Improvement of Workflow & Productivity in automotive industry

Dheeraj[1]; Mr. Bhupesh Kumar[2]

Department of Mechanical Engineering Dayalbagh Educational Institute, Dayalbagh Agra, U.P., India

Corresponding Author Email: dheerajbaghel98223@gmail.com

Abstract— In today's dynamic and competitive industrial landscape, improving workflow efficiency and productivity is paramount for organizations striving to maintain a competitive advantage. This paper investigates the application of the Maynard Operating Sequence Technique (MOST) as a strategic tool to optimize work processes and increase overall productivity. MOST is a proven methodology, designed to analyse, streamline and standardize work methods, helping to improve operational performance.

The main objective of the study is to present case studies and practical applications of MOST in various industrial sectors. These case studies dig deeper into practical implementations of MOST, illustrating how organizations have successfully used the technique to identify bottlenecks, eliminate waste, and improve workflow efficiency. overall job. The results of these applications are examined, highlighting tangible improvements in production, resource utilization and employee satisfaction.

The study begins by providing an overview of the current challenges industries face in optimizing workflow and productivity. Common problems such as ineffective task sequencing, underutilization of resources and variation in working methods are addressed. The article then introduces the Maynard Sequence of Operations technique, highlighting its principles, tools, and methods that contribute to systematic work analysis and process improvement.

Line balancing is the process of evenly distributing workloads among workstations along a production line to eliminate bottlenecks and optimize resource utilization. This study investigates the impact of strategic line balancing on increasing efficiency, minimizing idle time, and improving overall workflow dynamics. By analysing and optimizing production line configurations, manufacturers can achieve a more synchronized and efficient manufacturing process.

This overview examines the critical role of identifying and eliminating non-value-added activities in the automotive manufacturing process to improve workflow efficiency and overall productivity. Non-value-added activities characterized by waste and inefficiency can disrupt the smooth flow of production, thereby impacting resource utilization and impeding on-time delivery.

Keywords: MOST (Maynard Operation Sequence Technique), Line balancing, Cycle time and Value added and non-value-added activities.

I. INTRODUCTION

MAYNARD OPERATION SEQUENCE TECHNIQUE (MOST)

MOST is developed by H.B.Maynard and Company, Inc., Kjell Zenden in 1974. It's a method for measuring human work that focuses on grouping motions together into pre-defined sequence models, which you to build times, like you use words to build sentences.

Time study is a work measurement technique that:Uses a stopwatch to time operation,Adjusts the time by applying a performance rating that reflects performance of an 'average'worker[1].

I.I. ADVANTAGES

Fast apply, Easy to learn, it's more precise to improvement productivity, reduce comfort of human, reduce cost, increase workflow and improvement of work process.

I.II. APPLICATIONS

It is a predetermined motion time system that used in industrial settings to get the standard time in which worker perform a task, MOST is the most effective work evaluation technique.

I.III. FEATURES OF MOST

Reduces applications time,is easy to learn and use,is accurate,requires a minimum of paperwork,generate consistent results,encourages method improvement, 100 % performance level,Activity timings can be obtained in advance.

I.IV. WORK MEASUREMENT SYSTEMS OF MOST

Influence system selection factors is activity types, cycle length, how frequently the activity occurs, how much variation is involved and use of standards.

I.V. MOST WORK MEASUREMENT SYSTEMS

Basic MOST – MOST is a work measurement technique that determines standard working hours and maximizes resources. Utilization by improving work styles. The concept of MOST was first introduced by Maynard; In 1960, in the form of Basic MOST, industrial application began in 1967. To carry out administrative duties Basic MOST was refined and named in 1970 for officework in manufacturing and service industries. Spiritual number one. In 1972 and 1974, his basic MOST was first used for lunch in Sweden and the UnitedStates.Part of each state Basic MOST, two others widely used versions ofMOST, namely Mini MOST and Maxi MOST was also introduced into the literature in 1980 (Jamil et al. 2013). Three common versions of MOST can be found in the literature. B. Basic MOST, Mini MOST, and Maxi MOST.Toperform manual tasks, the most basic requirements are defining a sequence of his three actions: general movement, controlled movement, and tool use, which are described below. (1) The most used version of MOST(2) Typically used for: Activities that are 'medium cycle' (10 minutes) and Repetitive and non – repetitive activities.

I.VI. PREDEFINED SEQUENCE MODELS REPRESENT DIFFERENT TYPES OF ACTIVITIES (BASIC MOST)

1.General move (moved freely through space)

2.Controlled move (attached or in contact; push, pull, process time)

3.Tool use (using common hand tools)

I.VII. PARAMETERS

Phases & sequence models are built using letters called parameter[2].

GET	PUT	RETURN	Action distance	Body motion	Gain control	Placement
ABG	ABP	A	A	B	G	P

GENERAL MOVE

GET	PUT	RETURN	Action distance	Body motion	Gain control	Placement
ABG	ABP	A	A	B	G	P

CONTROL MOVE

ABG	MXI	A	M	X	I
Get	Move	Return	Move control	Process time	Alignment

TOOL USE

ABG	ABP	.	ABP	A
Get tool	Put tool	Tool action	Aside tool	Return
Fasten or loosen and Cut, Surface clean, Measure, Record, Think.				

I.VIII. TIME MEASUREMENT UNIT (TMU) USED IN MOST

1 TMU = 0.00001 hours ; 1 hour = 100000 TMU

1 TMU = 0.0006 minutes ; 1 minutes = 1667 TMU

1 TMU = 0.036 seconds ; 1 seconds = 27.8 TMU

I.IX. CASE STUDY

5step walk then grasp the alternator bracket then come back 3step then put on the table then within reach grasp the 4 bolts then engage the bolts in alternator bracket then come 2step and fasten the alternator in block then within reach grasp the nut runner then tightening the 4 bolts of alternator then put the nut runner on the table.Rotate the engine then 3step walk then get the tensioner.

Then come 2step then within reach grasp the 3 bolt of tensioner andthen engage in tensioner then fasten the tensioner in block then within reach grasp the nut runner then tightening the 3 bolts of tensioner & then put the nut runner on the table. (2.58 min).

SAMPLE MOST SHEET

Alternator Mtg bkt Fitment and Tightening		Get			Put			Tool/ Return	Asside tool			Ret urn	TMU	FREQ	MP	WC IN SEC	CT IN SEC
Walk 3-4 steps and get 2 dowel pin, Dolly and Hammer and return 3-4 steps to stn	G	A	B	G	A	B	P	A									
	Index	6		1				6					130	1	1	4.68	4.68
	Par Freq	1	1	1	1	1	1	1	1	1	1	1					
Possition dowel pins one by one on the block	G	A	B	G	A	B	P	A									
	Index				1		6						70	2	1	5.04	5.04
	Par Freq	1	1	1	1	1	1	1	1	1	1	1					
Grasp the hammer and strike dolly by hammer 6-7 times (do it for 2 dowel pin)	T	A	B	G	A	B	P	T	A	B	P	A					
	Index	3		1				16	3		1	1	410	1	1	14.76	14.76
	Par Freq	1	1	1	1	1	1	2	1	1	1	1					
Walk3-4 steps and get the alternator Bkt and 4 bolts from bin and return 3-4 steps to stn	G	A	B	G	A	B	P	A									
	Index	6		1				6					130	1	1	4.68	4.68
	Par Freq	1	1	1	1	1	1	1	1	1	1	1					
Possition Alternator bkt on the block with alignment to Dowel	G	A	B	G	A	B	P	A									
	Index						6						60	1	1	2.16	2.16
	Par Freq	1	1	1	1	1	1	1	1	1	1	1					
Get 4 bolts and possition it on bkt one by one (4 times)	G	A	B	G	A	B	P	A									
	Index						6						240	1	1	8.64	8.64
	Par Freq	1	1	1	1	1	4	1	1	1	1	1					
Engage the Bolts by 8-10 finger spin (do it for 4 bolts)	T	A	B	G	A	B	P	T	A	B	P	A					
	Index							16					640	1	1	23.04	23.04
	Par Freq	1	1	1	1	1	1	4	1	1	1	1					
Get the nut runner and sockte and Place it on 4 bolts one by one	G	A	B	G	A	B	P	A									
	Index	3		1	1		3						190	1	1	6.84	6.84
	Par Freq	1	1	1	3	1	4	1	1	1	1	1					
Tighten 4 bolts one by one by nut runner and return the nut runner	C	A	B	G	M	X	I	A									
	Index					10		3					430	1	1	15.48	15.48
	Par Freq	1	1	1	1	4	1	1	1	1	1	1					
Walk 3-4 steps and get manual torque wrench and return to stn	G	A	B	G	A	B	P	A									
	Index	6		1				6					130	1	1	4.68	4.68
	Par Freq	1	1	1	1	1	1	1	1	1	1	1					
Do torquing of all 4 bolts one by one	T	A	B	G	A	B	P	T	A	B	P	A					
	Index	1			1		1	10	1		1	6	570	1	1	20.52	20.52
	Par Freq	1	1	1	4	1	4	4	1	1	1	1					
Do marking and inspection of fitment	T	A	B	G	A	B	P	T	A	B	P	A					
	Index	1		1				32				1	350	1	1	12.6	12.6
	Par Freq	1	1	1	1	1	1	1	1	1	1	1					
														Time in sec		123.12	123.12
														Time in mir		2.052	2.052

I.X. INDEX VALUES TABLE

General Move — A B G A B P A (A B G: Get; A B P: Put; A: Return)

Index x 10	A Action Distance	B Body Motion	G Gain Control	P Placement	Index x 10
0	≤ 2 in. (5 cm)			Pickup Toss	0
1	Within Reach		GRASP: Light Object Light Objects Simo	PUT: Lay Aside Loose Fit	1
3	1 – 2 Steps	Sit or Stand	GET: Light Objects Non-Simo Heavy or Bulky Blind or Obstructed Disengage Interlocked Collect	PLACE: Loose Fit Blind or Obstructed Adjustments Light Pressure Double Placement	3
6	3 – 4 Steps	Bend and Arise		POSITION: Care or Precision Heavy Pressure Blind or Obstructed Intermediate Moves	6
10	5 – 7 Steps	Sit or Stand with Adjustments			10
16	8 – 10 Steps	Stand and Bend Bend and Sit Through Door			16

A — Action Distance Extended Values

Index	Steps	Feet	Meters
24	11 – 15	38	12
32	16 – 20	50	15
42	21 – 26	65	20
54	27 – 33	83	25
67	34 – 40	100	30
81	41 – 49	123	38
96	50 – 57	143	44
113	58 – 67	168	51
131	68 – 78	195	59
152	79 – 90	225	69
173	91 – 102	255	78
196	103 – 115	288	88
220	116 – 128	320	98
245	129 – 142	355	108
270	143 – 158	395	120
300	159 – 174	435	133
330	175 – 191	478	146

Controlled Move — A B G M X I A (A B G: Get; M X I: Move / Actuate; A: Return)

Index x 10	M Move Controlled: Push / Pull / Turn	M Move Controlled: Crank	X Process Time: Seconds	X Process Time: Minutes	X Process Time: Hours	I Alignment	Index x 10
1	≤ 12 in. (30 cm) Button Switch Knob		.5 Sec.	.01 Min.	.0001 Hrs.	1 Point	1
3	> 12 in. (30 cm) Resistance Seat or Unseat High Control 2 Stages ≤ 24 in. (60 cm) Total	1 Rev.	1.5 Sec.	.02 Min.	.0004 Hrs.	2 Points ≤ 4 in. (10 cm)	3
6	2 stages > 24 in. (60 cm) Total 1 – 2 Steps	2 – 3 Rev.	2.5 Sec.	.04 Min.	.0007 Hrs.	2 Points > 4 in. (10 cm)	6
10	3 – 4 Stages 3 – 5 Steps	4 – 6 Rev.	4.5 Sec.	.07 Min.	.0012 Hrs.		10
16	6 – 9 Steps	7 – 11 Rev.	7.0 Sec.	.11 Min.	.0019 Hrs.	Precision	16

M — Push or Pull Extended Values

Index	Steps
24	10 – 13
32	14 – 17
42	18 – 22
54	23 – 28
67	29 – 34

Crank Extended Values

Index	Steps
24	12 – 16
32	17 – 21
42	22 – 28
54	29 – 36

Tool Use — A B G A B P * A B P A (A B G: Get Tool; A B P: Put Tool; *: Tool Action; A B P: Aside Tool; A: Return)

F Fasten or L Loosen

Index x 10	Finger Action	Wrist Action				Arm Action					Power Tool	Index x 10
	Spins	Turns	Strokes	Cranks	Taps	Turns		Strokes	Cranks	Strikes	Screw Diam.	
	Fingers, Screwdriver	Hand, Screwdriver, Ratchet, T-Wrench	Wrench	Wrench, Ratchet	Hand, Hammer	Ratchet	T-Wrench 2-Hands	Wrench	Wrench, Ratchet	Hammer	Power Wrench	
1	1				1							1
3	2	1	1	1	3	1		1		1	1/4 in. (6 mm)	3
6	3	3	2	3	6	2	1		1	3	1 in. (25 mm)	6
10	8	5	3	5	10	4		2	2	5		10
16	16	9	5	8	16	6	3	3	3	8		16
24	25	13	8	11	23	9	6	4	5	12		24
32	35	17	10	15	30	12	8	6	6	16		32
42	47	23	13	20	39	15	11	8	8	21		42
54	61	29	17	25	50	20	15	10	11	27		54

A B G A B P * A B P A Get Tool Put Tool Tool Action Aside Tool Return Tool Use	C Cut				S Surface Treat			M Measure	
Index x 10	Cutoff	Secure	Cut	Slice	Air-Clean	Brush-Clean	Wipe	Measure	Index x 10
	Pliers		Scissors	Knife	Nozzle	Brush	Cloth	Measuring Tool	
	Wire		Cuts	Slices	sq. ft. (0.1 m²)	sq. ft. (0.1 m²)	sq. ft. (0.1 m²)		
1		Grip	1						1
3	Soft		2	1			1/2		3
6	Medium	Twist Form Loop	4		Spot Cavity 1	1			6
10	Hard		7	3			1	Profile Gauge	10
16		Secure Cotter Pin	11	4	3	2	2	Fixed Scale	16
24			15	6	4	3			24
32			20	9	7	5	5	Steel Tape ≤ 6 ft. (2 m)	32
42			27	11	10	7	7		42
54			33						54

P Tool Placement			
Tool	Index	Tool	Index
Hammer	0 (1)	Screwdriver	3
Fingers or Hand	1 (3) (6)	Ratchet	3
Pliers	1 (3)	T-Wrench	3
Scissors	1 (3)	Wrench	3
Knife	1 (3)	Power Tool	3
Surface Treating Tool	1	Adjustable Wrench	6 (3)
Measuring Tool	1		

A B G A B P * A B P A Get Tool Put Tool Tool Action Aside Tool Return Tool Use	R Record				T Think				
Index x 10	Write			Mark	Inspect	Read			Index x 10
	Pencil / Pen			Marker	Eyes / Fingers	Eyes			
	Digits	Words	Copy	Digits	Points	Digits, Single Words	Text of Words	Compare	
1	1			Check Mark	1	1	3	1	1
3	2		1	1 Scribe Line	3	3 Gauge	8	2	3
6	4	1	3	2	5	6 Scale Value Date or Time	15	4	6
10	6		5	3	9 Feel for Defect	12	24	8	10
16	9 Signature or Date	2	8	5	14	Table Value	38	13	16
24	13	3	10	7	19		54		24
32	18	4	14	10	26		72		32
42	23	5	18	13	34		94		42
54	29	7	22	16	42		119		54

P Tool Placement	
Tool	Index
Writing Tool	1
Eyes	0

P Equipment Use Placement	
Equipment	Index
Keyboard	1
Keypad	1
Letter / Paper Handling	1

SIMPLE CALCULATIONS FOR TIME MEASUREMENT UNIT

Index value multiple by 10, then we get the TMU. Then TMU convert in seconds multiple by 0.036. Then we get the final time in seconds.

I.XI. WORK MEASUREMENT

Creating sub operations easily, copy paste elements from existing or library, reports use in operations and routings, combo filters for sub operations, index values, auto cycle, graphical display of operation values.

I.XII. MOP (MEASURE OF PERFORMANCE)

.net 2008 version: - Faster connectivity and multiple access, month data entering easily, multiple operators' allocation easily, operation data entry from excel.

MOP is beggar is better because industry is easily fulfilling the costumer's demand. MOP is equals to standard man hour * no. of production divided by manpower.

II. RESEARCH METHODOLOGY

Through the analysis of the case studies conducted, several issues were identified, such as lack of capacity. Under planning. Furthermore, there is a lack of pre-defined standard hours and working methods, as well as a lack ofpractice. Advanced tools i.e., H. Unplanned routes, material waste, imbalance ofmaterial flow and manual. Non-value-added work increased, impacting the entire assembly line. Therefore, this is with proper use and selection, you can achieve a competitive advantage on the assembly line you run. Adjust tools, balance workflows, and optimize layouts. Hand tools save operator time.

Effort and completion time to complete a task. Furthermore, changes in methodology and Standardize work hours to create a balanced line andeliminate non-value-added activities. and completion time. The division of various workstations and processing areas has changed. It is also expected to help improve scenarios in terms of operator travel distance and disruption avoidance. in areas such as operators, material and equipment handling, tool organization, and WIP storage areas. Smooth delivery of materials from one station to another.

III. RESULT AND DISCUSSION

Improvements through implementation of suggestions require investment and therefore need to be evaluated.Justify the proposed change in two different terms: (a) Increased production rate (b) Investment amount.

And the according to method elemental study the time of alternator mounting bracket fitment and tightening time is 2.58 min and after the use of MOST the time is 2.05 min.

IV. WAY FORWARD TECHNIQUE

IV.I. CYCLE TIME

Cycle time, defined as the total time from the beginning of any process to the end of the process, is used in differentiating totalduration of a process from its runtime. The cycle time is usually measured with a stopwatch. Cycle time is normally larger thanthe service time.

Cycle Time = Service Time + Idle time

Also, Cycle TimeC = Useful production time per day (T) /Output per day (Q)

MEASUREMENT OF CYCLE TIME

The cycle time for each workstation can be measured by picking apart until it has been located at the next workstation. The cycletime can be measured and recorded based on work sequences determined during observation. To enhance the reliability of thedata obtained; a video camera can be used in recording.

IV.II. TAKT TIME

Takt time is defined as the maximum amount of time in which a product needs to be produced to satisfy customerdemand. It is the speed with which the product needs to be produced to satisfy the demand of the customer. Takt time isdefined as,Takt time = T/D

Where, T = Net available time for production, D= Customer’s daily demand

IV.III. LINE BALANCING

In an assembly line, if the workers are not utilized effectively, then it results in less efficiency. If the cycle time of oneworkstation is high, then it will affect the production rate of the whole product. If the line balancing is done in theassembly line, itwill result in smooth functioning of the plant withoutbottleneck. Line balancing is done to obtain the maximum output at the

desired time[3].

IV.IV. VA AND NVA ANALYSIS

In this section, the current definition and classification ofVA and NVAactivities in the manufacturing, constructionand maintenance industry were reviewed. Construction projectis a typical example of a project-basedproduction andmanagement system. The review of relevant studies in theconstruction industry can offer useful insights about theclassification of VA and VA in the project managementarea.

The definition and classification of VA and NVA inthe manufacturing industry

Lean thinking originated from the automobile industry anddeveloped fromTaiichi Ohno’s notion of ‘reduce cost byeliminating waste’ (Holweg 2007). It is observed that the definitionsof value and waste have developed over time andthe demarcation and similarities of the definition have beencaptured. According to Ohno (1988) and Shingo and Dillon(1989), lean research at initial defined value by system inputand output, waste is any loss of cost during inefficient transformation(commonly called Muda – the Japanese term, inthe sense of wasted effort or time) (Thurber, Tomaseic, andStevenson2016). The research focused on efficiencyimprovement in the production process by quantifying theratio between valuable output and consumedvaluable inputresources (Thurber, Tomaseic, and Stevenson 2016). Wasteswere divided into seven categories: over-production, defects,inventory, over-processing, transportation, waiting, andunnecessary motion. Lean was a systematic recognition andexpulsion of the waste contributing to the poor operationefficiency. Since the publication of Womack and Jones (1996), theview of value has changed from waste and cost reduction toenhance customers' value by adding product or service featuresand/or removing wasteful activities (Thurber, Tomaseic,and Stevenson 2016; Hines, Holweg, and Rich 2004).

Womack and Jones (1996) focused on developing a guidelineof wasteelimination and value improvement by classifying and quantifying the activities from customers' perspective.Along with the evolution, Value is defined from the viewpoint of customers, withthe capability to deliver exactly the customer neededproduct or service with minimal time at an appropriateprice. Value adding activities contribute directly to creatingproduct or service customers really want.Waste is any activity which absorbs resources but createsno customer value. The seven kinds of waste werereported as well (as shown in Since then, lean thinking is defined as initiatives whichfocus on improvingproduction efficiency and productivity byconcentrating on waste eliminationand value creation fromcustomers' perspective (Holweg 2007). Ever since ultimatecustomers' value becomes the key principle of lean thinking,a precise definition of value through a dialogue with specificcustomer in terms of the specific product with specific capabilitiesoffered at a specific time isconsidered as the startingpoint of lean application (Womack and Jones 1996).

Based on the customer-driven value definition, valuestream is 'the set of all the specific actions required to bringa specific product' (Stone 2012), defines the work processfrom the view of actions. These actions consider both informationand physic flows within the overall value chain. To realise value in the production process, the activitiesin value stream were classified to three types of action:

Valueadding (VA), necessary but non-value adding (NVA), andnon-value adding (NVA)/waste (Womack and Jones 1996).They were defined as follow (McManus 2005):VA is any operation contributes to the form, fit or functionof the final customer required product in the productionflow.NVA is anyoperation does not create value but isnecessary for streamlining the production process toincrease the value of the final product.

Waste is any operation that customer will not be willingto pay.The valuestream principle focuses on the transparency ofall the actions in the process to eliminate waste, by visualizingwaste to all the participants.

Moreover, value stream mapping (VSM), as an essential lean technique proposed byRother and Shook (2003) to understand VA and NVA activitiesin flow through systematic lean strategy, has been consideredas the generalisable lean implementationframework (Maro din and Saurin 2013). Combined withWomack and Jones's (1996) work on VA and NVA definition,the activities inproduction process were defined and organisedsystematically from thecustomers' perspective. VSM hasbeen used as an initial step of lean transformation to explorethe wastes, inefficiencies and non-valued-added steps[4].

V. THEORETICAL AND PRACTICAL IMPLEMENTATION

In terms of theoretical implementation, this research highlightedthe importance of sector-specific VA and NVA definitionand classification, which has a big impact on successful leantransformation. Previous studies showed that the identificationof VA and NVA is the most important step of lean and VSMapplication. However, it is argued that the current definition ofVA and NVA is limited to physical transformation betweenmanufacturing processes. Given that lean production is becomingpopular and has implemented in many different sectors,the issue of accurate VA and NVA identification and classificationhas arisen. In this research, to facilitate lean applicationin TAMprojects, first, the value and waste definition andclassification in manufacturing, construction and maintenanceprojects were reviewed and analysed; second, the developedVA and NVA definition and classification system was improvedand validated in three focus group studies and validated followinga series of well-designed criteria. Finally, a VSM analysisof a selected sample case was used to evaluate the efficiencyof the system. The proposed system has been shown to be aneffective solution to tackle this issue.The developed VA and NVA definition and classificationframework also have practical implications. It provides aguideline for project clients to efficiently manage VA andNVAduring the operation of TAM projects. At the time ofthis study, few VSM implementations in TAM projects havebeen identified. The classification system can help projectplanners and clients efficiently identify the NVA and waste inthe process of TAM projects and make sure they are timelyeliminated or reduced.

VI. LIMITATION AND FUTURE RESEARCH

This research is limited by the viewpoint of clients,and the simplified qualitative criteria for validating the proposedsystem. Future research should explore the understandingand classification of VA and NVA activities fromdifferent viewpoints, such as operation contractors andresource vendors.

For example, temporary structure erectioncan be 'VA' activity fromscaffolding contractors' perspective;off-site material refurbishment should be classified as 'VA'not 'supportive activities for critical resource' from the viewpointof surface treatment company. In addition, quantitativemethods should also be adopted for a systematic evaluationof the effectiveness of the proposed classification system.

VII. CONCLUSION REMARKS

It is obvious that a business must improve working practices, standardize time, decrease idle and/or downtime, and improve overall capacity planning to survive in this cutthroat industrial climate. In this regard, the MOST can be quite helpful. A potential strategy for raising a car company's productivity is offered in this study. The outcome demonstrates that competitive advantages in meeting client demands, maintaining a well-balanced process flow, and guaranteeing financial gains can be achieved by substituting certain working instruments and altering the procedures. Because of this, the MOST has been included to estimate typical timeframes for various elemental tasks involved in various.

The significance of de-bottlenecking as a strategic imperative for organizations seeking to optimize workflow and improve overall productivity. By presenting real-world examples and exploring the synergy with cutting-edge technologies, the paper aims to provide a comprehensive guide for industry professionals and decision-makers looking to implement de-bottlenecking strategies for sustainable and impactful workflow improvement[5].

Through case studies and real-world examples, to showcase the practical implementation and positive outcomes of line balancing and cycle time reduction strategies in the automotive industry. The findings presented here contribute valuable insights for automotive professionals seeking to enhance their workflow, increase productivity, and remain competitive in an ever-evolving market.

Provides valuable insights for automotive professionals seeking to optimize their production processes by strategically identifying and eliminating non-value-added activities, thereby fostering a leaner and more agile manufacturing environment.

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