Bangladesh University of Engineering and Technology

Industrial Training Report

Course Name: Industrial Training
Course No: ME-370

Name of the Industry: AST Beverage, Shimrail, Narayangonj

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1. Introduction

Vision of AST Beverage

They want to be the first choice in all of the beverages existing and in pipelines throughout the country and also to embody global leadership through innovation, success and growth guided by an unwavering commitment to deliver high-quality, differentiated beverages focused on customer needs .

Mission of AST Beverage

- They are aimed to develop products to empower/enforce the customers with improved performance in their daily life. Our philosophy is that with the daily hustle and bustle of the challenging and industrialized world, health should not be overlooked. New Advancements in research through latest technology and expertise professionals shall be the breakthrough to produce the brands perfect for our dynamic life style.
- They intend on, being the vanguard of choice/development, our products shall be available to all sectors of the society to deliver highest taste and functional value for optimum health performance to assist the society to enjoy the modern facilities.
- To assist them further augmentation our category leadership position in beverage market and sustain the customers' trust as their preferred brands through ensuring our highest ethical standard practice and concentration on our promise.
- They at Globe, will continue to conduct research for the products that will contain optimum nutrition while taste and flavour shall gratify our customers by dispensing superior-quality, healthy, as well as tempting beverages for entire family members. Using the latest that technology has to offer and the most experienced staff they will continue our journey to be the first choice in beverage

Industry at a glance

"All men dream, but not equally. Those who dream by night in the dusty recesses of their minds, wake in the day to find that it was vanity: but the dreamers of the day are dangerous men, for they may act on their dreams with open eyes, to make them possible." –T. E. Lawrence.

Mr. Harunur Rashid dreamt of Globe Pharmaceutical Group of Companies Ltd. more than 25 years ago, a tender sprout of 1986 became a huge tree, with his strong and uncompromising belief in nourishing the common people and utmost dedication to the well-being of millions of people of our country.

With Globe Pharmaceuticals Ltd. in 1986, the journey of touching millions of lives started. Motivated by a passion for well being of people, quality and consumer

centric innovation, he created many first-ever products and then shaped the industries like Carbonated Beverages, Biscuits and Dairy Milk etc. Globe-Uro soon became a household name, his mark and trusted signature throughout the Globe.

He continues to inspire us every day in and every day out. Working together, we create moments of happiness and delight for people around the Globe with our well accepted popular brands.

Through our values-based culture, we create a stronger future every day — enriching communities by putting common people first in everything we do. Globe Pharmaceutical Group consists of various business units catering to the vision of becoming the most innovative company. Presently the group has following business units:

Globe Pharmaceutical Group is a place where innovation is the name of the game, where we never stop innovating and where we're excited about future; And it all started simply with a single belief of touching millions of lives every day.

2. Organogram



Organogram of AST Beverage.

3. Strategic Areas

- a) Electrical and Mechanical Workshop
- b) Utility Section
- c) PET Section
- d) Production Process and Filling Zone

Electrical and Mechanical Workshop

In this section we learned:

- Mechanical Workshop
- Electrical Section
- Motor Rewinding

Utility Section

- Generator
- Boiler
- CO_2 Plant
- Chiller
- Cooling Tower
- HP & LP Air Compressor

PET Section

PET stands for Polyethylene Tetra phenol

- Injection moulding machine
- CCM (continuous compression machine)

Production Process and Filling Section

- Syrup process section
- Pasteurizers & Premixture
- Bottle blower and Air Conveyor
- Filler and Warmer
- Labeller
- Wrapping

4. Utility Section

Generator

- This company has nine generators to meet their electricity demand.
- Among them eight Gas generators and one Diesel generator.
- The Capacity of Power generation by Gas generators is 1.8 MW.
- Diesel generator which produces 1MW power is used during peak production.

Boiler

- There are three boilers in this company.
- All are fire tube boilers.
- Two of them are used for CO2 production.
- One is used for steam generation and it’s capacity is about 4 tons/hour.
- Working pressure is 8 bar.

CO_2 Plant

In this company there are two plants (ASCO plant & UNION Plant) for producing CO_2 which is mainly used in soft drinks production.

The capacity of ASCO plant is 285 kg/hr.

The capacity of UNION plant is 500 kg/hr.

As the CO_2 is mainly used in soft drinks like Fizz UP, URO Cola etc. its purity must be maintained at 99.98-100%. Otherwise, the process has to be checked properly to achieve the required purity level. In ASCO plant $KMnO_4$ is used as the purifier of the produced CO_2 gas. On the other hand, in UNION plant soft water is used as purifier of CO_2.

Raw Materials

- MEA (Mono-ethylene Amine) (9%)
- Soda Ash (3%)
- Water (88%)
- Natural gas

CO_2 Production Procedure

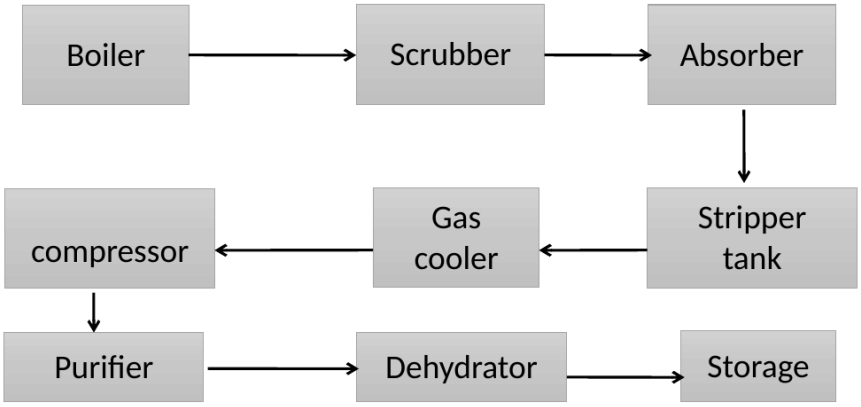
At first natural gas is burned by a fire-tube boiler. Thus fuel gas is produced that contains N_2 and CO_2. Then the fuel gas is passed to the Scrubber tower for cooling the gas. In this case, the temperature of the fuel gas is slightly reduced. After that the fuel gas is sent to Absorber where the mixture of MEA and soda water is kept in liquid form. This mixture absorbs the CO_2. The rest amount of gas is exhausted through an upper chimney. But the escaped gas amount cannot be more than 0.5%. If the amount is too high, then the MEA solution has to tested. Generally, to be a good absorbent, the strength of MEA solution should be 1.9N-2.0N. For maintaining this

strength the MEA solution has to be tested in lab. This is done by 4 chemical tests: (i) Percentage test (9-11%)

- (ii) Normality test (1.9-2N)
- (iii) pH test (pH 7.0-11.0)
- (iv) Density test (0.5-3kg/m3)

In absorber tower the absorbed CO_2 gas becomes liquid and it is mixed with MEA solution. After that this mixture is sent to Stripper tower through rich MEA pump. At this time the mixture is sent to the boiler again from the stripper tower for re-boiling it and thus the CO_2 becomes separated. Then the separated CO_2 gas is again sent to Stripper tower. Then the CO_2 is sent to gas cooler unit and CO_2 compressor for cooling it. After that CO_2 is purified by purifier and by a dehydrator(drier) at about 30-35^{0}C the pure CO_2 is dried and it is stored making dry ice through refrigeration process.

Flow chart of the overall procedure for producing CO_2:



Flow chart of the overall procedure for producing CO_2.

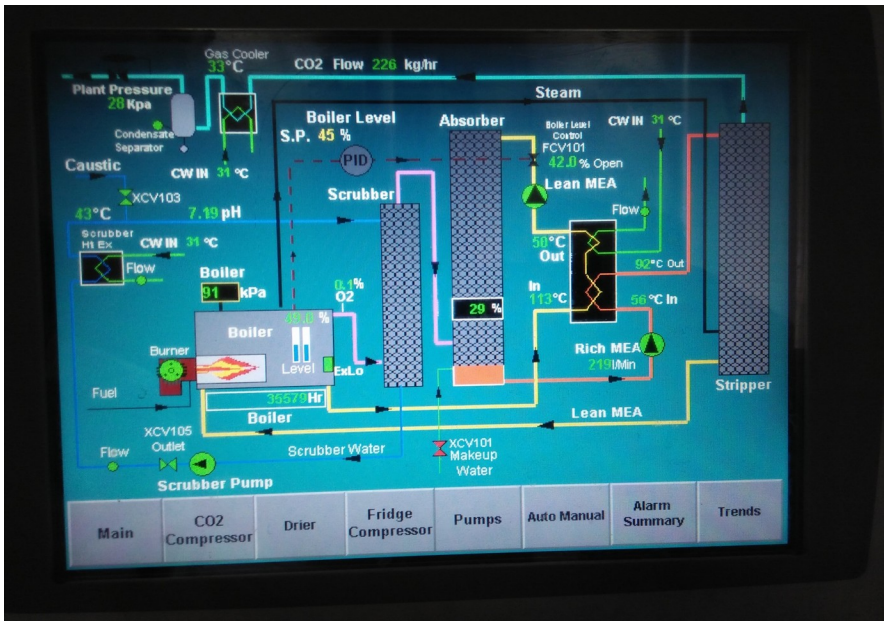


Figure 1: Circuit diagram of the CO_2 Plant.



Figure 2: ASCO CO_2 Plant at a glance.

For the production of soft drinks the CO_2 is sent to the production unit from the plant by evaporator at a temperature of 0^0-10^0C.

Maintenance of the CO_2 plant

- In absorber the MEA solution has to be changed after one year for maintaining its absorbability. To make new solution 360kg of Na_2CO_3 must be mixed with 1080kg MEA.

- $KMnO_4$ used for purification of CO_2 in ASCO plant can be used upto 100 hours from the time of addition. Then it should be changedreplacing new solution of $KMnO_4$.
- There cannot be formed any foam in the process pipe line as due to foaming different foreign particles and gases can mix with CO_2 and pollute it.
- Soot content has to be measured. Its range should read 0-1.
- In burning natural gas amount of CO_2 should be 12-13%.

Compressor

- There are five reciprocating compressors in this industry.
- These compressors have two compression stages (High pressure and Low pressure) air
- Compressed air is needed for two purposes. Low pressure air is needed for running conveyor and dissolving CO_2 in liquid and high pressure air is needed for making bottle from its preform.
- The rise of pressure of air is accomplished in three stage.
- In the first stage pressure is raised to 4 bar.
- In the second stage it is further increased to 15-16 bar.
- In the final stage the air is compressed to 40 bar.



Figure 3: Reciprocating compressor.

Chiller

A Chiller is a machine that removes heat from a liquid via a vapour-compression or absorption refrigeration cycle. This liquid can then be circulated through a heat exchanger to cool equipment, or another process stream (such as air or process water). As a necessary by product, refrigeration creates waste heat that must be exhausted to ambience, or for greater efficiency, recovered for heating purposes.

Chilled water is used to cool and dehumidify air in mid- to large-size commercial, industrial, and institutional facilities. Water chillers can be water-cooled, air-cooled, or evaporatively cooled. Water-cooled systems can provide efficiency and environmental impact advantages over air-cooled systems.

When the temperature range is 0 to 20 degree Celsius, chiller is used.

In this industry both water-cooled and air cooled chillers are used. Among them 2 are water cooled chillers which are used in PET section. The remaining are air-cooled chillers.

How water cooled and air cooled chillers work

The cycle begins in the evaporator where a liquid refrigerant flows over the evaporator tube bundle and evaporates, absorbing heat from the chilled water circulating through the bundle. The refrigerant vapor is drawn out of the evaporator by the compressor. The compressor then “pumps” the refrigerant vapor to the condenser raising its pressure and temperature. The refrigerant condenses on or in the condenser tubes, giving up its heat to the cooling water (or air). The high pressure liquid refrigerant from the condenser then passes through the expansion device that reduces the refrigerant pressure and temperature as it enters the evaporator. The refrigerant again flows over the chilled water coils absorbing more heat and completing the cycle.

Maintenance of chillers

- Inspecting the chiller quarterly.
- Routinely checking for refrigerant leaks.
- Confirming compressor operating pressures are within a reasonable range.
- Checking all motor voltages & amps.
- Checking all electrical starters, contactors and relays.
- Checking all hot gas and unloader operations.
- To reach maximum efficiency, using superheat and subcooling temperature reading.
- Line readings from Discharge lines should also be obtained.



Figure 4: Air cooled chiller.

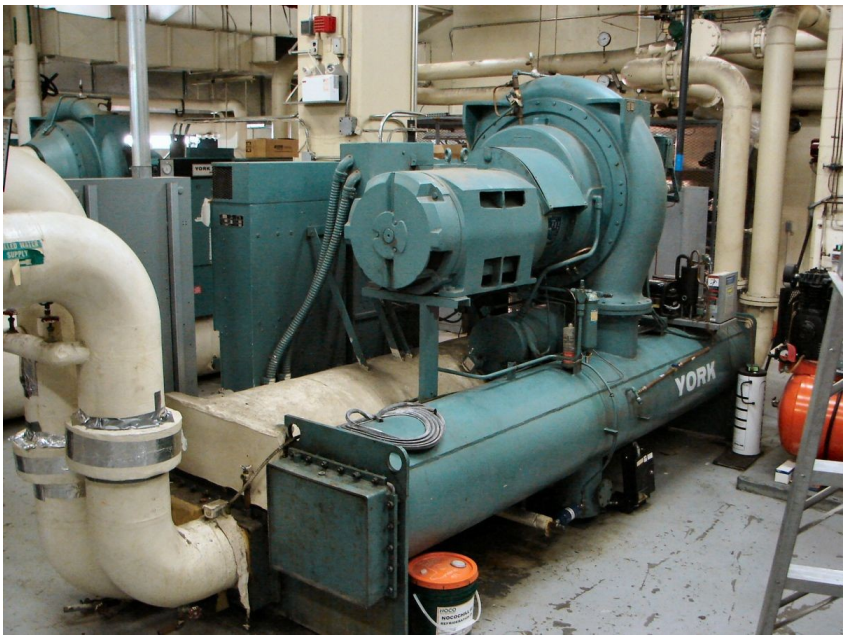


Figure 5: Water cooled chiller.

Cooling Tower

A cooling tower is a heat rejection device that rejects waste heat to the atmosphere through the cooling of a water stream to a lower temperature. Cooling towers may either use the evaporation of water to remove process heat and cool the working fluid to near the wet-bulb air temperature or, in the case of closed circuit dry cooling towers, rely solely on air to cool the working fluid to near the dry-bulb air temperature.

Common applications include cooling the circulating water used in oil refineries, petrochemical and other chemical plants, thermal power stations and HVAC systems for cooling buildings. The classification is based on the type of air induction into the

tower: the main types of cooling towers are natural draft and induced draft cooling towers.

The cooling tower used in this company is induced draft cooling tower.

Cooling tower is used when the temperature demand of water is around 20 degree Celsius.



Figure 6: Cooling Towers.

5. PET Section

In PET section, two types of machine is used to produce preform & bottle cap. These are Injection molding machine & CCM (Continuous Compression Machine). 3 Injection molding machines are used for producing preforms, one injection molding machine and one CCM is used for producing bottle caps. All the injection molding machines are of HUSKY brand and the CCM is of SAKMI brand (Italy) Injection molding machine performs molding process by injecting the raw materials.

38000 preforms is made per hour.

Preform is used to make bottles. It is made from Poly Ethylene Tetra Phenol resin (food grade). In PET resin moisture exists. So, the moisture has to be separated by a drier. The new raw PET has to to be dried for 6 hours. By using molecular chips moisture is removed from the drier. The PET resins are imported from India, China and some middle east countries. RELPET, ASPET, RAMPET, RICRON etc. are some brands that supply the resins to the company.

After drying the resin, it is sent to the Injection molding machine . This machine operates by a hydraulic system. Mechanical, electrical and pneumatic-3 types of power are used in the machine. Among the 3 injection molding machines one has 144 cavities and the other two has 72 cavities. If there occurs any problem in a cavity, only that individual cavity is kept closed. The other cavities can operates without any problem. Thus mass production is maintained properly. To keep the mold cool a

water cooled chiller is used. The mold has 2 sides-Hot runner side (fixed part) and cold hub side (moving part). Both the sides has to be cooled well. Besides, to keep the mold dry a mold dehumidifier is used here. After producing the preforms in the mold, these are sent to the robot for cooling. Then the preforms are sent to the conveyor belt and finally stored in a large basket.

In case of producing bottle caps by injection molding machine, all the procedure is similar to production of preforms. But in this case, the caps need not to be cooled and dried in robot as the required temperature is automatically controlled in the machine. For this reason, in cap molding machine no robot is needed.

The power requirement of this machine is 500kW and the production capacity is 13 lakh.

In CCM, raw materials are compressed to make cap. It is working at a temperature of 200-220^{o}C. No drier is needed for this machine. After production of the caps in the machine they are sent to conveyor for storage. At the time of sending the caps they are monitored properly by a DSLR camera. Thus if the camera detect any defect in the cap, then the cap is automatically removed from the conveyor belt through a sensor.

The power requirement for CCM is 280kW and the capacity is 27 lakh which clearly shows its better efficiency than the injection molding machine.

In bottle cap production, SDPE (High Density Poly Ethylene) is used as raw materials. It is imported from Thailand.



Figure 7: Injection molding machine (HUSKY Brand).

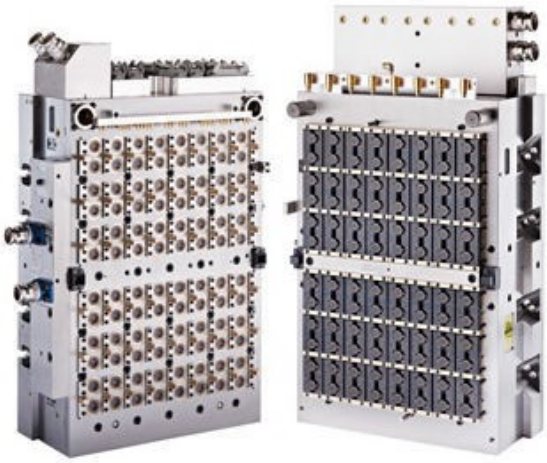


Figure 8: Hot runner of the mold.



Figure 9: Preforms produced in injection molding machine.



Figure 10: Continuous compression machine (CCM).



Figure 11: Different bottle caps.

6. Production Process & Filling Section

In this section we saw various syrup making process.

3 main raw materials are used in making syrup:

- Raw syrup
- Water
- CO_2

Raw syrup is firstly produced by mixing different ingredients with water. Sugar is mixed with water and it is purified by a filter.then the purified mixture is mixed with raw syrup and for making soft drinks, CO_2 is added with it. Oxygen has to be removed from water well for absorbing CO_2 easily. CO_2 is entered to the premix at 4 bar.In case of producing juice, fruit drinks etc. CO_2 is not needed.

In mango fruit drink production, the mango pulps have to be agitated to remove SO_2. The pulps are mixed with hot water. For increasing its density gum, sugar are mixed with it. Then sodium citrate and some other chemicals are mixed with it. By using homolizer the remaining fibres of the pulp are removed.

Pasteurization is a process that kills microbes (mainly bacteria) in food and drink, such as milk, juice, canned food, and others which is employed in this section.

After processing of the beverage syrups, they are ready to fill. Before filling the syrup , the bottles are produced from preform with their required shape in a Blow molding machine.

In filling section, Fillers (or filling machines) are used to fill bottles with beverages. Before filling the bottles , Ringer is used to ringe the bottles properly . Then the bottles are sent to filler and are filled with particular amount of liquid drinks and

through capper machine, caps are fitted to bottles by torque induced from a magnetic chuck.

After finishing of filling process all the bottles are sent to Labeller by a conveyor used to mark the product. The labels are attached to the bottles by either glue label and slip label.

Finally, the products are ready for packaging and wrapping.



Figure 12: Overall view of the production processing line.

7. Conclusion

During one semester training period, a lot of experience, knowledge and exposure that we have handy . All disclosures were awaken ourself in a boost of self-confidence to face life more challenging now. Practical is a complement to the science or theory learned. This is clearly the concept of science and charity, where they have learned without practice will be lost and will not give anything - what effect. So if we do without the knowledge of course there will be problems in terms of grip and stance ever - changing.

During our industrial training, there are many changes from the point of learning environments and discussion among colleagues. It can directly increase the dedication and rational attitude.

However, there are still some weaknesses that can be improved in the future. Therefore we conclude that the industrial training program has provided many benefits to students even if there are minor flaws that are somewhat disfiguring condition , so that this weakness can be rectified in the future.

We can conclude that this industry is through training we received a lot of exposure in the computing world.

8. Acknowledgement

The internship opportunity We had with AST beverage was a great chance for learning and professional development. Therefore, We consider ourself as a very lucky individual as We were provided with an opportunity to be a part of it. We are also grateful for having a chance to meet so many wonderful people and professionals who led us though this internship period.

We express our deepest thanks to Mr. Sanjoy Kumar ,DGM for taking part in useful decision & giving necessary advices and guidance and arranged all facilities to make life easier.We choose this moment to acknowledge his contribution gratefully.

We perceive as this opportunity as a big milestone in our career development.We will strive to use gained skills and knowledge in the best possible way, and We will continue to work on their improvement, in order to attain desired career objectives. Hope to continue cooperation with all of them in the future.