

International Journal of Technology and Emerging Sciences (IJTES)

www.mapscipub.com

Volume 02 || Issue 04 || Oct 2022 || pp. 11-17

E-ISSN: 2583-1925

### Implementation of Cloud-ERP in Rubber molding MSME- A Production Control Module framework

Tamanna Aggarwal<sup>1</sup>, Dr. HP Khairnar<sup>2</sup>

<sup>1</sup>Student, Mechanical Engineering, VJTI, Maharashtra, India <sup>2</sup> Professor, Department of Mechanical Engineering, VJTI, Maharashtra, India \*\*\*

Abstract: The rubber industry in India has a high potential for growth in the near future because of the increasing need for rubber products in various sectors and supported by the fact that India is the largest producer of natural rubber. As the size of these industries is increasing their organizations are becoming complex and are becoming prone to errors and losses. Therefore, it is necessary to organize all the functioning of the departments and help them work in synchronization with the help of an ERP solution. This research paper deals with identifying the potential problems in the rubber industries and deciding on a framework for the production control module in ERP which integrates the production process, material and equipment management and quality testing departments. The type of ERP selected for this research is a Cloud-based ERP which is slowly gaining momentum in all the MSMEs given its low cost, advanced features, mobility, and scalability that provides flexibility to the MSMEs and hence boosts their development. Finally, in the end, the potential benefits of this framework are discussed.

### 1. INTRODUCTION:

**MSMEs in India:** MSMEs are a major portion of the Indian economy contributing to 29.7 per cent of GDP and 49.66 per cent of exports. 99% of the total enterprises are from the micro sector. 31% are involved in manufacturing, 36% in trade, and 33% in other services. The sector offers employment to nearly 60 million people through 28.5 million enterprises, after the agriculture sector. Major MSME clusters in India are in Maharashtra, Andhra Pradesh, Gujarat, Tamil Nadu, West Bengal, Uttar Pradesh and Kerala. [2]

# **1.1** What makes the rubber industry an important domain in India?

India is the second-largest consumer (consuming about 1.1 million )and the largest producer of natural rubber in the world. The rubber industry in India is dominated by the small & medium sector as out of 5500 rubber products manufacturing units, 90% are MSMEs.

Here are some facts regarding the rubber industry in India.

- India is the largest producer and second-largest consumer of rubber in the world.[3]
- India is the world's largest manufacturer of reclaim rubber.[3]
- India and China are the only two countries in the world which have the capacity to consume the entire indigenous production of natural rubber.[3]

The above points show that India has huge growth potential in the rubber industry. The upcoming years can prove to be a boon for these industries due to technological advancements in the automotive, aerospace, defence, and other goods sector. A structured organisation and aid of the IT sector can increase the sales to very large figures for these MSMEs.

### **1.2 Rubber Consumption in India**

The following industrial sector consumes most of the rubber products.

- Automotive sector- esp tyre : 50% consumption of all kinds of rubbers
- Tyres and tubes of various bicycles: 15%
- Footwear and bags: 12%
- Belts and hoses: 6%
- Camelback and latex products: 7%
- Other products: 10%

### 2. PROBLEMS IN THE RUBBER INDUSTRIES AND NEED FOR ERP:

<ul> <li>Increasing complexity:</li> <li>1. Great demand for rubber products in India in almost all sectors which is expanding the industries.</li> <li>2. So their operations are becoming increasingly complex</li> <li>3. lack of coordination between different departments</li> <li>4Balance sheets are no longer effective</li> <li>[3]</li> </ul>	<ul> <li>Inadequate infrastructure:</li> <li>1. There is a gap between the farmers and R&amp;D institutions.</li> <li>fluctuating prices of raw materials.</li> <li>2. Difficulty in keeping track of the changing prices</li> <li>3. Difficulty in looking after the quality of the products and keeping a track of the rapid changes in product development.</li> <li>[3]</li> </ul>	<ul> <li>Sales and Marketing problems:</li> <li>1. Synchronization problem between the marketing and warehouse because of large distances between them.</li> <li>2. Lack of information about the production number and rejected items number.</li> <li>3. Errors in sales and order fulfilling process in case of insufficient production.</li> <li>4. Loss of customers</li> </ul>
Wastage problems: 1. Improper coordination between the sales team and the inventory management can lead to excess production of goods. 2. It also produces huge waste which proves harmful to the environment. [3]	<b>Competition with foreign markets:</b> 1. Tremendous competition from the China markets which sell the same products at a much cheaper rate. 2. So it is necessary to keep a constant check on the external threats and have an immediate modification in the ongoing process.	Accounting problems 1. Delayed payments in accounts receivables 2.Limited/ inaccurate cash flow 3.Paperwork errors 4. Mistakes when closing the books each month 5.Erroneous invoicing [3]

### Т

he above problems can be solved by implementing an ERP system which can help in coordination between different departments and help in providing all the necessary information on one screen which is easily accessible from one system thus reducing the significant amount of time. [1]

# **2.1 Reasons for the reluctance of MSMEs in ERP adoption:**

There are some problems associated with the traditional ERP system which make the MSMEs reluctant to adopt them.MSMEs are classified as micro, small and medium based on the investments and annual turnover. An ERP implementation can cost anywhere between INR 15 lakhs to INR 40 lakhs which becomes somewhat not feasible for those to implement an ERP system. The recent global development in the fastgrowing organisations' needs, has led organizations to search for new ERP opportunities in order to meet such needs, adopting the cloud computing-based ERP.[5]. The rubber industries are gradually expanding at a rate of 8% every year, a mobility advantage in order to beat the foreign competition, foreign currency exposure, accessibility from different locations etc. The on premise systems prove to be expensive due to installation and maintenance costs which leads to lower flexibility and accessibility for the organisations.[5] The approximate ERP adoption duration with default

settings may take months and bulky modification may take (2-5) years.[9].It requires highly skilled employees and training of the current IT team to implement the ERP system which can take a very long time and increase the cost. As the organisation evolves with time, an on-premise ERP system becomes outdated with time and needs to be modified with latest functioning of the company. This is a bigger problem if an organisation is expanding and evolving at a faster rate as it then creates a gap between the latest demands which the previously installed ERP cannot offer. [7] Thus, a cloud-ERP solution has become the best replacement for the onpremise ERP along with a solution to the reluctance of MSMEs for ERP solutions.

**3. CLOUD COMPUTING AND CLOUD ERP:** Cloud computing is on-demand access, via the internet, to computing resources - applications, servers (physical servers and virtual servers), data storage, development tools, networking capabilities, and more—hosted at a remote data centre managed by a cloud services provider (or CSP). Cloud computing helps in reducing costs by sharing the resources along with providing flexibility, scalability and reliability.The cloud ERP services are provided by a common vendor who looks after the service updates and other maintainence issues. It has lower cost because it is provided on a monthly subscription which can be cancelled anytime. Because of its easy connectivity it can be extended to outside customers, suppliers and partners. It allows the enterprises to pay only for the resources being used and a flexibility to add or subtract the resources as and when needed. [10]

### **Cloud ERP can be of three types:**

• Software as a Service (SaaS), which targets the end-user or business. It includes the delivery of

### 4. PROPOSED FRAMEWORK OF ERP

### 4.1 Proposed ERP modules in the Rubber industry:

a software application over the internet to multiple users. [8]

- Platform as a Service (PaaS) is the delivery of middleware which contains tools, services and platforms targeted to the software developers, to allow them to build SaaS applications.[8]
- Infrastructure as a Service (IaaS) is the delivery of computing power hardware and software targeted toward administrators. [8]

Sales and marketing module: 1. Management of activities prior to sales 2. Processing the sales order 3. Sales forecasting 4. Tracking sales invoices. [1]	<ul> <li>Production module:</li> <li>1. Material requirement planning</li> <li>2. Production process</li> <li>3. Demand Management</li> <li>4. Tools and equipment tracking</li> <li>[6]</li> </ul>	Quality management <ol> <li>Process quality checks</li> <li>Quality planning</li> <li>Quality inspection</li> <li>Quality Certificates</li> <li>Test Equipment Management <ol> <li>[1]</li> </ol> </li> </ol>
<b>Inventory</b> 1. Stock tracking and transfers 2. Warehouse management 3. Managing Purchase and Sales orders 4. Payment gateway [1]	Accounting module 1. Customer data- credentials, financial transactions etc 2. Virtual account management 3. Management of assets 4. Monitor receivables, payables [1]	<ul> <li>Human Resource module</li> <li>1. Tracking employees' time, attendance</li> <li>2. Accurate payroll processing</li> <li>3. Proper workforce allocation</li> <li>4. Employee training planning</li> <li>5. Employee services</li> <li>[6]</li> </ul>

**4.2 Rubber molding:** Rubber molding is a process of transforming uncured rubber or an elastomer into a usable product by transferring, compressing, or injecting raw rubber material into a metal mold cavity. The applied pressure creates a chemical reaction, such as curing or vulcanization, which causes the polymer chains in the material to crosslink. All rubber manufacturers use heat and pressure to produce their

products. The most common methods for rubber molding are injection, compression, and transfer. With the constant evolution of products, rubber mould producers are continually adjusting to meet the evergrowing demand for grommets, gaskets, tubing, o-rings, and hoses.[4]. The rubber molding process is shown in the figure 1.



## **4.3 The framework of ERP for Production Process control:**

The proposed framework integrates the production process, materials and equipment requirements and quality inspection processes. The primary screen in the dashboard gives information about the types of items to be produced with their respective quantity required, specifications, delivery date and location. Then after selecting a particular product, a primary screen will give an overview of the specifications, quantity and processes involved. There will be brief information beside each process about the completion status, the time required and the bill of materials. Then each particular process will include a separate section giving all the details of the materials and equipment involved and their availability in the warehouse. For equipment, operation time will also be mentioned to give a clear account of how much time each process will take. Next, the quality control section will include reports of the

various tests performed for quality checks along with the equipment used in them. The order information updated by the sales department is shown in the production planning module which will update the information on the materials and equipment requirements along with the process Gantt chart showing the estimated time of completion of each production process. The material and equipment information is then used by the material resource management to check the availability in the warehouse module and make necessary arrangements in case of a shortage. The quality module will update the test reports which will be integrated into the production process module along with the process information. Then the packaging and shipping will be handled by the inventory module. The proposed framework will integrate the production process, materials and equipment management and quality control modules in table-1 (primary view) and table-2(secondary view).

	-	•	-			
Tal	ble-1	: Primary view	( product information an	d production of	overview with res	pective charts)

Product 1	Name, code, quantity required, specifications, delivery date, location to be delivered				
Processes involved	<ol> <li>Compounding</li> <li>Mixing and testing</li> <li>Molding and Deflashing</li> <li>Quality testing</li> </ol>	<b>Status:</b> completed/work in progress <b>Time required:</b> in hrs <b>BOM report:</b> from each process			

Table -2 :	Secondary	y view (	each	process	details)
------------	-----------	----------	------	---------	----------

Process	Overview	Detailed information				
<b>Compounding</b> (Production control)	Status: completed/work in progress/to be started Quantity produced: kg Stored time: should be 16hrs	Material Manag Type Availability Tolerance Cost Equipment man Type	gement: Rubber- Natural/ synthetic Fillers- carbon, CacO3, Clay silica Oils - Aromatic/Naphthalene[11] 1. gms of each material 2. Location in warehouse Qnty used from each material type Cost of each item per kg/ltr magement: Intermix, Open			
			mixer, kneader[11]			

				1		
		n time		8-10 hrs		
		Availabilit	у	Unit	Units available	
	Statuce	Motoriolan	an a som on t			
<b>Mixing and testing</b> (production control)	Mixing- completed/ in- progress/to be started Testing - No. of tests completed (with names)	Internal agement:1. Compound(obtained from the previous step)1. Quantity available2. Curing agents2. Quantity to used 3. CostMixing time - hrs				
	Test Reports:	Testing man	agement:			
	Accepted/ need rework	Tests performed	Hardness t Specific Gravity, Rheologica Properties, ageing test ozone test, Cold resistance test[11]	est, al	1. Values observed 2. Properties defined 3. Range 4. Status- desirable/ undesirable	
		Equipment used	Oscillating disc rheometer, Air&oil ageing ove low temp t chamber, Electronic testing machine, Mooney viscometer	en, est	<ol> <li>Availability (in numbers)</li> <li>Operating time ( in hrs for each )</li> </ol>	
		Curing :				
<b>Moulding</b> (production control)	Curing Status: Competed/ in progress/to be started Time stored: in hrs Deflashing Status: completed/in- progress/to be started Time required: mins( if	Parameters input	1. 2. 3.	<ol> <li>Temperature</li> <li>Pressure</li> <li>Weight to be applied</li> </ol>		
		Equipment	Injectio mouldi device/ Hydrau press [	on ng ilic [1]	<ol> <li>Operation time</li> <li>Availability( no.of machines)</li> </ol>	
	status– ili progress)	Deflashing				

						T					
		Quantity of parts produced: No. of units			Materials management		1. Unfinished rubber products 2. Dry ice	Dry ice - quantity required			
							Equipment managemen	t	Grinding wheel, press operated dies, / cryogenic machine [11]	1. Operati time 2.Availab	on ility
						Ţ	Physical insp	ectio	<u> </u>		
<b>Quality testing</b> (Quality control department)		1. Acceptance Status: Accepted/ Rejected 2. No. of items rejected 3. No. of items need rework		us: cted d		Tests	Cur sho air for ma	Cut marks, shot mould, air pockets, foreign matters. [11]Percenta each def observed		of	
						Other test					
						Test	Tens hard dime abras [11]	Tensile test, nardness test,1. Values 2. Rangelimension test, ubrasion test3. Status desirable[11]11		ot	
						Ē	Final result: a	accep	table or not		
4.4 Working o	of ERP int	egrating	g diffe	erent departmer	nts- (acco	ore	ding to the al	bove	framework)		
		Pr • Creat	<b>oduc</b>	tion production plan	Material required list <b>Warehou</b> obtained from prod <b>managen</b>			ıse nent			
Sales • mater • equip • Estim time sends back products f		<pre>ials required planning ment allotment ation of operation  c sends products for testing</pre>		<pre>material and equip information update</pre>		al and equipme nation update	ent	<ul> <li>check av</li> <li>send ord materials</li> <li>Check ec availabil</li> <li>update in</li> </ul>	ailability er for raw guipment ity		
Quality control and testing			products send for packaging and shipping				I				
<ul> <li>perform tests</li> <li>prepare reports</li> <li>segregates items for rework or delivery</li> </ul>										-	
	ent depart	tm	ents through E	RP							

As shown in the figure-2, the sales department sends a and

sales order to the production department. The production department then creates a production plan

and generates a materials and equipment required list along with the operation time required for each machine and is sent to the warehouse department. The warehouse department then checks the availability of the materials and equipment and then makes the required arrangements. It updates the necessary information in the ERP software which is received by the production department. After the individual production processes are completed their information is updated in the software which can be accessed by the other departments. Then the finished products are tested and the reports are updated. The products which need rework are then sent back to the production department and the accepted products are sent to the warehouse department for packing and shipping.

**5. Conclusion:** Thus, the proposed framework will help in integrating the production process management, materials and equipment management and the quality control modules which will help in tracking day to day production progress thus helping in forecasting the exact shipping date.On completion of any work order, information will be sent for delivery. It will help to schedule the particular material or product to produce in a given time. It will help to know about the availability of raw materials and equipment thus helping the company in determining the capacity of the organization to manufacture the products as per the demand. By streamlining the processes, all information will be available in a centralised location — giving a 360degree view of the entire manufacturing process. Besides, it will enable the companies to monitor the production status in real-time without any dependence on the team members. Automation brings inefficiency to the system and improves productivity, helping companies to maintain their order commitments.Quality management in this framework will ensure that the products are safe to use and are exactly as they should be. This framework also ensures that the products match the guidelines and specifications to pass the quality certification process. Thus, the framework for ERP in rubber industries has been proposed.

#### 6. References:

[1] Concepts in Enterprise Resource Planning- Ellen F. Monk, Bret J. Wagner

[2] MSME Annual report 2020-21

[3] All India Rubber Industries Association (Eastern Region) Report of the Seminar on "Make in India and Made in India for MSME - Challenges & Opportunities in Rubber Industry"

[4] J. M. MAUSKAR, "Development of standards for rubber products manufacturing industry

[5] Nizar Mohammad Alsharari, Mohammad Al-Shboul, Salem Alteneiji(2020) " Implementation of cloud ERP in the SME: evidence from UAE" Journal of Small Business and enterprise Development Vol. 27 No. 2, 2020 pp. 299-327

[6] Joko Siswanto, Anggi Maulida "ERP Module Requirements for Micro, Small and Medium Enterprise Fashion Industry in Bandung" International Conference on Information Technology Systems and Innovation (ICITSI) 2014 Bandung-Bali, 24-27 November 2014 ISBN: 978-1-4799-6526-7

[7] Sonny Demi, Moutaz Haddara "Do Cloud ERP Systems Retire? An ERP Lifecycle Perspective" International Conference on Project Management / HCist - International Conference

[8] Mohamed A. Abd Elmonem a,\*, Eman S. Nasr b, Mervat H. Geith a "Benefits and challenges of cloud ERP systems e A systematic literature review" -Future Computing and Informatics Journal 1 (2016) 1e9

[9] Ahmed A. Al-Johani and Ahmed E. Youssef "A FRAMEWORK FOR ERP SYSTEMS IN SME BASED ON CLOUD COMPUTING TECHNOLOGY" - International Journal on Cloud Computing: Services and Architecture (IJCCSA), Vol.3, No.3, June 2013

[10] Ganesh L, Arpita Mehta\*" Understanding Cloud-Based ERP Implementation in light of Conventional ERP Implementation at Indian SMEs: a Case Study"

[11] "Skill Gap Analysis across Sub-Segments (Tyre and Non-tyre) for Rubber Industry – Manufacturing process of Rubber products"- Rubber Skill Development Council