP. Gaballa (1974) is the first author who applied mathematical programming to a supplier selection problem in a real case. He used a mixed integer programming .model to minimize the total discounted price of it misallocated to the VSP. Weber and Current (1993) developed a multi objective MIP for vendor selection and order allocation among the selected supplier .they applied the proposed model in a proposed model in a practical case.[3] fuzzy multi agent system is proposed for ta-chung chu,Rangnath varma (2011),developed to depict the relationship among parent criteria and their sub-criteria and criteria and the weight of all criteria,[5] amit karami and zhiling Gua We demonstrate that the fuzzy logic approach provides a robust analysis for vendor selection, [6]Mamdani and sugeno approaches.setnes et al (1998) showed that using the sugeno approach it would be difficult to give a linguistic interpretation of the information that is described in the rule base. while, Mamdani approach is typically used in modeling human expert knowledge [7]. according to Li-xin wang functions make up the fuzzy if-then “rule is a “if then “rule which some of the terms are given with continuous functions. A fuzzy logic system when case study is presented to show the practical application of the methodology.

3.1 AVERAGE FLOW OF PRODUCTION PROCESS

The steel industries of flow of material mainly the casting in the form on ‘ingot’ and this is ingot used for making production cycle. Raw materials, production process and dispatching in metal production. Material capacity of kilo ton the production flow of segment. Production data provider in manufacturing industry, One year production process.

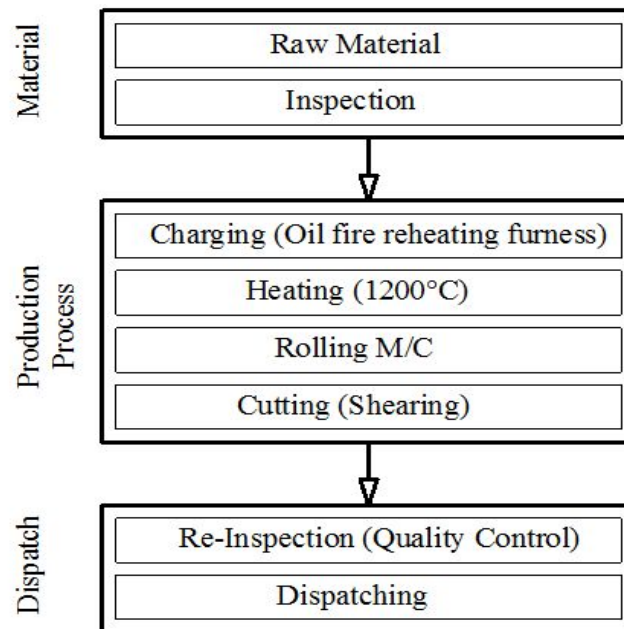


Figure.1: Three stage production process

3.2 RANGE FOR PRODUCTION PROCESS IN AVERAGE MATERIAL

Following are the table.1 (kilo tons capacity every segment)

Production process in average material			
S. No.	Raw material	Production	Dispatch
1.	148.800	122.1	42.800
2.	225.700	186.3	142.735
3.	451.200	390.7	124.925
4.	618.915	487.6	285.335
5.	572.165	303.6	206.445
6.	466.950	201.9	215.225
7.	438.480	138.7	109.180
8.	478.700	259.8	415.850
9.	548.000	231.3	672.025
10.	360.200	141.8	215.090
11.	174.800	231.5	589.530
12.	265.500	237.4	390.245

Table: 1 Range for production process in average material

4.1 MATLAB is a tool for solving problems with fuzzy logic system.

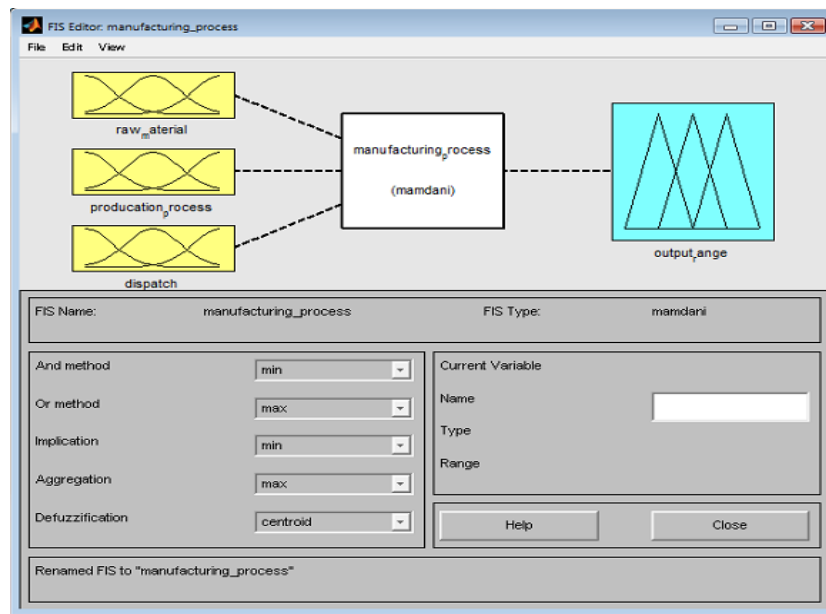


Figure2: Membership functions for supplier

4.2. FUZZIFICATION FOR RAW MATERIAL

4.2.1 RAW MATERIAL.

The sum or production process and dispatch of material at which a product is valued, which sets on his goods is market .it is affected by total cost suitable working process time period. can take many forms including triangular, Gaussian bell shaped, trapezoidal etc. the knowledge base consists of the data base and the linguistic control rule base. The data base providers the information which is used to define the linguistic control rules and the fuzzy data manipulator in the fuzzy logic controller. The rule base defines (expert rules) control goal actions by means of a set of linguistic rules. Which could be provided by an expert The input production data and by using process the expert rules determines the appropriate output control actions. The rule base contains a set of if- then rules.

Table 2: Range for raw material.

Fuzzy No.	Variable	Range
1.	Low quantity	100-350
2.	Medium quantity	200-600
3.	Large quantity	450-700

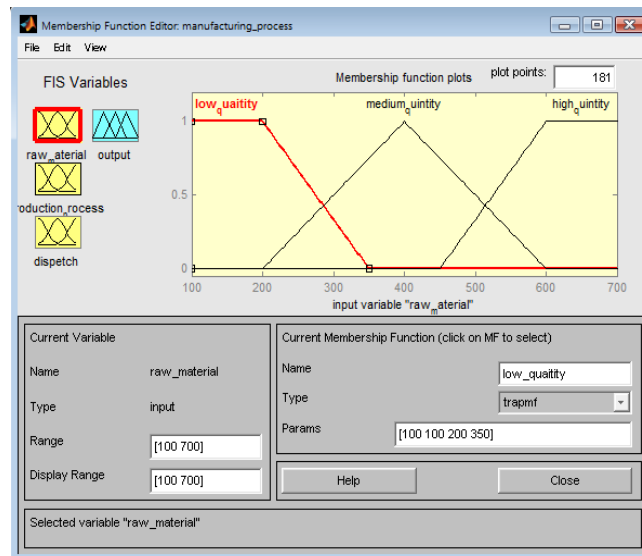


Figure3: Membership functions for raw material

4.3 FUZZIFICATION FOR PRODUCTION PROCESS

A reliable production process performs its intended functions is said to be charging of ingot metals. the metals reaction combination of oil fire reheating Furness and rolling machine cutting and quality. Then slow, Average and fast process

Table3. Range for production process

Fuzzy no.	Variable	Range
1.	Slow process	100-250
2.	Average process	200-400
3.	Fast process	350-500

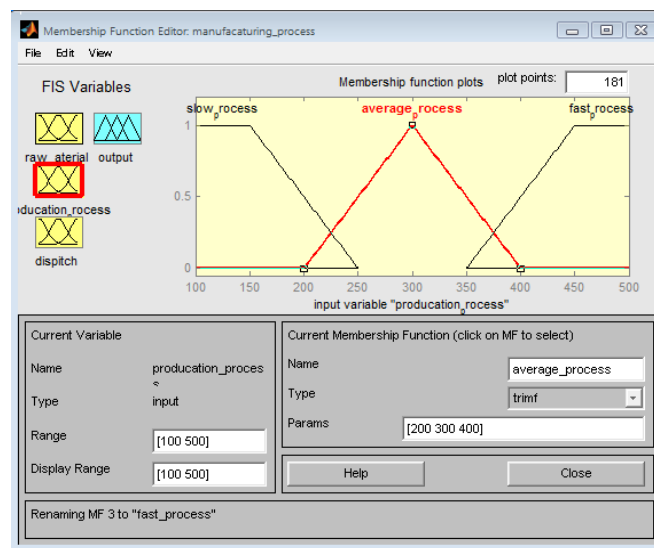


Figure4: Membership functions for production process

4.4 FUZZIFICATION FOR DISPATCH

Dispatching process then production quality is a combination of flow metal. There variable poor, good and excellent Range of fuzzification following the table 4 and figure 5

Table4. Range for Dispatch

Fuzzy No.	Variable	Range
1.	Poor	40-250
2.	Good	200-550
3.	Excellent	500-700

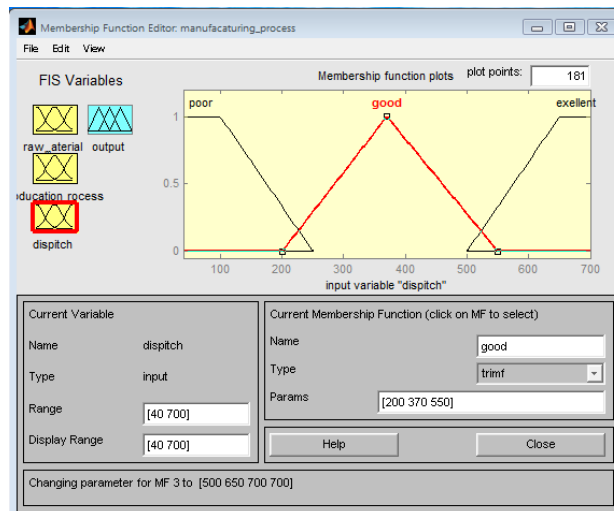


Figure5: Membership functions for dispatch

4.5 FUZZIFICATION FOR SUPPLIER

production process is a decision making if- then rule combination of supplier. There variable Reject, Under consider and accept Range of fuzzification in following the table 5 and figure 6

Table5. Range for supplier

Fuzzy no.	Variable	Range
1.	Reject	0-350
2.	Under consider	200-500
3.	Accept	400-700

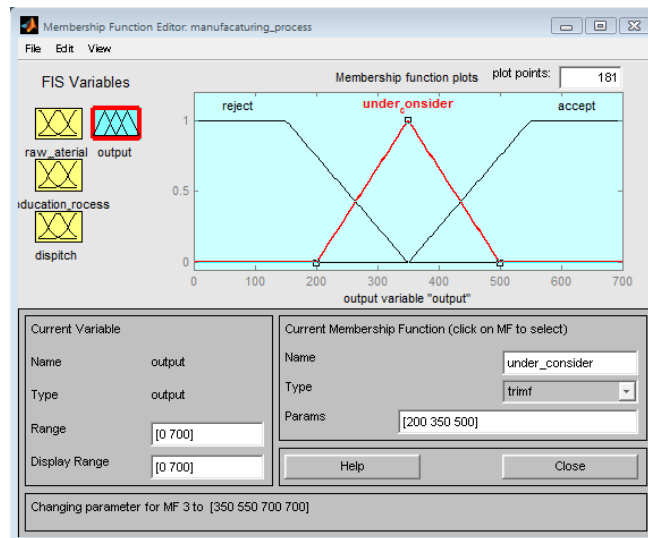


Figure5: membership functions for output

5.1 FUZZY RULE CONSTRUCTION

Fuzzy logic system makes decisions and generates output values based on knowledge provided by the designer in the form of if-then action rules. The rule base specifies qualitatively how the output parameter “overall rating” of the supply proposal is determined for various instances of the input parameters of “Raw material”, “ production process” and “dispatch” and output parameter is supplier selection. The following tables 6, 7, and 6 show the formation of fuzzy rules.

Table6. Fuzzy rule when dispatch is poor

Raw material \ Production	Low quantity	Medium quantity	Large quantity
Slow process	Reject	Reject	Reject
Average process	Under consider	Reject	Reject
Fast process	Under consider	Under consider	Reject

Table7. Fuzzy rule when dispatch is good

Raw material \ Production	Low quantity	Medium quantity	Large quantity
Slow process	Reject	Reject	Reject
Average process	Accept	Under consider	Reject
Fast process	Accept	Under consider	Reject

Table8. Fuzzy rule when dispatch is Excellent

Raw material / Production	Low quantity	Medium quantity	Large quantity
Slow process	Reject	Reject	Reject
Average process	Accept	Under consider	accept
Fast process	Accept	Accept	accept

5.2 FUZZY RULE CONSTRUCTION

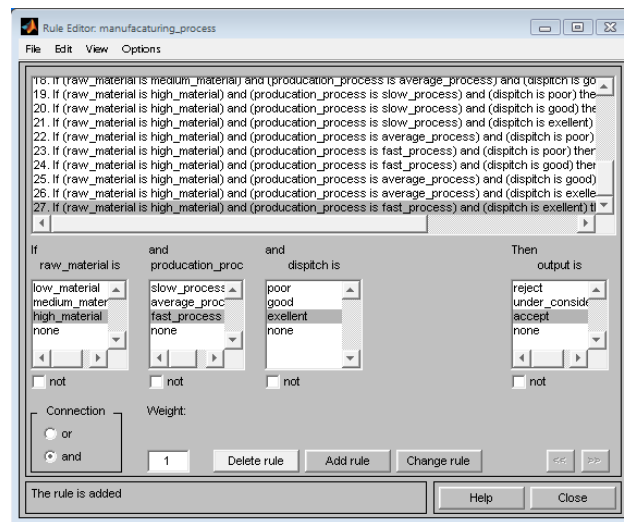


Fig.6 membership functions for Rule process

6.1 DIFUZZIFICATION

If the values considered in the fuzzy logic sets are in terms of degree variation then in the final output the fuzzy values should be converted in to crisp value by using any Defuzzification method. Defuzzification can be performed by deriving the centre of gravity method with the help of MATLAB

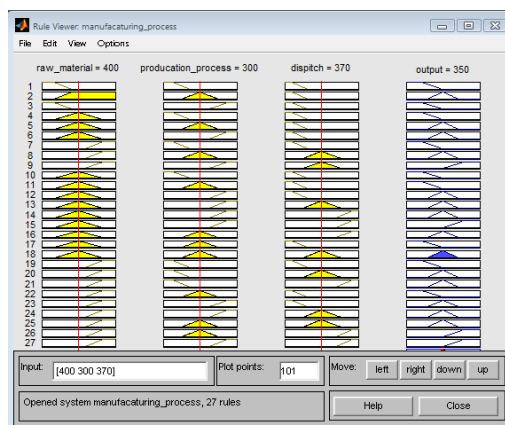


Fig.6 membership functions for Rule process

6.2 SURFACE VIEWER-3D graph

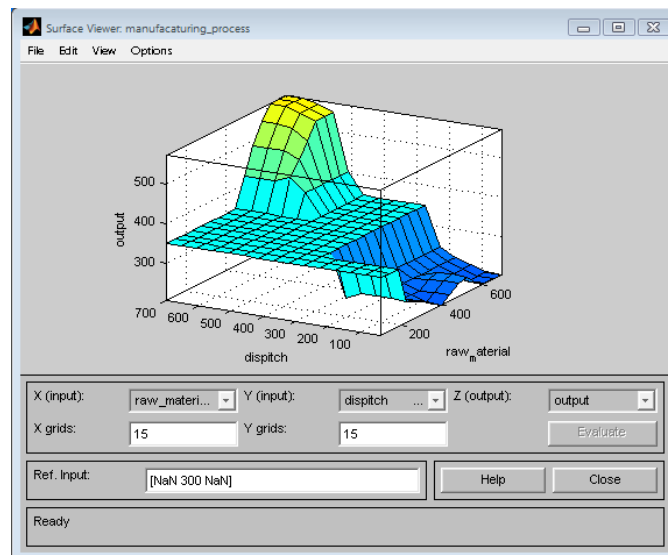


Fig.7: Surface viewer-3D graph

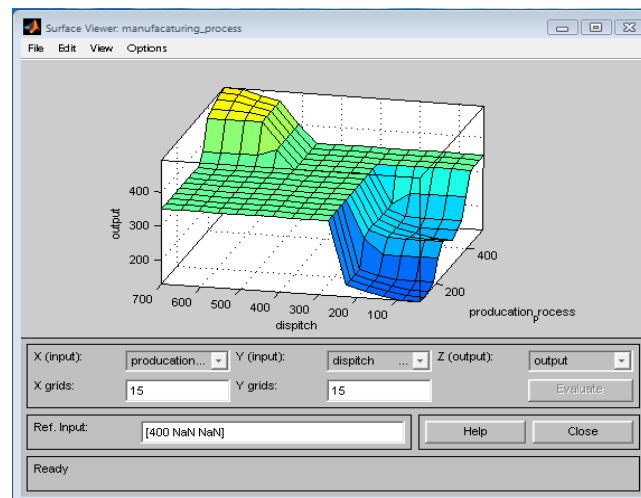


Fig.8: Surface viewer-3D graph

7.1 RESULTS AND DISCUSSION

With the help of fuzzy tool box of MATLAB, there are three input can be set within the upper and lower specification limits and the output is calculated as point that can be translated into linguistic form. For example taking weight of Raw material input 350 (medium), production process input 250(average process) and dispatch input 370 (good) then as output weight of supplier selection is 370 (under consider) As shown in figure 7.and figure 8. the variation obtained can be further observed from the Mat Lab surface Viewer, which is 3D Graph of two input Vs one output. Where production process &dispatch are input VS one output supplier as shown in Fig. 8.

8.1 CONCLUSIONS

Solve multi-criteria decision making problems through a case study of Supplier selection. The Study demonstrates the effectiveness of the said MATLAB techniques in solving such a Supplier selection problem. this study show that factors related to Raw material, production process and dispatch of supplier are the major criteria for assessment and choosing the best performance in material process.

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