IMPROVEMENT OF PROCESS AND PRODUCT LAYOUT FOR METRO COACH USING CRAFT METHODOLOGY

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Abstract - *Plant layout optimization involves setting up the department and the Material Handling System of the industry in order to reduce the cost and time involved in the movement of material. It can be done with the intent to full one or multiple objectives.*

In the manufacturing plant consider different department with interconnected and interdependent to each other. Plant layout plays the significant role in the efficient working of the industries. Plant layout plays a vital role in process layout. Where the studied industries layout depends on process based that can be minimized modification problem of the plant. In this work the modification of product-process based plant layout is studied, and CRAFT algorithm was used to minimize the travel route and transportation cost of interdepartmental activities. The features provided by CRAFT algorithm suggests that you can design the plant layout on the basis of frequently manufacturing product and their process. It is suggested to the organization to interchange the few departments to minimize the cost and distance in the industries.

*Keywords- CRAFT, Plant layout, Process layout*

1. INTRODUCTION

Facilities Planning & Design

The facility planning process can be defined as the process by which a facility management organization envisions its future by connecting its idea to the strategy of the overall organization and then developing goals, objectives and action plans to achieve that future.

Manufacturing and Service companies spend a considerable amount of time and money to design their facilities. This is an enormously important issue and must be addressed before products are produced.

1.1 FACILITIES PLANNING HIERARCHY

Show the detail view of the process and procedure of implementation.
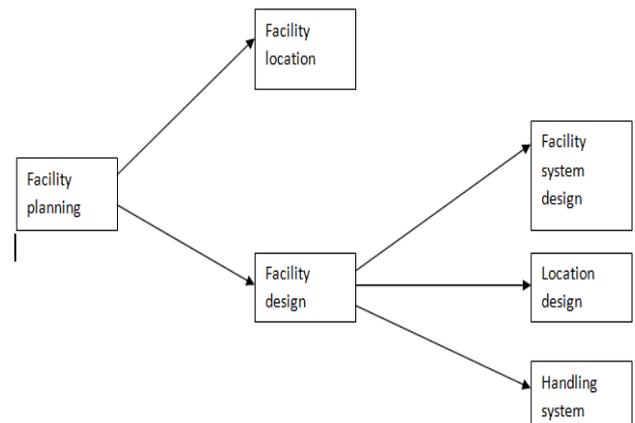
1.2 FACILITIES IN THE MANUFACTURING CONTEXT

A facility is a place where raw materials, processing equipment, and people come together to make a finished product.

Location Problems:

Location Problems involve determining the location of one or more new facilities. The number of sites must at least be equal the number of new facilities location ploted. The cost of locating each new facility at each of the possible sites is assumed to be unknown. It is the fixed cost of locating a new facility at a particular site .The operating and transportation cost of serving customers from this facility-site combination.

Allocation Problems:

Allocation Problems assume that the number and location of facilities are known and effort to determine how each customer is to be satisfied. That is, given the demand for goods at each customer center, the production at each facility, and the cost of serving each customer from each facility, the allocation problem determined how much each facility is to supply to each customer center.

2. ALTERNATIVES TO NEW LOCATION

The increase of existing capacity by additional shifts or overtime, especially for capital-intensive systems

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• The use of seasonal inventories to reduce the need for maintaining capacity for peak demand.
• The use of subcontractors.
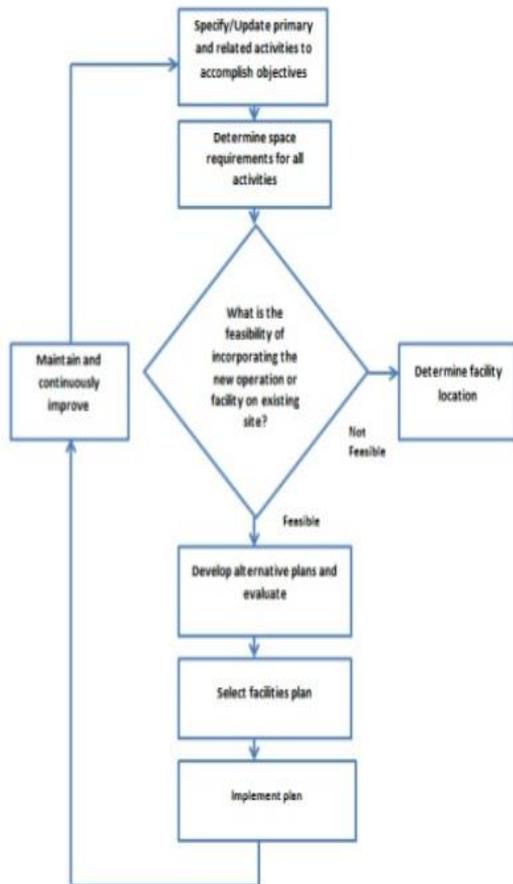• The purchase of new equipment for the present location.

Figure -1: Methodology of designing new layout

CRAFT (Computerized Relative Allocation of Facilities Technique) was the first improvement type algorithm used in computerized facilities design. CRAFT was developed in 1964 by Armour and Buffa.

3. LITERATURE REVIEW

As the review of literature review suggest that improvement algorithm like craft will enhance the productivity and usage of space. Considering CRAFT algorithm is used for improvement.
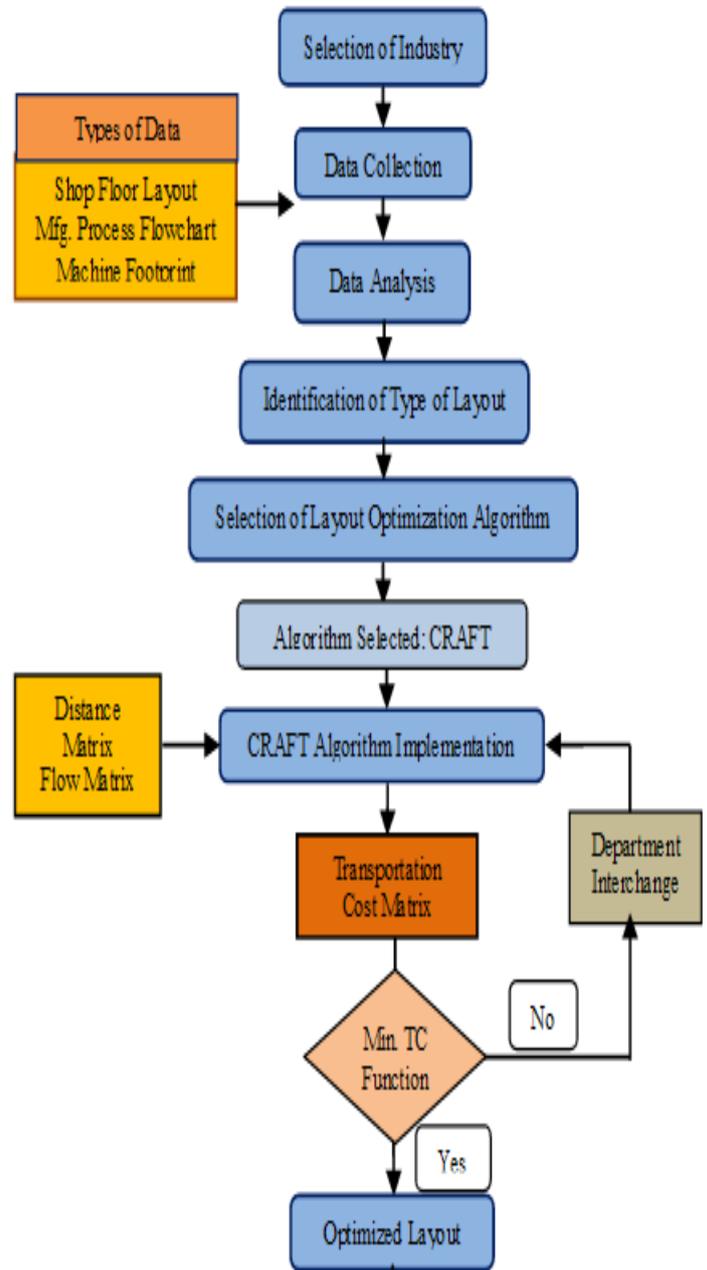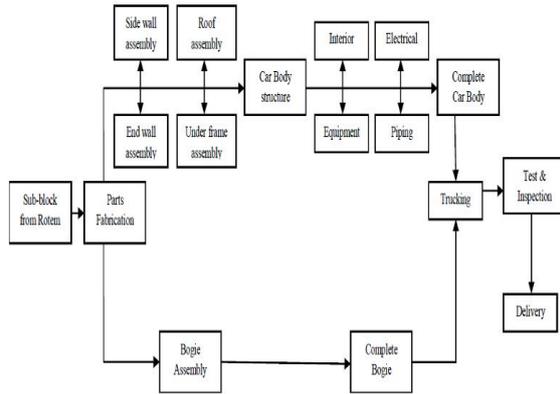
4. METHODOLOGY

Figure -2: Methodology of designing new layout using CRAFT algorithm

5. DATA COLLECTION PROCEDURE

The collected data follows the following procedure:

- Flow diagram
- Present layout
- Distance matrix
- Frequency of material movement
- Handling cost

Process flow diagram boxes: Side wall assembly, Roof assembly, End wall assembly, Under frame assembly, Car Body structure, Interior, Equipment, Electrical, Piping, Complete Car Body, Sub-block from Rotem, Parts Fabrication, Trucking, Test & Inspection, Delivery, Bogie Assembly, Complete Bogie

Unit cost of movement between each department(cost of 1mt=0.025) in rupee

	Machine shop 1 and 2	Bogie	Sub assembly	Material preparation	Underframe	Delivery	Material pretreatment	Car body	Furnishing	Erection	Sheet metal	Painting	Total
Machine shop 1 and 2		1.222	1.171	3.9265	2.353	1.814	2.1515	2.651	3.766		0.6985		22.0285
Bogie	0.013		1.093	0	1.794	0	3.254	0	0	0	0	0	7.254
Sub assembly	2.171	2.095		4.8685	0.585	3.718	0.822	1.833	2.028	2.028	1.755		21.8595
Material preparation	3.9625	2.8635	4.0165		4.5175	4.2105	6.084	3.2855	3.0745				32.0045
Underframe	2.353	0	0	0		0	1.5665	0	0	0	0	0	3.9195
Delivery	0	0	0	0	0		0	0	0	0	0	0	0
Material pretreatment	2.1515	3.254	0.822	6.084	1.5665	4.9655		4.03	2.574	2.574	2.158	2.492	32.7485
Car body	0	0	1.833	3.2855	1.248	3.9645	0		0.195				10.53
Furnishing	3.766	2.257	2.028	3.698	0	4.472	2.574	0				2.458	21.593
Erection	0	0	0	0	0	4.472	0	0	0.013		0	0	4.485
Sheet metal	0.6985	0.787	1.755	3.4905	1.326	3.861	2.158	3.159	3.354	3.354		0	15.166
Painting	4.771	0	0	0	0	4.825	0	0	0	0	0		9.594
													196.5685

6. Present Layout

Distance between each department in meters

	Machine shop 1 and 2	Bogie	Sub assembly	Material preparation	Underframe	Delivery	Material pretreatment	Car body	Furnishing	Erection	Sheet metal	Painting	Total
Machine shop 1 and 2		94	167	301.5	181	218	165.5	227	292		485		1694.5
Bogie			161		198		158						557
Sub assembly	167	161		570.5	45	186	84	141	156	156	155		1602.5
Material preparation	301.5	229.5	570.5		347.5	324.5	498	151.5	289.5		198.5		2799
Underframe	181						120.5						301.5
Delivery													
Material pretreatment	165.5	158	84	498	120.5	388.5		310	198	198	166	187	2508.5
Car body			141	151.5	95	306.5			15				810
Furnishing	292	249	156	236		344	198				186		1661
Erection						344							344
Sheet metal	335	54	155	198.5	102	197	166	249	256	259			1930.5
Painting	167					371							738
													14953

Fig -3: Present layout design

Number of trips between each department

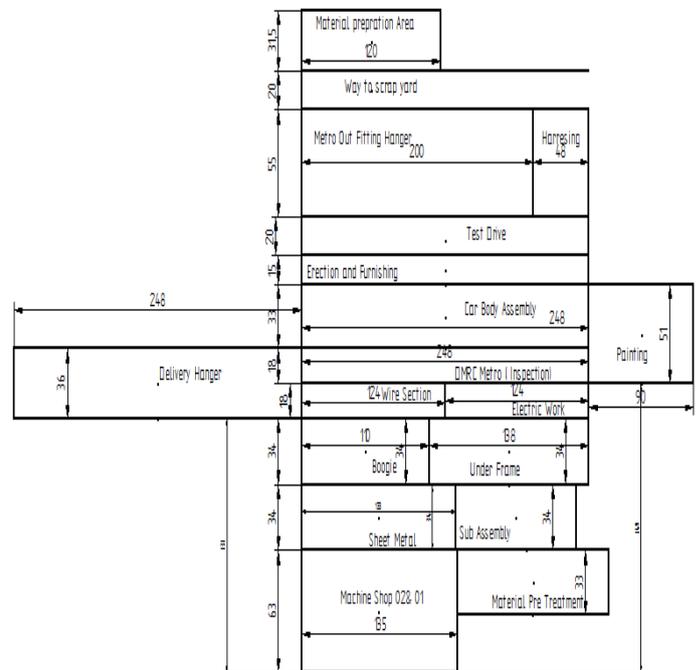|	Machine shop 1 and 2	Bogie	Sub assembly	Material preparation	Underframe	Delivery	Material pretreatment	Car body	Furnishing	Erection	Sheet metal	Painting	total
Machine shop 1 and 2		100	200	20	14	10	14	10	10	13	0	0	411
Bogie	12		0	0	8	0	3	0	0	0	0	0	23
Sub assembly	17	55		5	2	4	100	40	13	2	2	0	240
Material preparation	89	12	4		12	13	55	14	15	0	60	0	274
Underframe	6	26	14	38		13	23	0	0	0	0	0	132
Delivery	0	0	0	0	0		0	0	0	0	0	0	0
Material pretreatment	34	78	102	175	330	22		14	13	16	130	1	915
Car body	0	0	12	0	1	1	1		9	0	0	0	24
Furnishing	3	8	22	4	0	12	8	0		0	0	1	68
Erection	0	0	0	0	0	1	0	0	49		0	0	50
Sheet metal	356	507	245	45	25	245	560	300	100	125		0	2168
Painting	1	0	0	0	0	4	0	0	0	0	0		5
													5421

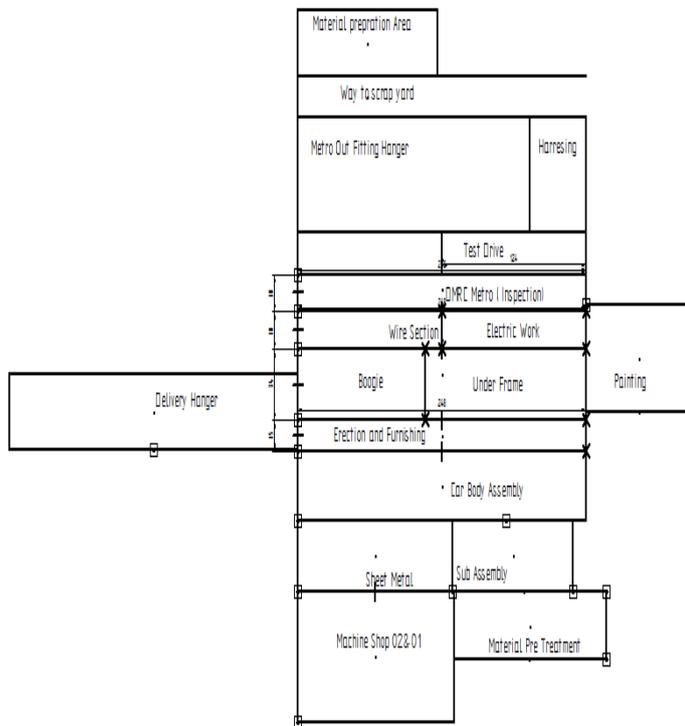## 7. Proposed Layout Design

Fig -4: Proposed layout design

Proposed Layout design is formed after iterating through number of iteration before getting to the optimum layout which has considerably reduced the cost and distance travel between departments.

6. CONCLUSIONS

When the results from the present layout are compared with the improved layout, it is found that there is a considerable reduction in the cost of material transportation. The departments are relocated in such a way that the flow of the material is smoother. From the implementation of new layout the organization can save 21.1% cost compared to the present transportation cost

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