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DEVELOPMENT OF LEARNING UNITS FOR HIGH SPEED FINISHING LINE

Arka Ghosh

Gilbreth Hall, Room No.118, National Institute Industrial Engineering, Vihar Lake, Mumbai
Corresponding Address : E.K.T.P. Phase – IV, No. C-34/4, Kolkata - 700107
Email : arkaghoshektp@gmail.com, ghosharka@rediffmail.com

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Abstract: A company has its own operational philosophy of complete ownership and person,owner, operating the line is responsible for maintaining the machine, ensuring the quality of product, capable of addressing the line faults from its inception has a global outlook and ownsoverall 62% share in India for its product; has shown impressive growth rate of 18.6% (this growth is calculated in terms of value growth in INR). It is essential to prepare the manpower to handle the production in compliance with the CP operational philosophy. To build the skill of the operators, OEM training has started there. But, there are certain challenges company identified to move ahead with the OEM training. The line associates, in the company, are fresh engineer without any prior exposure to the machines those are highly automated machine involves lot of technical complexity. Also, there are challenges from the OEM trainer perspective. To overcome all these identified challenges and streamline the entire learning process by giving a proper structure to the training the need of types learning unit came up. On the basis of case study, here the author has tried to develop a scientific training module.

Key words: Learning unit; high speed production; productivity; finishing line.

1. INTRODUCTION

From the inception the plant of the company selected for the study has a global outlook. The target of the management is to producing products to export, along with fulfilling the growing domestic market demand. In line with this global perspective, three finishing lines are prepared with best in class machines. Each line consists of Filler and Cartoner machine from IWK–ATS Automation System and Bundler, Case packer and Palletizer from Pester Packaging Automation System. Capacity of each line is to fill 750 tubes per unit, which is fastest in the world.

Also, the company, selected for the study, globally has its own operational philosophy of complete ownership: person who is operating the line is responsible for maintaining the machine, ensuring the quality of product and capable of addressing the line faults.

The company of study had their own manufacturing facilities in two places in India. Now to cater to the growing market demand company has invested INR 500 Cr to set up a state of the art of its manufacturing facility in another place in India. So, the obvious next step is to prepare the manpower to handle the production in compliance with the CP operational philosophy. To build the skill of the operators, OEM training has started.

But, there are certain challenges company identified to move ahead with the OEM training. The line associates are fresh engineering graduates without any prior exposure to the machine. On the other hand the highly automated machine involves lot of technical complexity. Also, there are challenges from the OEM trainer perspective. Generally OEM trainers are reluctant to provide proper training. Even if they are asked to provide training, they usually follow the manual based approach. As the manuals are written from manufacturer perspective, it includes lot of technicality; but ignores operational perspectives.

To overcome all these identified challenges and

streamline the entire learning process by giving a proper structure to the training the need of proper learning unit has came up.

Learning units for the line are developed in four steps.

- In the first step the topics to be learnt are identified. From where a properly structured training syllabus is prepared.
- Learning unit templates are prepared by identifying the key perspectives for each topic considering the operational philosophy of Company – EOHS, Quality and FP&R (Productivity).
- Facilitating the OEM training and capturing knowledge in a structured manner in the learning units.
- Finally prepared the complete learning units of each machine which can be used for future training.

The success story of the project involves:

- The identified syllabus for training is approved by manufacturing leadership team of the company.
- All the stakeholders involved in the training: Trainee, Trainer and Facilitator accepted the learning unit model and the entire OEM training on basic operations of machines was conducted using the learning unit templates.
- By capturing the learning of the OEM training in a structured manner through learning units, ready references of the machines are prepared.
- Trained associates are running the line and addressing the common production issues

2. Company Background

2.1 Company originated: The company chosen is more than two hundred year old. In the year 1806, the owner, an English soap and candle maker, opened up a starch, soap and candle factory in New York City. In the year 1928 it merged with another renowned company and later it renamed and that name is continuing.

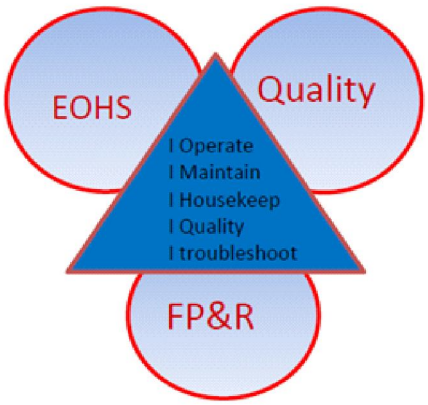
The **Company** is a multinational consumer products company focused on the production, distribution and provision of household, health care and personal products, such as soaps, detergents, and oral hygiene products (including toothpaste and toothbrushes). It is also a manufacturer of veterinary products. Currently it is a $ 17.1 billion company with presence in 200 countries all over the globe.

The Company in its Indian name: In India the company started its operation from the year 1937. Currently the Company in its Indian name are mainly in the business of Oral care products. Besides oral care products company offers some personal care products like : Liquid Hand wash, Body wash, ; Household products : Dish wash, Floor wash; Pet nutrition products. In the financial year 2012-13 the company made total sales of INR 3084 Cr, which was 17% higher than the previous year and owns 62% market share of entire of such product market in India, is growing with a rate of 12%. In recent years the overall industry of such product has shown impressive growth rate of 18.6% (this growth is calculated in terms of value growth in INR).

Company produces toothpaste in its own facilities in two places in India. Recent the company has added new manufacturing facility in another state in India. Till now for manufacturing of its main focused product, it depends upon contract manufacturers. They have started building a plant for manufacturing recently focused product in a place near by a metro city of another state.

All other products marketed by the company in India are imported from the manufacturing facilities located outside India. In near future they have intention to plan to produce of some of such product in India.

Operational Philosophy: The company has its operational philosophy of complete ownership i.e.



a person who is operating the line, is responsible for maintaining the line, ensuring the quality of the product, housekeeping the workstation and addressing the production issues.

Also, the company always strives towards achieving the goal of operational excellence, which is built upon three pillars: FP&R (Factory productivity and Reliability), Quality and EOHS.

Also, all the manufacturing facility of Company strives toward achieving Operational Excellence through an inclusive growth of : Productivity, Quality & EOHS.

2.2. Production Process Outline

The entire production process can be outlined into four phases, like manufacturing of empty tubes, production of toothpaste through batch production system, packaging of toothpaste and finally dispatching of finished products.

2.3. Finishing Line Outline

Currently there are three packaging lines. Two of them have the capacity of filling 510 tubes per minute each. Another line has the capacity to fill 750 tubes per minute. Line with the capacity of 750 tubes per minute is the globally fastest tube filling line installed second in the world.

Each line consists of five machines: Tube Filler machine, Cartoner Machine, Bundler Machine, Case Packer Machine, Palletizer Machine

Empty tubes are manually fed to the tube filler machine, which sucks the cream from the pressure hopper of making section, fills the cream inside the tube and finally seals the tubes.

Cartoner machine comes second in the line after filler machine. It takes folded cartons and complete tubes from tube filler machine as input. Machine opens the cartons, inserts the complete tubes inside the cartons and seals the carton boxes.

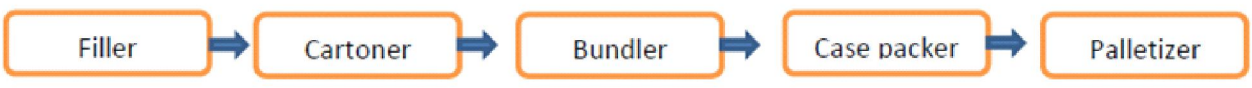
Complete cartons move to the bundler machine, where stack of cartons according to the SKU specifications are produced and wrap with the film.

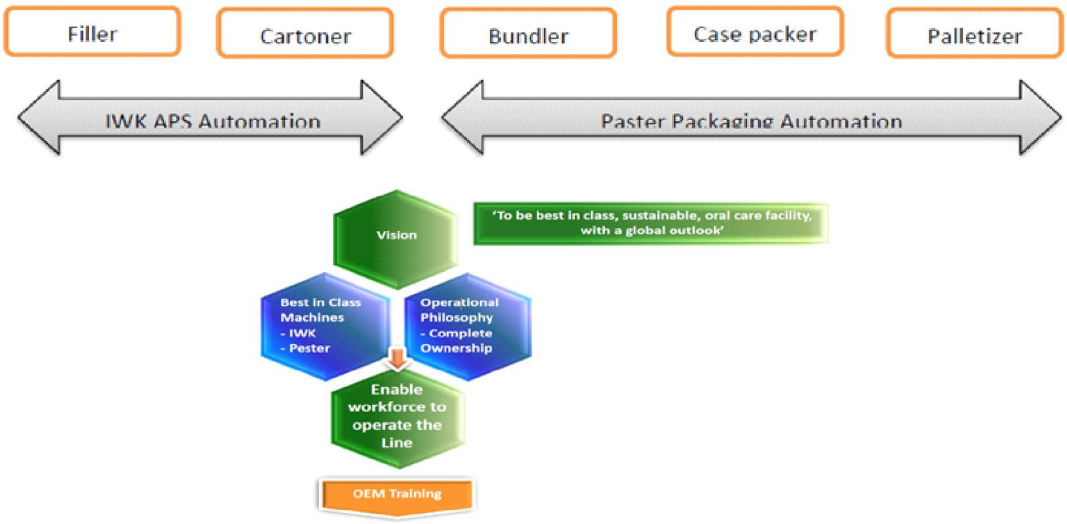
Bundles move to the next Case packer machine. Case packer takes bundles and folded shipper cases as input. Here the shipper cases are opened, bundles are inserted into the shipper case and cases are sealed.

Complete cases are move to the Palletizer machine which takes complete shipper cases and pallets as input. Machine robot creates stack of complete cases on the pallets and makes the pallets ready for storage as finished goods inventory.

1. Need of the Project

To cater to the growing business demand in domestic and international market, the company has started the new manufacturing plant in a





rapidly growing industrial zone with the vision : ***'To be best in class, sustainable, oral care facility, with a global outlook'***.

In line with its vision they have installed globally best in class machines for toothpaste making and packaging in the plant. Currently they have installed three high speed packaging lines. Each lines consists of five machines : Filler, Cartoner, Bundler, Case packer and Palletizer. Filler and Cartoner machines are by IWK APS Automation System. Bundler, Case packer and Palletizer machine is from Paster Packaging Automation system.

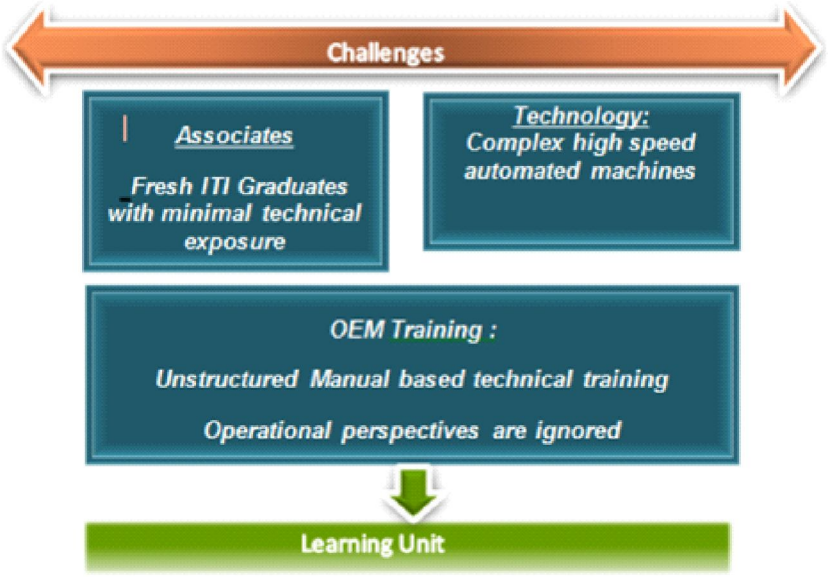
The company has its operational philosophy of complete ownership i.e. a person who is operating the line, is responsible for maintaining the line, ensuring the quality of the product, housekeeping the workstation and addressing the production issues.

So, the obvious next step is to prepare the workforce to handle the production in compliance with the Colgate Operational philosophy. For that the company has planned OEM training by the engineers of the machine manufacturers.

Now to road to move ahead with the plan for skill development of associates through the OEM training, is not smooth. There are multidimensional challenges. Challenges are from the perspectives of associates, machines technology and OEM trainer.

- **Associates :** Recruited associates are fresh graduates engineer without any prior exposure to the machines.
- **Technology :** All the high automated machines involve technical complexity. The driving mechanism involves – Servo motors, Cam follower, Pneumatics etc. Machines and robots are controlled by PLC and HMI program.
- **OEM Trainer:** OEM engineers are generally reluctant to provide formal training. Even if they are asked to provide formal training, they follows manual based approach. As the manual are written from the manufacturer's perspective so it includes lot of technical details but the main operational perspective is ignored. Also the manuals are written for, technically learned person, on the other hand our associates are with zero technical knowledge.

So, to overcome above identified challenges, the need of the Learning Unit came up.



Learning Unit identified the key topics for each machine that need be leaned during OEM training to handle the production.

A. Project Scope

The project was initially undertaken to streamline the training process of finishing line machines of one its plant. Later the designed training roadmap concept was replicated for the technology transfer of the upcoming unit of its proposed manufacturing plant in south India.

B. Objective of Learning Units

a) To leverage OEM training effectively.

b) To provide associates with the skill and knowledge to operate & handle production in compliance with quality, safety & standard operating procedure of the organization.

c) Fostering an environment of continuous learning & development.

d) Facilitating scientific method of assessment to create performance driven culture.

C. Challenges

a) When the Learning Units are developed none of the lines are operational. So it was not possible to physically visually the process of the machine.

b) No having prior exposure to the finishing line operations

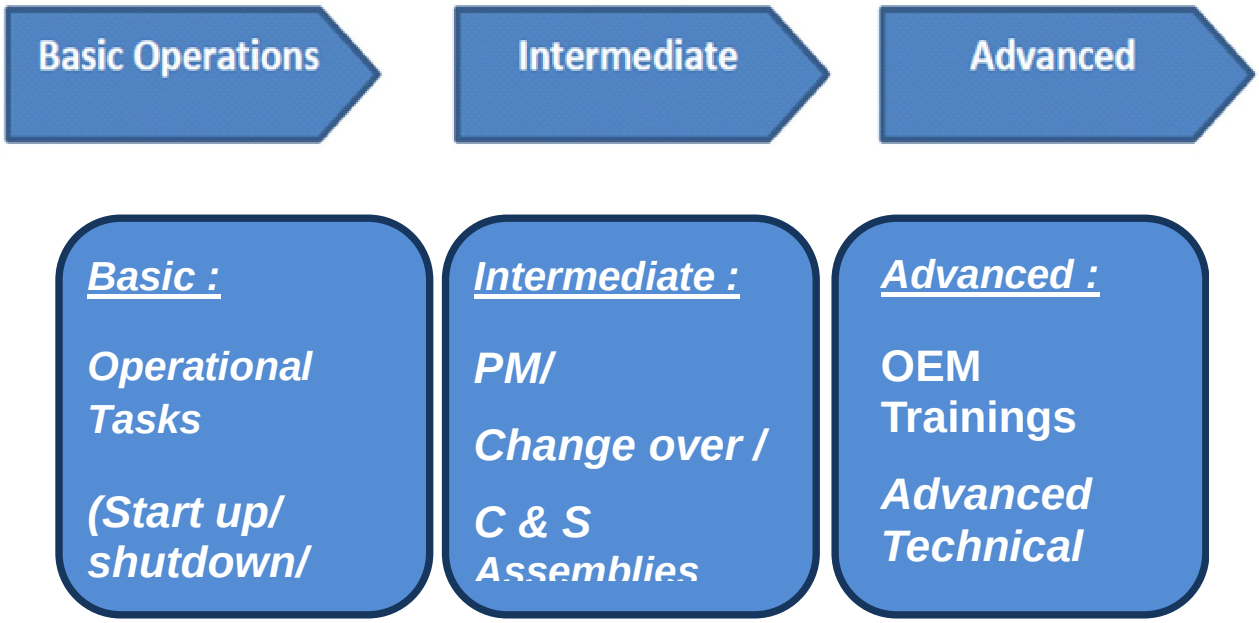
c) State of the art technology, driving mechanism includes Servo motor, Cam, Pneumatics etc.

d) Chaotic situation of the entire project. Everyone was busy to start the production. So, it was difficult to take help from others to understand the concepts.

4. Methodology

To make the training session effective considering above mentioned difficulties, a step by step iterative development approach was chosen.

1. Developed the learning unit templates for all machines. Learning templates identifies all the key topics that need to be learned during the OEM training. Also it defines the perspective of training on each topic.
2. Prepared step by step proper training roadmap with the identified topics for each machine.
3. Facilitated and captured the knowledge during OEM training.
4. After that for better understanding referred to machine manuals.



5. Prepared complete second version of learning units.

4.1. Training Roadmap

To make an effective training process, the entire training process was planned in three phases – Basic Operations, Intermediate and Advanced.

At first an outline of the syllabus for each phase was designed:

4.2. Training Philosophy

Training process was designed in such a way that it should support & compliment the Operation Philosophy - I Operate, I Maintain, I Housekeep, I Quality, I troubleshoot. Also the training process was designed in such a way that it drives results through systematic skill up-gradation and can build a culture of Operational Excellence.

5. Basic Operation

5.1. Training Approach

For the training on machine basic operations a bottom up three step approach was followed.

First, the trainee should learn about the physical stations of each machine. This includes the technical knowhow and operational aspects like possible quality defects, safety hazards, common faults and don'ts.

In the next phase trainees are trained on how to operate the machines. Mainly HMI, Machine Startup & Shutdown procedure, Reference run, Jog mode run of machine etc. are covered.

The last phase was Hands on Exposure: Operate, Observe and Learn phase. Here the trainees performed the activity with the guidance of the OEM trainer and acquire the confidence to handle the production.

5.2. Scope of the Basic Operation Training

The topics to be covered in each phase of the Basic Operation Training are identified:

Acquire Knowledge on all stations

1. What is the functionality of the station?

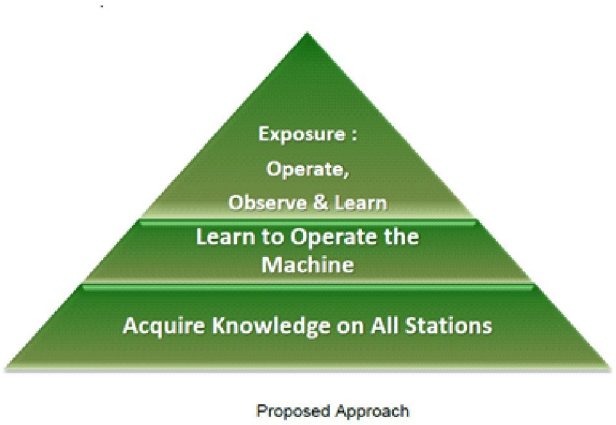
2. Relevance of station in terms of value addition to the product

3. How the station works?

4. What are the key components of the station?

5. What are sensors present on the station?

6. Detail of sensors system present on the station



Proposed Approach

7. What are the safety hazards involved with each station?

8. What are the safety interlocks presents on each station?

9. What are the possible product quality defects associated with each station?

10. How basic troubleshooting for each station need to be performed?

11. Common faults and resolutions

12. How to perform minor adjustments in the station?

Learn to Operate the Machine:

1. How to operate the machine through HMI?

2. Explain the utilities of each buttons in HMI

3. Explain the meaning of and steps to address different flags & messages of HMI

4. How to start and operate the machine?

5. Mention the sequence of steps to be followed to start the machine

6. What is the procedure to stop machine in normal & emergency scenario?

7. Mention the procedure & consequence of normal/ emergency stop

8. How to run the machine without materials?

9. What are activities that can cause damage to the machine?

10. Don'ts for the machine

11. How to identify and address the leakages present in the machine?

12. How to attend line stoppages and clear jams?

13. How to perform minor adjustments in the machine?

14. What is the procedure to replace parts in the machine?

15. What is the procedure to be followed for weekly shutdown & weekly startup?

Acquire following basic knowledge for specific machines

Filler :

16. How to remove the filling module?

- Procedure of dis-assembling & assembling the filling module

17. How to adjust filling weight in the machine?

18. How to calibrate the machine before weight measurement?

Cartoner *:*

19. How hot melt glue should be handled?

Exposure : Operate, Observe and Learn

After completion of the training on each learning objective of machining and quality section, execute the job and document the process details in the specified sections of the learning unit.

- Process Exposure
- Technical Exposure
- Quality Exposure
- New Learning

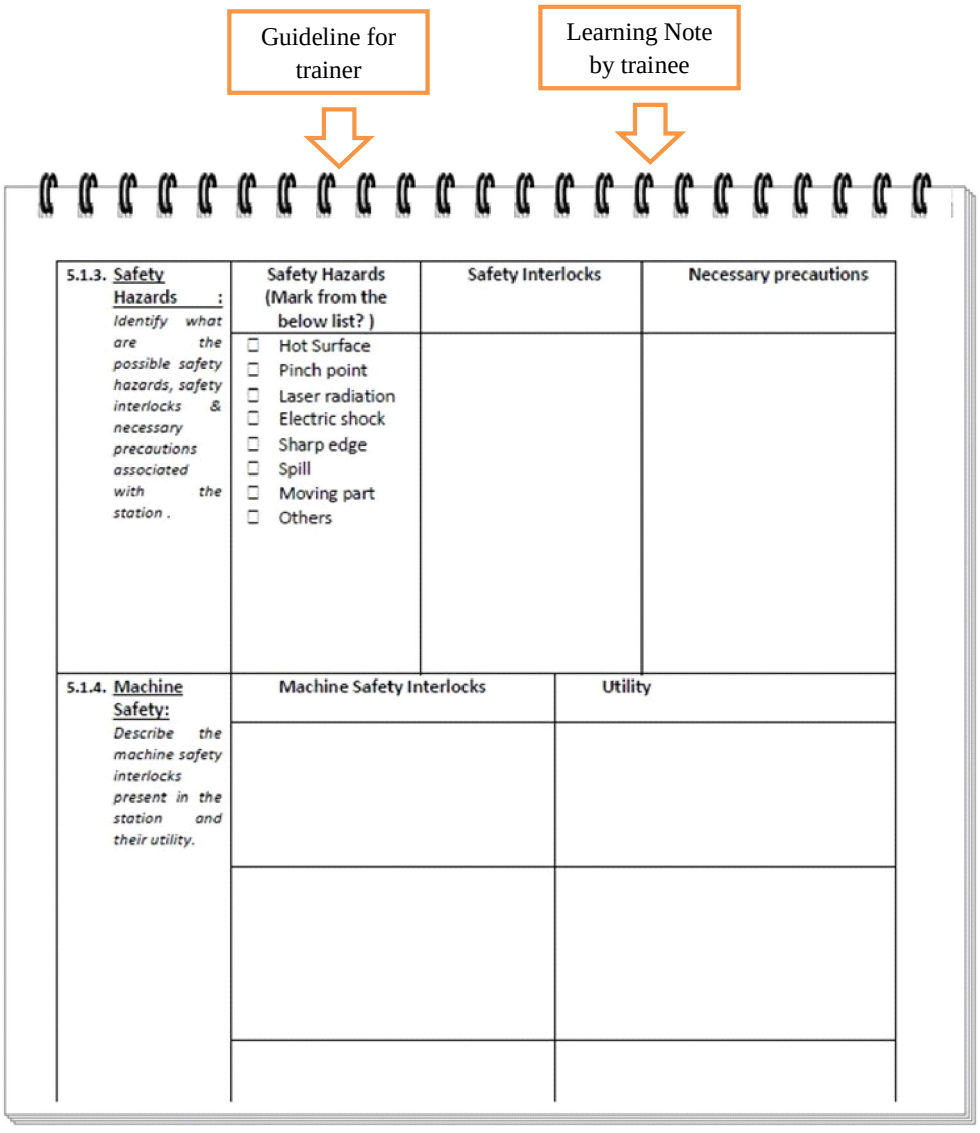
6. Structure of the Learning Unit

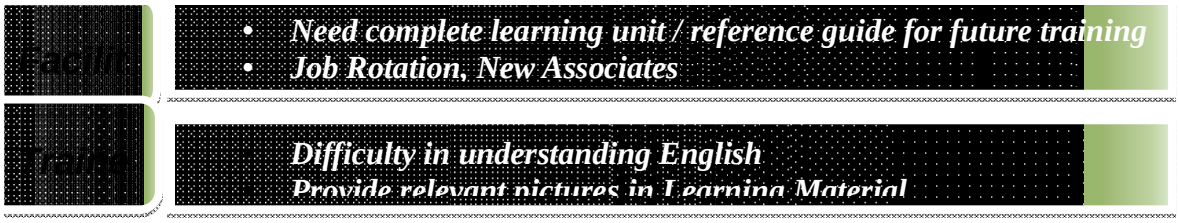
Structure of the learning units are decided in such a way that it fulfill the target of the Learning Unit of giving the direction of the training and also capturing the learning during OEM training in a structured manner.

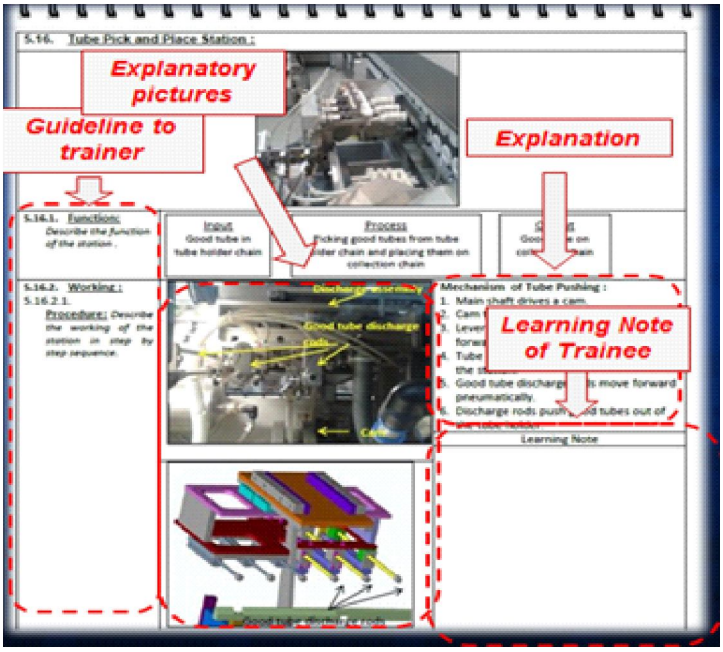
Guideline for trainers: The left most column of the learning unit template identifies the topic that should be covered during the training.

Learning Note by Trainee: The header of the right part the learning units : Learning Note section, identifies the perspectives to be covered for training of each topic.

Also, the blank space facilitates the documentation of the learning during OEM training. Trainee or the facilitator during training write down the processes in a structured manner







and thus the learning unit template, would convert to a ready reference for each machine.

Structured OEM Training : After developing the Learning Unit template, the next step is to implement the model to ensure a structured OEM training, following the learning units. Also, capturing the knowledge of the training to produce master copy for each machine. To ensure the effectiveness of the OEM training, a step by step approach was followed.

Pre Training : Aligning all stakeholders (Facilitator, Trainee and Trainer) to the proposed training roadmap.

OEM Training : Facilitating the training and ensuring that all the topics are covered from the identified perspectives. Also, conducting post training evaluation of the trainee.

Post Training : Enriching learning units : - - Preparing Version 2 of Learning Units.

7. Enriching the Learning Units

During the OEM training there are certain observations ad received suggestion from the different stakeholders.

So, the next step was to enrich the learning units, and prepared complete master copy.

7.1. Development of Reference Guide: Objective

Fostering an environment of continuous learning and development.

Facilitating scientific method of assessment to create performance driven culture.

7.2. Structure of the Enriched version of Learning Unit

The enriched version, includes direction for trainer along with explanatory pictures and proper explanation. This version also includes, learning note section, where trainee can write down their learning in their own language.

8. SOP, Guideline & Checklist - OLQ, Code Change

OLQ (Online Quality Check): OLQ is performed by finishing line associates in every twenty minutes to ensure the quality of finished product.

- Drawing Sample

- Sample Inspection – CMD, CND

- OLQ Rating Calculation by OPERA software

Code Change: Code changes are required for printing new code in accordance with SKU format, Date, Price.

- Code change in Tube Filler
- Code Change in Cartoner
- Code Change in Case Packer

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