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DEVELOPMENT OF RACI MATRIX FOR COMPLETE MACHINE LIFECYCLE

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Abstract - *A RACI Matrix or Responsibility Assignment Matrix is a matrix of all activities or decision-making authorities undertaken for any process. At each intersection of activity and role it is possible to assign someone responsible, accountable, consulted or informed for that activity or decision. In this research, the process of capacitor manufacturing is observed and safety critical machines are identified for the same. Then for those safety critical machines different stages of life cycle are identified. Once the identification of machine is completed with different stages, a list of safety related activities and list of stakeholders, associated with the task or activity, is created. To identify the stages, activities and different stakeholders, a risk assessment study was carried out to find the safety critical equipment to define the criticality of the task and of the machine. On finding the risks, roles and responsibilities were assigned for the same to ensure proper and safe working operation of the equipment. The main objective of this research is to ensure accountability is placed with the person who really can be held accountable for specific work and safe work practices. It includes all routine and non-routine activities involved in capacitor manufacturing process.*

Key Words: RACI, Safety Accountability, Responsibility

1.INTRODUCTION

RACI Matrix or Responsibility Assignment Matrix is a safety management tool designed to assign tasks, activities, responsibilities, accountability, decision making, support to team members of a process/project and clarify expectations on the level of their participation. This tool is used for identifying roles and responsibilities and avoiding confusion over those roles and responsibilities during project. To ensue collaboration and project success, it is crucial for all stake holders to understand their roles and responsibilities and those of other project members.

It is an element of the safety assurance program which integrates various safety management tools to assure safety of the employee. There are fifteen elements in this program which address the safety issues in organization at different levels. It has four levels in it namely People Certification & Authentication, Engaging Hearts & Mind in Safety, Equipment Certification & Authentication and Safety Assurance Program. All four level starts from creating safe environment, creating awareness among employees regarding safety at workplace, creating a system to check if the safety related issues have been addressed and maintaining a level of safety for the employees.

RACI Matrix is one of the key safety management tools used in assuring safety of employees. It uses a work breakdown structure and organizational structure to link deliverables or activities to resources

In Responsibility Assignment Matrix, a process or activity is defined step by step and for every step or task specific roles are assigned according to the needs. It ensures each activity have accountability fixed with the respective person who can be held accountable for specific work and safe work practices. It involves representatives from all departments and information is being shared in between them. The purpose of a RACI Matrix is to eliminate confusion between departments and individuals regarding their roles and responsibilities.

1.1 Elements

Stakeholders – Any individual or a group of individuals connected to a given task, directly or indirectly, and whose involvement affects the outcome of the desired task will be called as a stakeholder. Other than the ones performing the task, there are many individuals and many departments which work together to form a communication model and helps in performing the task effectively.

Operations – For this project the focus is to identify various stages of machine lifecycle in which safety related issues are faced and are addressed. Starting from pre-commissioning to decommissioning of the machine there are seven stages in which the activities are identified and roles are defined for the same.

- Pre-commissioning Inspection
- Commissioning
- Daily Startup Inspection
- Standard Operation
- Maintenance Operation
- Modification
- Decommissioning

1.2 Assigning Roles and Responsibility

Responsible – Responsible is one who will perform the defined task and will have required knowledge of the operation to perform the task. He should know the basic safety awareness about the operation and PPE and standard operating procedure knowledge. The role demands the individual to have understanding about what to do and whom to contact in case of an emergency.

Accountable – An individual who will have total authority over the operation and who can give command to perform the task. He should also have a total understanding of the work permit system to perform a task, if required. He is one who will have thorough knowledge of operations to be performed. He will decide by whom the task will be performed and how it is being performed. He should also have knowledge of operations safety training and will provide the same to the employees before starting the operation. He will have a thorough knowledge of required rules and regulations and will provide the same to employees along with manuals and checklist.

Consulted – An individual who is an expert in his field and have a thorough knowledge and experience of the work being performed. He should provide solution to any safety related problem.

Informed – The one who is not directly connected to task or who has no direct effect on task completion but is required to get an update about the task. The individual with this role is generally a higher authority or senior department. He is the head of the team concerned with the section of the task. He is one who gives the order to do the task and is informed once the task is completed.

Assigning roles should provide both positive and negative aspects of the tasks to be performed. Identifying and promoting individual accountabilities can raise self fulfilment and can lead to enhanced performance. The actual pattern of responsibility assignment depends on the management body's administrative structure and any legally defined accountability.

Too many responsibilities assigned wastes available expertise and limit its further development in any local or field office

2. LITERATURE REVIEW

Jesús Álvarez-Santos, José-Á. Miguel-Dávila, Liliana Herrera, Mariano Nieto (2018): "Safety Management System in TQM environments" The journal aimed at knowing the conditions that accelerate the adoption of safety management system either under principles, beliefs and values of TQM or because of the implementation and application of essential safety management technique. Safety management system is a management model that groups functions, responsibilities, practices, procedures and processes for risk prevention. Assumption of responsibility incorporates the principles of a risk prevention policy.

T. Kontogiannis, M. C. Leva, N. Balfa (2017): "Total Safety Management: Principles, Processes and Methods" The integration of safety with other management systems (e.g., quality, environment and productivity) has been addressed either at a strategic level or a standardization level. This article looks at the coordination between business processes that are common to these management systems and proposes several principles of Total Safety Management based on earlier studies and a three-year experience with a European project. Four safety processes are proposed which are compatible with ISO 31000 & CCPS Standards 2008 and principles of TSM are discussed briefly. In general, a TSM approach should consider risk assessment within the framework of a functional system model that describes both the activities of operators and the business processes that support human performance (i.e., supplies, tools, workplaces, training). Human operations are analyzed in terms of tasks, information needs, decisions and coordination.

Gudela Grote (2015): "Promoting safety by increasing uncertainty – Implications for risk management" In this research paper processes are proposed as a criterion for decision on reducing, maintaining and increasing uncertainty. Necessity to manage uncertainty and its impact on control and accountability. Reduced uncertainty results in stable systems and maximum control whereas increased uncertainty leads to flexible system and self-organization

Sidney W.A. Dekker (2015): "The bureaucratization of safety" Bureaucratic accountability refers to the activities expected of organization members to account for the safety performance of those they are responsible for (e.g. unit, team, site). Bureaucratization of safety has brought benefits, including a reduction of harm, standardization, transparency and control. It has been driven by regulation, liability and insurance arrangements, outsourcing and contracting, and technologies for surveillance and data storage.

Oregon OSHA: Safety and Health Management – the Basics Gives to basic understanding about safety management system and basic definition of responsibility, accountability and difference between the two. The research paper concludes that production supervisors are held accountable for safety, health and ergonomics in their departments. Top management is held accountable for facility safety performance though their own performance evaluations.

Overview for Management of Change based on Business Process Model of Plant Lifecycle. This journal talks about the accidents caused by uncontrolled changes which could have been monitored easily. Various plant lifecycle stages are discussed here and many activities are identified over the plant lifecycle such as process hazard analysis, training, and so on are required for the changes.

2.1 Objective of the Project

- Detailed study about the machine and process and to understand every single activity involved in the process by breaking down it in simple stages.
- Identifying activities and tasks related to the process and the machine at every stage.
- Assigning roles and responsibility to individuals involved with the process and to create a proper communication model.
- To eliminate and avoid confusions between different departments regarding their roles.
- To know about every safety issue in every activity associated with the project and the steps taken to eliminate or reduce it.

3. METHODOLOGY

Current research methodology to obtain the desired RACI Matrix is demonstrated in figure below:

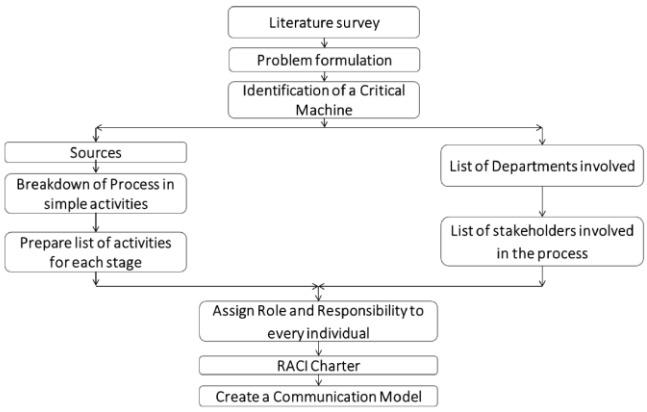

Figure 1 Methodology of project

4. RESULTS

4.1 Identification of Safety Critical Machines

The first step of the project was to identify safety critical machines for which RACI Matrix was to be created. To complete this task, Occupational Risk Assessment of the capacitor manufacturing process was carried out. The purpose of the risk assessment was to find out the high-risk activities and critical operation machines and to find involved dangers in it. Mitigation plan for the same was prepared and responsibilities were assigned.

Table 1: Probability of occurrence

Probability Level	Order of magnitude of Probability or Exposure duration
3- Probable	Daily to monthly event (larger exposure durations)
2- Improbable	Monthly to annual event (exposure remaining limited in duration)
1- Very improbable	Events occurring annually or every few years (short and rare exposure)

The severity of injuries or damage to health can be estimated by considering reversible injuries, irreversible injuries or death. The recommended classification is shown in the table 2. Probability of occurrence is estimated using the least favorable case. It is recommended to ensure that three factors namely Frequency of exposure, occurrence of hazardous events and possibilities of avoiding the harm are considered as mentioned in table 1.

Risk matrix is used to determine the level of risk based on the probability of occurrence of the hazard and the severity of the harm. On the bases of risk assessment carried out for the capacitor manufacturing process, following points are observed:

Table 2: Severity of occurrence

Severity level	Type of bodily harm considered
3- Very serious	Amputation major fractures; poisoning multiple fractures; fatal injury, occupational cancer; other illnesses reducing life expectancy; fatal acute illnesses. Partial permanent incapacity to work.
2- Quite serious	Lacerations and wounds; burns; concussion; serious sprains; minor fractures; deafness; dermatitis; asthma. Poor health leading to a minor but permanent disability; or temporary incapacity to work.
1- Minimal	Incidents nearly without injury or with superficial injuries; small cuts and bruises; irritation of eyes by dust; discomfort or problem with temporary discomfort of one or several people. Benign events or accidents that are recorded.

Table 3: Risk Rating Matrix

Severity Probability	Minimal	Quite serious	Very serious
Probable	3- Moderate risk	4- Substantial risk	5- Intolerable risk
Improbable	2- Tolerable risk	3- Moderate risk	4- Substantial risk
Very Improbable	1- Negligible risk	2- Tolerable risk	3- Moderate risk

On the bases of risk assessment carried out for the capacitor manufacturing process, following points are observed:

- Winding area consisted of activities categorized in five groups. Total 31 risks were identified for winding operations out of which 2 risks are significant. The highest risk rating obtained by winding machine is 3.
- Spraying area consisted of activities categorized in seven groups. Total 3 risks were identified for winding operations out of which 5 risks are significant. The highest risk rating obtained by winding machine is 3.
- Element Testing area consisted of activities categorized in three groups. Total 17 risks were identified for winding operations out of which 1 risk is significant. The highest risk rating obtained by winding machine is 3.
- Support assembly line consisted of activities categorized in 9 groups. Total 25 risks were identified for winding operations out of which 0 risks are significant. The highest risk rating obtained by winding machine is 2.
- Resin Filling area consisted of activities categorized in six groups. Total 21 risks were identified for winding operations out of which 0 risks are significant. The highest risk rating obtained by winding machine is 2.
- Seaming operation consisted of activities categorized in ten groups. Total 19 risks were identified for winding operations out of which 1 risk is significant. The highest risk rating obtained by winding machine is 3.
- Capacitor testing area (Infinity and Koti) consisted of activities categorized in eleven groups. Total 63 risks were identified for winding operations out of which 1 risk is significant. The highest risk rating obtained by winding machine is 3.

The various risks identified for safety critical machines during standard operations are identified. During winding operations two safety risks were identified and control measures or counter measures are defined for the same. In the same manner for spraying area the five risks were identified with moderate risk level. Similarly, for testing operation, seaming operation and capacitor testing operations one risk is identified for each operation as moderate level risk and control measures are placed.

Table 4 Risk Assessment Sheet for Winding Operation

Task / Sl.No	Detailed operation	Danger / Hazard	Risk Explanation / End effect	No of employees affecte	Existing Control (Consider Hierarchy of Control)	Activity (Routine / Non Routine)	Gravity (Minimal/ Serious/ Very serious)	Probability (probable / Improbable / V. Improbable	Level of Risk = Gravity X Probability	Any Legal requirements	Significance (S/ IS)	Counter Measures for Control of Significant Risk (OCP / OHSMP)
Winding operation/ 5	Machine to stop if the door is opened.	Machine and working eqp	Hit / Cut injury -if machine bypassed & interlocks are not in place	09/12	N/A (PPE-Gloves)	Routine	*Serious*	*Improbable*	Moderate	No	S	Safety Interlocks
Maintenance of machines / 5	Chance of Winding Machine Door falling on the maintenance technician.	Machine and working eqp	Hit Injury - winding M/c door falling on the Operator.	2/12	N/A	Non Routine	*Serious*	*Improbable*	Moderate	No	S	Fasterners of the Door to be checked while performing PM.

Table 5 Risk Assessment Sheet for Spraying Operation

Task / Sl.No	Detailed operation	Danger / Hazard	Risk Explanation / End effect	No of employees affect	Existing Control (Consider Hirarchy of Control)	Activity (Routine / Non Routin	Gravity (Minimal/ Serious/ Veru serious)	Probability (probable / Improbable / V. Improbabl	Level of Risk = Gravity X Probabilit	Any Legal requirements	Significance (S/ IS)	Counter Measures for Control of Significant Ris
Cleaning the booth and tray / 1	Cleaning of machine with cotton	Fumes, Vapour, Dust	Health Hazard - Zinc Dust Inhalation, Entire spray area is filled with zinc dust	14/15	PPE - Nose mask, Gloves	Routine	*Minimal*	*Probable*	Moderate	No	S	OHSMP
Element Loading, Arrangement / Stacking/2	Unloading of elements in some case	Machine and working eqp	Hit injury - while removing elements from tray using mallet.		N/A (PPE-Gloves)	R/NR	*Minimal*	*Probable*	Moderate	No	S	OHSMP
Spraying operation / 5	Hit by ROBO if limiti switchs are bypassed	Machine and working eqp	Hit / Fire injury - if booth limit switch is bypassed	6/15	N/A	Non Routine	*Minimal*	*Probable*	Moderate	No	S	OCP EHS 09
Spraying operation / 6	Hit by ROBO if someone inside booth and door is closed	Machine and working eqp	Hit / Fire injury - if some one inside the booth with the closed door	6/15	Emergency PB from outside	Routine	*V Serious*	*V.Improbable*	Moderate	No	S	OHSMP
Spraying operation / 7	Explosion in case LPG leakage	Fire / Explosions	Fire hazard - in case of heavy LPG leak	15/15	Fire sprinkler (Regular Maintenance)	Routine	*V Serious*	*V.Improbable*	Moderate	No	S	OHSMP

Table 6 Risk Assessment Sheet for Element Testing Operation

Task / Sl.No	Detailed operation	Danger / Hazard	Risk Explanation / End effect	No of employees affecte	Existing Control (Consider Hirarchy of Control)	Activity (Routine / Non Routine)	Gravity (Minimal/ Serious/ Very serious)	Probability (probable / Improbable / V Improbable	Level of Risk = Gravity X Probability	Any Legal requirements	Significance (S/ IS)	Counter Measures for Control of Significant Risk (OCP / OHSMP)
Testing operation / 4	Flast or blast due improper wound of elements	Electricity	Arc flash - If element failure	8/9	N/A (Regular maintenance)	Routine	*Serious*	*Probable*	Substantial	No	S	Safety Guards with Door Interlocks.

Table 7 Risk Assessment Sheet for Seaming Operation

Task / Sl.No	Detailed operation	Danger / Hazard	Risk Explanation / End effect	No of employees affecte	Existing Control (Consider Hirarchy of Control)	Activity (Routine / Non Routine)	Gravity (Minimal/ Serious/ Very serious)	Probability (probable / Improbable / V Improbable	Level of Risk = Gravity X Probability	Any Legal requirements	Significance (S/ IS)	Counter Measures for Control of Significant Risk (OCP / OHSMP)
6	Holding the CAN assy	Machine and working eqp	Crush injury - Hand	3/3	PPE - Gloves	Routine	*Serious*	*Probable*	Substantial	No	S	OCP

Table 8 Risk Assessment Sheet for Capacitor Testing Operation

Task / Sl.No	Detailed operation	Danger / Hazard	Risk Explanation / End effect	No of employees affecte	Existing Control (Consider Hirarchy of Control)	Activity (Routine / Non Routine)	Gravity (Minimal/ Serious/ Very serious)	Probability (probable / Improbable / V Improbable	Level of Risk = Gravity X Probability	Any Legal requirements	Significance (S/ IS)	Counter Measures for Control of Significant Risk (OCP / OHSMP)
6	Holding the CAN assy	Machine and working eqp	Crush injury - Hand	3/3	PPE - Gloves	Routine	*Serious*	*Probable*	Substantial	No	S	OCP

4.2 List of Activities and Stakeholders

After finding the all safety critical equipment used in capacitor manufacturing process, the next step requires the identification of all activities associated with the machine during whole life cycle and to find different stakeholders for different stages of machine lifecycle.

Table 9 Identified Departments and Stakeholders

Department	Stakeholders
Production	Production Operator
	Production Supervisor/ Shift in-charge
	Production Manager
CS&Q	Quality Manager
Maintenance	Maintenance Manager
	Maintenance Technician
Methods Department	Methods Head
SPS & CI	Schneider Performance System & CI Head
EHS	EHS Manager
	EHS Executive
Supply chain Management	Warehouse Manager
	Supply chain Manager
IFM	Facility Manager
	Housekeeping Personnel
HR Department	HR Manager
Plant Head	

To find the list of activities various documents were studied and observations were made.

The documents required for finding the list of activities are:

- Operations Work Standards
- Standard Operating Procedure
- Machine Manual from Original Equipment Manufacturer
- Job Breakdown Sheets
- Occupational Risk Assessment Sheets
- OCP and OHSMP

A stakeholder is one who's involvement, directly or indirectly, affects the outcome of the process. There are various departments and individuals from where the stakeholders are find. To ensure collaboration and project success, it is crucial for all project stakeholders to understand their roles and responsibilities and those of other project members. This is especially important when project teams are more complex due to their large size, involvement of distributed team members or reliance on staff from multiple departments.

RACI Guidelines:

- Avoiding multiple levels of oversight and working on one level.
- Maintaining chart fluidity- making changes as needed and letting people know when things change.
- Assigning only one accountable per task. There shall never be two persons accountable for a single task
- Ensuring accountable assignees have authority to ensure the task is complete.
- Avoid too many consultants as they may take too much time while too few can damage the performance
- Inform everyone with role of their assignment
- If too many people must be assigned consulted, evaluate whether one person can be assigned who talk with other involved.

4.3 Assigning Roles and Responsibilities

4.3.1 Winding Area

Table 10 No. of activities for winding machine

Metar Winding Machine		
Sr. No	**Stages of operation**	**No. of Activities**
1	Pre-commissioning Inspection	35
2	Commissioning	31
3	Daily Startup Inspection	17
4	Standard Operation	27
5	Maintenance Operation	30
6	Modification	24
7	Decommissioning	33
		197

Table 11 Department involved in winding operation

Departments involved			
CS&Q	Executive	Manager	
Production	Operator	Supervisor	Manager
Methods	Executive	Manager	
EHS	EHS Executive	EHS Manager	
Maintenance	Executive	Manager	
HR	Asst. Manager	Sr. Manager	
IFM	Housekeeping Staff	Housekeeping Supervisor	IFM Manager
Warehouse	Operator	Supervisor	Manager

Similarly, the no. of activities and involvement of department were identified for spraying machine, ECAC testing machine, riveting machine, HV Lid testing, resin filling machine, seaming machine, capacitor testing machine.

RACI Matrix as a sample for Pre-commissioning inspection, commissioning and Daily Startup inspection is attached in the Annexure I and Annexure II.

5. CONCLUSIONS

Risk Assessment has been carried out for all the machines involved in capacitor manufacturing process to identify critical machines. The process involved the detailed study of every machine and activity and finding related activities and stakeholders involved in the task. Assigning roles and responsibilities is done for all safety critical machines at different stages of life cycle. Steps undertaken to create the RACI chart are:

- Identified the project tasks – meeting the stakeholders to develop the activities involved. Maintenance of RACI matrix as a task is to be done.
- Identified the roles – roles identified and allocated to stakeholders associated with the tasks and clarifying the resource allocation. This step helps in eliminating the confusion over the roles and responsibilities of employees.

Critical machines found during the study are as follows

- Winding Machine – for winding MPP film on core
- Spraying Machine- Spraying zinc coating on sides of the elements
- ECAC Testing machine- Testing the quality of elements
- Riveting machine – Preparation of capacitor lid using hydraulic energy
- HV Lid testing – Checking the quality and durability of lids under high voltage
- Resin filling machine – Filling the resin in capacitor containers
- Seaming machine – Sealing and seaming the capacitor can

- Capacitor testing machine – Final checking of the capacitors before packing

The study of following machines was done and total 1240 safety related activities are observed and roles are assigned for the same. The results of risk assessment shows that most of the risks observed were of risk rating 2 and were tolerable. Control measures were identified to further minimize those risks and to bring it down to a risk rating of 1

Table 12 Risk Assessment Sheet

Sr. No.	Machine	No. of activities identified	Risk Rating for the machine
1	Winding Machine	197	3
2	Spraying Machine	256	3
3	Element Testing Machine	207	3
4	Riveting Machine and Lid TestingMachine	195	3
5	Seaming Machine	191	3
6	Resin Filling Machine	183	2
7	Capacitor Testing Machine	196	3

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Annexure 1

RACI Matrix for Pre-commissioning inspection of Winding Area

Pre-commissioning Inspection						
Sr. No.	Tasks Performed	List of activities identified for RACI matrix	Responsible	Accountable	Consulted	Informed
1	Guarding inspection and installation	Visual Inspection of the machine to be performed,unorganised cables, unguarded rotary parts, unshielded heating sources, sharp edges(Nip Points, Moving Parts) etc.	Methods Executive	Methods Manager	EHS Manager	Plant Head
2		Inspecting the machine guarding system effectiveness and identification of new guarding system installation requirement	Methods Manager/ EHS Manager	Methods Manager	EHS Manager	Plant Head
3		List of equipments and tools to be made available	Methods Executive	Methods Manager	Production Manager	Plant Head
4		No new hazards are being created by new installation	EHS Executive	EHS Manager	ORA CFT	Plant Head
5		Use cages or guards to cover the high-temperature flanges / valves / lines	Methods Executive	Methods Manager	EHS Manager	Plant Head
6		All gears, rollers and wheels are covered with guards	Methods Executive	Methods Manager	EHS Manager	Plant Head
7	emergency systems	Emergency switch and shutdown system to be checked if working properly and easy to access	Methods Executive	Methods Manager	EHS Manager/ Production Manager	Plant Head
8		Check for all electrical switches and wires connected to the machine	Methods Executive	Methods Manager	Production Manager	Plant Head
9		Check all fire protection system installation in the work area	EHS Executive	EHS Manager	EHS Manager	Plant Head
10		Emergency Response Plan to be prepared with the help of CFT	EHS Manager	EHS Manager	ORA CFT	Plant Head
11	Protective measures	Installation of two hand push button and biometric mechanism for operation	Methods Executive	Methods Manager	EHS Manager	Plant Head
12		Door interlock mechanism to be installed to avoid accidental opening of the machine guard	Methods Executive	Methods Manager	EHS Manager	Plant Head
13		The alarm system should be installed in case of opening of the door while the operation is going on.	Methods Executive	Methods Manager	EHS Manager/ Maintenance	Plant Head
14		Replacing sharp edges to avoid any serious injury due to striking the panel	Methods Executive	Methods Manager	EHS Manager	Plant Head
15		Provide sufficient number of fire extinguisher in the area for fire protection	IFM Executive	IFM Manager	EHS Manager	Plant Head
16		Proper earthing is to be provided for the system	Methods Executive	Methods Manager	EHS Manager	Plant Head
17		Proper air ventilation to be preset for the area	Methods Executive	Methods Manager	EHS Manager	Plant Head
18	Equipment Operation	Setting and testing the machine for operation	Methods Executive	Methods Manager	Production Manager	Plant Head
19		operator machine interface safety check to be done	Methods Executive	Methods Manager	EHS Manager/ Production Manager	Plant Head
20		check for any loose machine part.	Methods Executive	Methods Manager		Plant Head
21		check for any abnormal noise and excessive vibration from the machine	Methods Executive	Methods Manager	EHS Manager	Plant Head
22	Assessment of Risk	A team of experts from every dept. involved in the process should be deployed for the risk assessment task	EHS Manager	EHS Manager	EHS Manager	Plant Head
23		Proper Risk assessment to be carried our before the start of the operation of machine	ORA CFT	ORA CFT	EHS Manager	Plant Head
24		List of all hazards found, criticality and mitigation plan to be shared with every concerned department.	EHS Executive	EHS Manager	ORA CFT	Plant Head
25		Preparation of proper evacuation route and marking in the winding area.	EHS Executive	EHS Manager	ORA CFT	Plant Head
26		Fail safe condition for the machine present in the winding area should be reviewed	Methods Executive	Methods Manager	EHS Manager/ Methods Manager	Plant Head
27		Risk mitigation plans to be made	ORA CFT	ORA CFT	EHS Manager	Plant Head
28	PPEs	EHS dept. should study what operation is going on and according to that should decide what kind of PPEs are required.	EHS Executive	EHS Manager	EHS Manager	Plant Head
29		Provide PPEs to concerned departments according to needs	EHS Executive	EHS Manager	EHS Manager	Plant Head
30		For the operation of material handling and loading of the elements, the kind of gloves used should be defined.	Methods Executive	Methods Manager	EHS Manager	Plant Head
31		The noise level inside the room should be checked for levels below 85db.	EHS Executive	EHS Manager	EHS Manager	Plant Head
32	Inspection completion	Complete the installation of all safety features and guards	Methods Executive	Methods Manager		Plant Head
33		Define startup and shutdown of machine	Methods Executive	Methods Manager	Methods Manager	Plant Head
34		verify overall completion and inspection of the machine	Methods Executive	Methods Manager	Methods Manager/EHS Manager	Plant Head
35		Check and verify the lubrication of the system	Methods Executive	Methods Manager	Methods Manager	Plant Head

Annexure 2

RACI Matrix for Commissioning inspection & Daily Startup inspection of Winding Area

Commissioning						
Sr.	**Tasks Performed**	**List of activities identified for RACI matrix**	**Responsible**	**Accountable**	**Consulted**	**Informed**
1	Preparing to hand over the machine	Commissioning firefighting and active safety systems in the work area.	Methods Executive	Methods Manager	EHS Manager	Plant Head
2		Proper Safety signs to be provided in the shop floor	Methods Executive	Methods Manager	EHS Manager	Plant Head
3		Prepare a Job Breakdown Sheet for the operation with safe operation condition	Methods Executive	Methods Manager	EHS Manager	Plant Head
4	LOTO	A proper LOTO procedure to be made for the machines present in the winding area.	Methods Executive	Methods Manager	EHS Manager	Plant Head
5		A team of specialists should decide the procedure for LOTO of every individual machine separately.	Methods Executive	Methods Manager	EHS Manager	Plant Head
6		The LOTO equipments i.e., locks tags and keys should be properly maintained	Methods Executive	Methods Manager	EHS Manager	Plant Head
7		LOTO Placards to be placed on every machine showing critical points which should be locked out before performing the maintenance operation.	EHS Executive	EHS Manager	Production Manager	Plant Head
8	first aid	Proper First aid kit to be provided in that area in case of an emergency	Facility Incharge	Facility Incharge	EHS Manager	Plant Head
9		First aid kit to be maintained and inspected periodically by concerned department	Medical Attendent	EHS Manager		Plant Head
10	Final commissioning	Concerned department should be informed about the final commissioning of the machine	Methods Executive	Methods Manager	Production Manager	Plant Head/Production Manager
11		Prepare a list of personnel authorized to work in the area	Methods Executive	Methods Manager	Production Manager	Plant Head
12		List of material requirements that are required for work execution	Methods Executive	Methods Manager	Production Manager	Plant Head
13		Daily startup checklist to be made and provided to operator and supervisor	Methods Executive	Methods Manager	Production Manager	Plant Head
14		Proper Warning Signs to be posted in the work area and near the machine	Methods Executive	Methods Manager	EHS Manager	Plant Head
15		MSDS to be placed and provided to operator	Methods Executive	Methods Manager	EHS Manager	Plant Head
16		Removal of temporary support structures in the area, if any	Methods Executive	Methods Manager	EHS Manager	Plant Head
17	Final Preparation and setup	All legal documents to be verified	EHS Executive	EHS Manager		Plant Head
18		Check if all legal requirements related to fire department is fulfilled	EHS Executive	EHS Manager		Plant Head
19		Prepare Maintenance checklist and Plan to be made for periodic preventive maintenance.	Methods Executive	Methods Manager	EHS Manager	Plant Head
20		Preparation of Standard operating procedure to be done	Methods Executive	Methods Manager	EHS Manager	Plant Head
21		Roles and responsibilities defining	Methods Executive	Methods Manager		Plant Head
22		List out the individuals to be contacted in case of failure or breakdown of machine	Methods Executive	Methods Manager	EHS Manager	Plant Head
23		Make provision for reporting Near Miss cases inside the winding area	EHS Executive	EHS Manager		Plant Head
24		Prepare Stretching Exercise Program for operators working in shop floor for prolonged time	EHS Executive	EHS Manager		Plant Head
25		Make a set of procedure so that others can inform in case is someone is violating any safety rules in the area	EHS Executive	EHS Manager	Production Manager	Plant Head
26	Training	The training period should be defined for specific machine and operation	EHS Executive	EHS Manager	Production Manager	Plant Head
27		Provide area specific training to the operators and employees going inside the winding area	Methods Executive	Methods Manager	Production Manager	Plant Head
28		Provide Equipment/machine specific training to authorized operators to perform the task and operate the machine	Methods Executive	Methods Manager	Production Manager	Plant Head
29		Provide safety induction training for all employees.	Methods Executive	Methods Manager	EHS Manager	Plant Head
30		Scheduling a timetable for certification of machine and operator	Methods Executive	Methods Manager	EHS Manager	Plant Head
31		Arrange a training program for the operators from different department for responding to any hazard or any incident	Methods Executive/EHS Executive	Methods Manager	EHS Manager	Plant Head

Daily Startup Inspection						
Sr. No.	**Tasks Performed**	**List of activities identified for RACI matrix**	**Responsible**	**Accountable**	**Consulted**	**Informed**
1	PPEs	Inspect the PPEs before starting the operation. Check for any defect	Production Operator	Production Supervisor	EHS Manager	Production Manager
2		if the PPEs are found damaged, discard it immediately from use and contact concerned department for replacemen	Production Operator	Production Supervisor	EHS Manager	Production Manager
3	Emergency Circuit function and door closing safety function	check and ensure proper functioning of emergency circuit function	Production Operator	Production Supervisor	Methods Manager	Production Manager
4		Door closing function should work properly	Production Operator	Production Supervisor	Methods Manager	Production Manager
5		interlock mechanism to be checked and make sure machine does not start if the door is open	Production Operator	Production Supervisor	Methods Manager/ EHS Manager	Production Manager
6	Cleaning	The cap should be provided for the air gun and when not operational. it should be placed at its designated place with cap put on	Production Operator	Production Supervisor	Methods Manager/ EHS Manager	Production Manager
7		Check the bin condition and see for sharp edges and damaged bins	Production Operator	Production Supervisor	EHS Manager	Production Manager
8		Clean the machine and remove all film waste	Production Operator	Production Supervisor		Production Manager
9		Clean the area and place the bins at its place to avoid slip trip and fall hazard during cleaning	Production Operator	Production Supervisor	Methods Manager/ EHS Manager	Production Manager
10		Make sure to use proper PPEs before using any chemicals for cleaning work	Production Operator	Production Supervisor	EHS Manager	Production Manager
11		Concerned Department to be informed before using any chemical	Production Operator	Production Supervisor	Methods Manager	Production Manager
12	Lubrication	Grease the grooved mandrel support shaft	Production Operator	Production Supervisor	Methods Manager	Production Manager