Syllabus For Rubber Mixing & Milling Operator

Course Name	Rubber Mixing & Milling Operator
Sector	CHEMICAL
Course Code	CHE/2024/RMMO/336
Level	4
Occupation	Mixing
Job Description	Mill Attendant performs the mixing operation in a mill machine. The job involves feeding the raw materials and carry out mixing operation to produce the required product, collecting the compound rubber from the mill, cutting, and cooling the rubber produced and packing them according to Company's SOP.
Course Duration	**Total Duration 480 Hrs. (T- 90, P-210, OJT-120 and ES-60)**
Trainees' Entry Qualification	• 12th grade pass • Completed 2nd year of 3-year diploma (after 10th) • Pursuing 2nd year of 3-year regular Diploma (after 10th) • 10th grade pass with two years of any combination of NTC/NAC/CITS or equivalent. • 8th pass plus 2-year NTC plus 1-Year NAC plus 1-Year CITS • 10th grade pass and pursuing continuous schooling (for 2-year program) • 11th Grade Pass and pursuing continuous schooling • Previous relevant Qualification of NSQF Level 3.0 with minimum education as 8th Grade pass with 3-year relevant experience Previous relevant Qualification of NSQF Level 3.5 with 1.5-year relevant experience
Trainers Qualification	B.E./B.Tech. in Rubber/Polymer/Chemical Engineering with one-year's relevant work experience OR Diploma in Chemical Engineering / Post Diploma in Petrochemicals with two years' relevant work experience

Structure of Course:

Module No.	Module name	Outcome	Compulsory/ Optional	Theory (Hrs)	Practical (Hrs)	Total (Hrs) [Multiple of 30]
1	Raw materials for rubber compound in the mixing mill.	Arrange the appropriate raw materials of exact amounts ready to carry out the mixing operation.	Compulsory	20	40	60
2	Set up of the Mill.	Prepare the mill with all accessories to carry out the mixing operation in a safe mode.	Compulsory	10	50	60
3	Mix the raw materials in the mill	Perform the mixing operation with appropriate raw	Compulsory	20	40	60

Module No.	Module name	Outcome	Compulsory/ Optional	Theory (Hrs)	Practical (Hrs)	Total (Hrs) [Multiple of 30]
		materials of exact quantities in a proper sequence to prepare the desired rubber compound.				
4	Functions after mixing operation	Perform cutting, cooling, and packing of compound sheet rubber as per the Company's SOP.	Compulsory	20	40	60
5	Report and Documentations	Identify and address the data anomalies, problems, or incidents to communicate the findings efficiently to the relevant authority in accordance with the company's Standard Operating Procedures (SOP)	Compulsory	10	20	30
6	Health & Safety aspects	Perform occupational health & safety practices according to company's SOP.	Compulsory	10	20	30
7	**OJT**	Work in real job situation with special emphasis on basic safety and hazards in this domain (OJT).	Compulsory	--	120	120
8	**Employability Skill**	As per guided curriculum	Compulsory	60	--	60
		TOTAL:		150	330	480

SYLLABUS:

Module 1: Raw materials for rubber compound in the mixing mill.

Outcome: Arrange the appropriate raw materials of exact amounts ready to carry out the mixing operation.

Theory Content:

1.1 **Introduction:** Current situation of Rubber Industry in India.
1.2 **Rubber:** Types of Rubber used in Industry to produce different products.
1.3 **Mixing:** Necessity of mixing in rubber industry.
1.4 **Raw materials:** Peptizers, Processing Aids, Plasticizers, Fillers - Non-black fillers and Black filler, Anti-degradants (Antioxidant and antiozonants), Vulcanizing agents (Curing, cross-linking agent, Accelerators, Retarders, and Activators), zinc stearate.
1.5 **Amounts of the raw materials:** Direction for the exact quantities of the raw materials to be fed to the mixing mill such as: Rubber compounds, rubber chemicals, Vulcanizing agents, and Fillers.

Practical Content:

1. Identification of different types of rubber used in various rubber industries.
2. Identification of different types of ingredients used in mixing mill to produce desired rubber product.
3. Weighing of the exact quantities of the raw materials to be fed to the mixing mill such as: Samples of rubber compounds, rubber chemicals, Vulcanizing agents, and Fillers.

Tools & Equipment needed:
Different rubber samples: RSS sheets, crepe rubber, TSR rubber, synthetic rubber, reclaimed rubber, 10 different types of rubber finished parts.
Samples of rubber compound, rubber chemicals, Vulcanizing agents, and Fillers.
Weighing scale.

Module 2: Set up of the Mill

Outcome: Prepare the mill with all accessories to carry out the mixing operation in a safe mode.

Theory Content:

2.1 Mixing mill: Basic introduction about types of mixing mill used in Industry to produce rubber: Rolling mixing mill or External mixing mill (batch or continuous), Continuous mixing mill and Banbury or Internal mixing mill (batch or continuous).
2.2 Two-Roll Mixing Mill: Description and operation of a Two-Roll Mixing Mill.

Practical Content:

1. Demonstration of Roller, Bearings and Glands, Mill Frames and Caps, Base Plate, Mill Tray or Mill Pan, Mill Drive Train, Distance adjusting device, lubrication system, Temperature control device, and Emergency brake device.
2. Demonstration of operation of the Mill.
3. Keeping all the accessories like compound cutting knife, cooling rack, compound sheet spreading table, compound storing racks ready.

Tools & Equipment needed:
Rubber mixing mill (min. size of 300 mm×750 mm or higher), compound cutting knife, compound sheet spreading table, compound storing racks.

Module 3: Mix the raw materials in the mill

Outcome: Perform the mixing operation with appropriate raw materials of exact quantities in a proper sequence to prepare the desired rubber compound.

Theory Content:

3.1 Mixing operation: Description of Mastication and Mixing of rubber compound.
3.2 Effect of various parameters: Explanation about the effect of Nip gap, Roller temperature, Roller speed, and Batch time.

Practical Content:

1. Feeding the materials into the mixing mill to produce rubber in the specified quantity and sequence as per Company's SOP.
2. Setting of various parameters such as Nip gap, Roller temperature, Roller speed, and Batch time as per specification.
3. Compound cutting and re-roll in mixing mill.

Tools & Equipment needed: Rubber mixing mill (min. size of 300 mm x 750 mm or higher), compound cutting knife.
Consumables: Samples of rubber compounds, vulcanizing agents and/or other additives and Fillers.

Module 4: Functions after mixing operation

Outcome: Perform cutting, cooling, and packing of compound sheet rubber as per the Company's SOP.

Theory Content:

4.1 Cutting of compound rubber: Direction for cutting of compound sheets as per Company's SOP.
4.2 Cooling of the sheet: Effect of cooling period on compound sheets. Direction for cooling of the sheets of the compound rubber as per Company's SOP.
4.3 Application of zinc stearate: Usefulness of the application of zinc stearate on the compound rubber sheet.
4.5 Packing of the sheet: Direction for packing of the compound sheets of rubber in polythene packets.
4.6 Sample selection and submission for testing: Selection process for samples of rubber compound as per Company's SOP and submission procedure for a batch of samples to laboratory for rheology testing.
4.7 Waste disposal: Process of disposal of waste materials as per Company's SOP.
4.8 Process of handover: Process of cleaning the Mill and making the Mill ready for next batch operation.

Practical Content:

1. Cutting of milled rubber compound sheets into slabs as per Company's SOP.
2. Cooling of the sheet of the compound rubber taking sample for rheology testing as per Company's SOP.
3. Application of zinc stearate on the compound rubber sheet.
4. Packing of the compound sheets of rubber in polythene packets and batch marking the packets as per Company's SOP.
5. Disposal of waste materials as per Company's SOP.
6. Cleaning the Mill and making the Mill ready for next batch operation.

Tools & Equipment needed: Rubber mixing mill (min. size of 300 mm x 750 mm or higher), gauge scale, compound cutting knife, compound sheet spreading table, compound storing racks, identification tags.
Cleaning equipment: cleaning brush, broom, cleaning agents/ solvents, water, wiping cloth/Mop.
Consumables: Finished rubber compound, Zinc stearate powder, polythene sheets,

Module 5: Report and Documentations

Outcome: Identify and address the data anomalies, problems, or incidents to communicate the findings efficiently to the relevant authority in accordance with the company's Standard Operating Procedures (SOP)

Theory Content:
5.1 Reporting: Action plans and recommendations of the Company. Reporting procedures as per company's instructions.
5.2 Documentation: Procedures for documentation as per Company's guidelines.

Practical Content:
1. Making reports for data, problems, or incidents whichever is applicable following Company's Reporting Procedures.
2. Making a complete documentation within stipulated time following the standard format given by the Company.

Tools & Equipment needed: Desktop computer, documentation format, sample of the reports, working procedure and instructions.

Module 6: Health & Safety aspects

Outcome: Perform occupational health & safety practices.

Theory Content:
6.1 **Health & Safety hazards at workplace:** Common workplace hazards, common hazards, and safety signs.
6.2 **PPE & Fire Extinguisher:** Use of PPE, Types of fire extinguisher and use of fire extinguishers.
6.3 **Dos and Don'ts at workplace:** List of "Dos and Don'ts" at workplace.
6.4 **Housekeeping:** Methods of housekeeping for both pre-mixing & post-mixing operations.

Practical Content:
1. Use of the machineries and equipment following standard operating procedure to minimize the hazards in the working environment.
2. Use of PPE.
3. Use of Fire Extinguisher.
4. Use of First Aid Box.
5. Inspection and selection the cleaning procedure and the cleaning equipment, and the maintenance of the equipment for smooth running of housekeeping activities.

Tools & Equipment needed:
PPE- safety goggles, safety shoes, safety gloves, mask, and earmuff.
Fire Extinguisher, First Aid Box, Cleaning agents and equipment.

Module 7: OJT

Outcome: Work in real job situation with special emphasis on basic safety and hazards in this domain

Practical Content:
Assessor will check report prepared for this component of Practical training of the course and assess whether competency has been developed to work in the real job situation with special emphasis on basic safety and hazards in this domain. (The trainee is expected to undertake work in actual workplace under any supervisor / contractor for 120 Hours.)

Module 8: Employability Skills (60 Hrs)

Key Learning Outcomes

Introduction to Employability Skills Duration: 1.5 Hours

After completing this programme, participants will be able to:
1. Discuss the Employability Skills required for jobs in various industries
2. List different learning and employability related GOI and private portals and their usage

Constitutional values - Citizenship Duration: 1.5 Hours

3. Explain the constitutional values, including civic rights and duties, citizenship, responsibility towards society and personal values and ethics such as honesty, integrity, caring and respecting others that are required to become a responsible citizen
4. Show how to practice different environmentally sustainable practices.

Becoming a Professional in the 21st Century Duration: 2.5 Hours

5. Discuss importance of relevant 21st century skills.
6. Exhibit 21st century skills like Self-Awareness, Behavior Skills, time management, critical and adaptive thinking, problem-solving, creative thinking, social and cultural awareness, emotional awareness, learning to learn etc. in personal or professional life.
7. Describe the benefits of continuous learning.

Basic English Skills Duration: 10 Hours

8. Show how to use basic English sentences for everyday conversation in different contexts, in person and over the telephone
9. Read and interpret text written in basic English
10. Write a short note/paragraph / letter/e -mail using basic English

Career Development & Goal Setting Duration: 2 Hours

11. Create a career development plan with well-defined short- and long-term goals

Communication Skills Duration: 5 Hours

12. Demonstrate how to communicate effectively using verbal and nonverbal communication etiquette.
13. Explain the importance of active listening for effective communication
14. Discuss the significance of working collaboratively with others in a team

Diversity & Inclusion Duration: 2.5 Hours

15. Demonstrate how to behave, communicate, and conduct oneself appropriately with all genders and PwD
16. Discuss the significance of escalating sexual harassment issues as per POSH act.

Financial and Legal Literacy Duration:5 Hours

17. Outline the importance of selecting the right financial institution, product, and service
18. Demonstrate how to carry out offline and online financial transactions, safely and securely

19. List the common components of salary and compute income, expenditure, taxes, investments etc.
20. Discuss the legal rights, laws, and aids

Essential Digital Skills Duration: 10 Hours

21. Describe the role of digital technology in today's life
22. Demonstrate how to operate digital devices and use the associated applications and features, safely and securely
23. Discuss the significance of displaying responsible online behavior while browsing, using various social media platforms, e-mails, etc., safely and securely
24. Create sample word documents, excel sheets and presentations using basic features
25. utilize virtual collaboration tools to work effectively

Entrepreneurship Duration: 7 Hours

26. Explain the types of entrepreneurship and enterprises
27. Discuss how to identify opportunities for potential business, sources of funding and associated financial and legal risks with its mitigation plan
28. Describe the 4Ps of Marketing-Product, Price, Place and Promotion and apply them as per requirement
29. Create a sample business plan, for the selected business opportunity

Customer Service Duration: 5 Hours

30. Describe the significance of analyzing different types and needs of customers
31. Explain the significance of identifying customer needs and responding to them in a professional manner.
32. Discuss the significance of maintaining hygiene and dressing appropriately

33. Create a professional Curriculum Vitae (CV)
34. Use various offline and online job search sources such as employment exchanges, recruitment agencies, and job portals respectively
35. Discuss the significance of maintaining hygiene and confidence during an interview
36. Perform a mock interview
37. List the steps for searching and registering for apprenticeship opportunities

Learning Outcome – Assessment Criteria

Module No and Name	Outcome	Assessment Criteria
1. Raw materials for rubber compound in the mixing mill.	Arrange the appropriate raw materials of exact amounts ready to carry out the mixing operation.	**After completion of this module students will be able to:** 1.1 Identify different types of rubber used in various rubber industries. 1.2 Identify different types of raw materials used in mixing mill to produce desired rubber product. 1.3 Arrange the raw materials to be fed such as: Samples of rubber compounds, rubber chemicals, Vulcanizing agents, and Fillers. 1.4 Weigh the required quantity of all ingredients to produce rubber.
2. Set up of the Mill	Prepare the mill with all accessories to carry out the mixing operation in a safe mode.	**After completion of this module students will be able to:** 2.1 Demonstrate the Rollers, Bearings and Glands, Mill Frames and Caps, Base Plate, Mill Tray or Mill Pan, Mill Drive Train, Distance adjusting device, lubrication system, Temperature control device, and Emergency brake device in a two-roll mixing mill. 2.2 Demonstrate the operation of the Mill. 2.3 Maintain all the accessories like compound cutting knife, cooling rack, compound sheet spreading table, compound storing racks ready.
3. Mix the raw materials in the Mill	Perform the mixing operation with appropriate raw materials of exact quantities in a proper sequence to prepare the desired rubber compound.	**After completion of this module students will be able to:** 3.1 Perform mixing the materials in the mill to produce compound rubber in the specified quantity and sequence as per Company's SOP. 3.2 Set of various parameters such as Nip gap, Roller temperature, Roller speed, and Batch time as per specification. 3.3 Perform the compound rubber cutting and re-roll in mixing mill.
4. Functions after mixing operation	Perform cutting, cooling, and packing of compound sheet rubber as per the Company's SOP.	**After completion of this module students will be able to:** 4.1 Perform the cutting of milled rubber sheets into slabs as per Company's SOP. 4.2 Perform the cooling of the sheet of the compound rubber and sample taken for rheology as per Company's SOP. 4.3 Apply of zinc stearate on the compound rubber sheet. 4.4 Perform the packaging of the compound sheets of rubber in polythene packets and batch marking the packets as per Company's SOP. 4.5 Ensure disposal of the waste materials in a safe

Module No and Name	Outcome	Assessment Criteria
		manner as per Company's SOP. 4.6 Ensure cleaning the Mill and making the Mill ready for next batch operation.
5. Report and Documentations	Identify and address the data anomalies, problems, or incidents to communicate the findings efficiently to the relevant authority in accordance with the company's Standard Operating Procedures (SOP)	**After completion of this module students will be able to:** 5.1 Prepare reports for data, problems, or incidents whichever is applicable following Company's Reporting Procedures. 5.2 Prepare a complete document within stipulated time following Company procedure. 5.3 Maintain all the records.
6. Health & Safety aspects	Perform occupational health & safety practices according to the company's SOP.	**After completion of this module students will be able to:** 6.1 Explain Common workplace hazards, common hazards, and safety signs. 6.2 Use PPE, fire extinguishers and first aid box. 6.3 Explain "Dos and Don'ts" at workplace. 6.4 Inspect and select the cleaning procedure and supervise the maintenance of the cleaning equipment for smooth running of housekeeping activities.
7. OJT	Work in real job situation with special emphasis on basic safety and hazards in this domain (OJT).	Assessor will check report prepared for this component of Practical training of the course and assess whether competency has been developed to work in the real job situation with special emphasis on basic safety and hazards in this domain. (The trainee is expected to undertake work in actual workplace under any supervisor / contractor for 120 Hours.)
8. Employability Skill	As per guided curriculum	As per guided curriculum

List of Tools, Equipment & materials needed for 30 Trainees (Practical):

Sl No	Items Name	Specification	Qty
	Samples		
1	RSS sheets, crepe rubber, TSR rubber, synthetic rubber, reclaimed rubber, rubber finished parts – 10 different types	150 mm × 150 mm	3 nos. each
Mill and its accessories			
2	Rubber mixing mill (min. size of 300 mm ×750 mm or higher)	(min. size of 300 mm × 750 mm or higher)	1 no.
3	Digital weighing machine	Up to 5kg	1 no.
4	compound cutting knife	600 mm long × 25 mm width × 5 mm thick	3 nos.
5	samples of rubber compounds	Rubber sample	60 kg
6	vulcanizing agents	Sulphur	3 kg
7	compound sheet spreading table	600 mm × 900 mm	3 nos.
8	compound storing racks	1800 mm (H) × 1200 mm (L) × 450 mm (B) – 4 shelves	2 nos.
9	zinc stearate powder	Commercial	1 kg
10	polythene sheets	1800 mm (L) × 1200 mm (B)	100 pcs.
11	identification tags	As company's standard	100 nos.

Sl No	Items Name	Specification	Qty
Cleaning Equipment			
12	Cleaning Brush	500 mm	2 nos.
13	Broom	1000 mm	2 nos.
14	Cleaning Agents/ Solvents	Soap-based floor cleaner	5 L
15	Water	Normal cold-water supply line	Continuous
16	Wiping Mop	1000 mm	2 nos.
17	Bucket	20 L capacity, Plastic/galvanized iron	2 nos.
18	Universal testing machine	10 KN capacity	1 no.
19	Rubber viscometer	Moony viscometer rubber testing machine	1 no.
Sample of PPEs			
21	Safety Goggles	ISO/TC 94	30 nos.
22	Safety Shoes	ISO/TC 94	30 nos.
23	Safety Gloves	ISO/TC 94	30 nos.
24	Mask	ISO/TC 94	30 nos.
25	Earmuff	ISO/TC 94	30 nos.
26	First Aid Box	Wall mount SS first aid box (30 cm×12 cm×45 cm)	1 no.
27	Fire Extinguisher	4 kg capacity	2 nos.
Classroom aids			
28	White board or Blackboard	1000 mm (Height) × 625 mm (Width)	1 no.
29	Marker/ Chalk	Standard (compatible with the board)	1 box
30	Duster	Standard (compatible with the board)	6 nos.
31	Computer	Desktop computer	1

Marks Distribution

Outcome	Outcome Code	Total Th marks	Total Pr marks	Total OJT marks
Arrange the appropriate raw materials of exact amounts ready to carry out the mixing operation.	CHE/3902/OC1	30	90	0
Prepare the mill with all accessories to carry out the mixing operation in a safe mode.	CHE/3902/OC2	20	100	0
Perform the mixing operation with appropriate raw materials of exact quantities in a proper sequence to prepare the desired rubber compound.	CHE/3902/OC3	30	90	0
Perform cutting, cooling, and packing of compound sheet rubber as per the Company's SOP.	CHE/3902/OC4	30	80	0
Identify and address the data anomalies, problems, or incidents to communicate the findings efficiently to the relevant authority in accordance with the company's Standard Operating Procedures (SOP)	CHE/3902/OC5	20	70	0
Perform occupational health & safety practices according to company's SOP.	CHE/3902/OC6	20	70	0
Work in real job situation with special emphasis on basic safety and hazards in this domain (OJT).	CHE/3902/OC7	0	0	300
Employability Skills – 60 Hrs	DGT/VSQ/N0102	50	0	0