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CHAPTER 3 - INTERNSHIP EXPERIENCE AND COMPANY ANALYSIS

INTERNSHIP EXPERIENCE

1. DAILY TASK PERFORMANCE DURING INTERNSHIP

- Data entry in accounting books and ERP system. ERP system helps in taking entries in accounting, materials and inventory. It also helps in taking inventory, materials and inventory. It also helps in taking inventory, materials and inventory.
- Material master creation - creating material master in SAP system for new materials.
- Quality Management - creating inspection lot in SAP system for new materials.
- Inspection lot processing - creating inspection lot in SAP system for new materials.
- Maintaining inspection records - filing inspection material records in books and system.

HR OBJECTIVES

- Effectively play the role of strategic team member.
- Planning for pragmatic man power, induction, re-skilling, deployments and retention of HR.
- Develop and position right mix of person at the right time.
- Create, maintain and nurture a healthy employer and employee relations.
- Evolve and implement best industrial practices with transparency in approach, competitive reward and incentive system for excellence in performance.
- Provide effective and meaningful social support to the community, society around.

Current HR Status in CSL

- The total manpower of the company as on 31 March 2012 was 2017 employees.

Embed Size (px) 344 x 292429 x 357514 x 422599 x 487 REPORT ON INDUSTRIAL TRAINING HINDUSTAN SHIPYARD LIMITED VISAKHAPATNAM Indian Maritime University, Visakhapatnam Campus. Preface This project report is prepared during the summer industrial training undertaken at HINDUSTAN SHIPYARD LTD., Visakhapatnam as part of the curriculum of Tech Naval Architecture and Ocean Engineering at Indian Maritime University, Visakhapatnam Campus. The theory of project is important, but without practical knowledge it becomes futile particularly for the engineering students. The knowledge of engineering is incomplete without the practical applications of the theories studied. This training provides a golden opportunity to all the students, especially engineering students who are not familiar with the functioning and working of project construction facility. Hence, this report is designed with the objectives to gain practical know-how and is undertaken at HINDUSTAN SHIPYARD LTD., Visakhapatnam. Acknowledgement Industrial training at HSL had been a great learning experience for me. The theoretical knowledge I gained during my three years of study at I.M.U, Visakhapatnam had been complemented effectively due to the guidance and support provided by HSL employees. The factors that need to be taken into consideration while designing a ship cannot be fully covered theoretically. This practical knowledge can only be gained by handling those cases yourself or by witnessing the process under guidance. The shipbuilding process at HSL is a holistic one. HSL has been catering to Indian and international clients with ease. The reason for the title of one of the largest government shipbuilding company in India was plainly visible. I would like to acknowledge Mr. Sanjay Rao, Deputy Manager, Training department, for allowing me to complete my training at HSL under knowledgeable training guides who were happy to pass on their wisdom guided over experience. Also I am very thankful to all those guides and department members whom I visited to get the details related to my research. The process of teaching and giving practical experience soon after, was an effective one. Finally, I would also like to thank my college and department for making such training compulsory for students and for providing me an opportunity to visit HSL. Sr. No. Contents 1 Training Schedule 2 Introduction 3 About HSL 4 Shipbuilding Terms 5 Hull Shop 6 Pre Fabrication Department 7 Erection Department 8 Engineering Department 9 Plumbing Department 10 Design Department 11 Quality Control Department 12 Conclusion Introduction Ship Building Industry International Level: Shipbuilding is a global industry. China, South Korea and Japan currently control approximately 90% of the total market share measured in dead weight tons (DWT). The Indian shipbuilding industry is small by global standards, and currently accounts for less than 1% of the global shipbuilding industry. The structure of the Indian shipbuilding industry can be divided into three distinct segments viz. Public sector shipyards, Defense shipyards and Private shipyard. This industry is dynamic and cyclic in nature therefore challenges result in procedural delays and hampers augmentation of capacity. Domestic Level: Recent economic growth and wider trade patterns have resulted in longer voyages, and increased tonnage per mile, and that has caused a shortage of ships to develop with consequent increases in freight rates. The increase in freight rates has encouraged ship owners to place orders for more new ships. The increase in new vessel orders during the period from 2004 to 2006 has included all the main categories of commercial ships, including the Panamax bulk carriers. The higher levels of placement of global new vessel orders in 2006 has continued into 2007, but from last three to four years i.e. from 2011 shipping industries has been affected by Global recession. Government Sector Shipbuilding Industries 1) Cochin Shipyard Limited 4) Hindustan Shipyard Limited 2) Mazagaon Dock Limited 5) Goa Shipyard Limited 3) Garden Reach Shipyard 6) Hooghly Docks Private Sector Shipbuilding Industries 1) ABG Shipyard 4) Bharti Shipyard Limited 2) Pipavav Shipyard 5) L&T Shipyard Limited 3) Tebma Shipyard 6) Chowgle & Co. Ltd. Etc. About HSL Hindustan Shipyard Limited is strategically located on the east coast of India at Visakhapatnam in Andhra Pradesh originally set up under private management in 1941. The Shipyard was taken over by the government of India in 1952. The shipyard functions under the administrative control of ministry of shipping, Road Transport and Highway, Govt. of India. Hindustan shipyard Limited is the pioneer ship building industry in India. It is located on the east coast on 83.17E latitude, 73.41N longitude. It is one of the prestigious industries in Visakhapatnam. HSL is the part of the natural harbor of Visakhapatnam port and naval Dockyard meeting with it. Dr. BABU RAJENDRA PRASAD, The president of India National Congress laid the foundation stone on 21st June 1941 for Scindia Steam Navigation at Visakhapatnam. Mr. Walchand Hirachand Scindia was the founder of Shipyard. In 1949, there were 4000 men employed and 9 British engineer including Mr. Compher (the chief Manager of shipyard). In March 1950, Government with the formation of Eastern Shipping Corporation entered the field of shipping. It was a joint venture with Government holding 74% of the capital and Scindia 26% of the capital. Scindia Steam Navigation Company (SSNC) was established at the present place of HSL later it was taken over by late Sri Walchand Hirachand, who opened a boat building Company with the collaboration of M/S. Sir Alexander & partners consulting engineers in U.K. The keel of the ship named JALA USHA was launched on 14th March 1948 by late Pundit Jawaharlal Nehru our first PM. BACKGROUND: The shipyard has built and delivered so far over 137 ships aggregating over 1.27 million DWT. The shipyard has built big ships, small crafts, tugs, dredges, naval vessels, passenger ships, training ship, drill ship, off shore patrol support cum-stand by vessels etc. of different designs for owners. HSL has undergone modernization at a cost of approximately 100 crores. The shipyard is at present capable of building bulk carriers up to 80,000 DWT. HSL with expertise skill, sound technology and a host of hull engineering back up facilities also offers excellence ship repairs and dry dock services. The recent orders were MOT, Research vessels, A&N administration for barges, utility boats. Four ships of 30,000 DWT cargoes for GEMI and acquiring repairs for Indian Navy of INS Sindukranti division. Now, one of the main ship building industries in India is going to emerge into Indian security forces for Indian Navy Wing as efficient work and faster outputs. HSL is awarded as ISO-9001 certified industry by LLOYD'S register of quality assurance (LRQA) London for construction. INFRASTRUCTURE DETAILS: HSL yard is spread over an area of 3, 00,000 square meter. Workshops and facilities are systematically planned and functionally laid out to ensure unidirectional flow of material. The steel processing facilities consists of a stock yard to hold 30,000 tons of steel, modern plate and section treatment plant gas cutting machines, heavy duty press self-elevating trucks capable of handling blocks of up to 250 tonnes and large pre-fabrication shops with overhead travelling cranes of adequate capacity. The hull construction facilities includes a modern building dock and three shipways. Cutting, welding and assembly of steel to any specification are handled with care and accuracy by skilled operation, with are continuously trained to upgrade their skills. The long out fitting quay is equipped with attendant self-contained services and facilities i.e. hull fitting, engineering and electrical shops. THE DESIGN CAPABILITY: A remarkable achievement in the field ship design is the development of HS-Standard flexible design acclaimed for its excellence for its Hydrodynamic characteristics by HSYA ship model testing tank established at Hamburg, Germany. Seven, 27000WT bulk carriers of this design were built for various costumers. HSLs design capability embraces a wide spectrum of general and special purpose vessels like medium size bulk carriers up to 70,000 DWT, Product tankers, container vessels, dredgers, passenger vessels, survey vessels, etc. it is backed up by latest CAD/CAM software a part from AUTOKON with independent work stations. OFFSHORE PLATFORMS: HSL has emerged as one of the leading manufacturer of Offshore Oil/Gas production platforms providing advanced technologies and up-to-date facilities. HSLs offshore facility is geared to take on offshore projects on turnkey basis covering design, procurement, fabrication, load out and installation. Its expertise and quality standard are world class. Over twenty offshore structures fabricated in HSLs exclusive yard are in operation at Bombay High, Southern and Eastern regions of India. THE INDUSTRIAL STRUCTURES AND OTHER DIVERSIFIED AREAS: With accredited experience and technology absorbed through Shipbuilding, Ship repairs and offshore platforms coupled with skilled manpower and modern facilities. HSLs business Loading Preview Sorry, preview is currently unavailable. You can download the paper by clicking the button above. Something went wrong. Wait a moment and try again. 1. INDUSTRIAL TRAINING & INDUSTRIAL VISIT REPORT BY SHONE JOHN (14015040) Final Year B.Tech (Mechanical Engineering) 2017-2018 DEPARTMENT OF MECHANICAL ENGINEERING SAINTGITS COLLEGE OF ENGINEERING Kottukulam Hills, Pathamuttom P. O, Kottayam 686532, Kerala. Tel: +91-481-2436169, 0481- 0481. Fax:2436170-2430349 E-mail: saintgitsengg@sify.com, Website : www.saintgits.org OF 2. INDUSTRIAL TRAINING & INDUSTRIAL VISIT REPORT BY SHONE JOHN (14015040) OF Final Year B.Tech (Mechanical Engineering) 2017-2018 DEPARTMENT OF MECHANICAL ENGINEERING SAINTGITS COLLEGE OF ENGINEERING Kottukulam Hills, Pathamuttom P. O, Kottayam 686532, Kerala. Tel: +91-481-2436169, 0481-2436170. Fax: 0481-2430349 E-mail : saintgitsengg@sify.com, Website : www.saintgits.org 3. DEPARTMENT OF MECHANICAL ENGINEERING SAINTGITS COLLEGE OF ENGINEERING Kottukulam Hills, Pathamuttom P. O, Kottayam 686532, Kerala. Tel: +91-481-2436169, 0481-2436170. Fax: 0481-2430349 Website: www.saintgits.org 2017- 2018 Certificate This is to certify that this report is a bonafide record of the industrial training and industrial visit undergone by SHONE JOHN bearing Reg No:14015040 towards the partial fulfillment of the requirements for the award of B.Tech. Degree in Mechanical Engineering under the Mahatma Gandhi University during the year 2017-2018. Er Nandu S Dr. Jacob T Varghese Chief Staff Advisor Head of the Department Dept. of Mechanical Engineering Dept. of Mechanical Engineering 4. ACKNOWLEDGEMENT I am using this occasion to state my gratitude to all those who helped me to attend Industrial Trainings (Internships) at Cochin Shipyard Limited, Travancore Sugars and Chemicals Limited & KSRTC Regional workshop. It meant a great deal for me as it helped me with my practical and theoretical knowledge and changed my perspective of the industry. First of all, I would like to thank God Almighty for providing me with such a wonderful learning experience. Without the blessings from him, I could have never completed this opportunity successfully. Next, I would like to thank the principal of our college, Dr. M.D Mathew, beloved Head of Mechanical Engineering Department, Dr. Jacob T Varghese and Ex HOD Dr. Sreejith C for allowing me to attend the training. I thank Mr. Kolanadaivela P for allowing us to undergo summer training at Cochin Shipyard Limited (CSL) and all of the HR team of the Institute for their constant guidances also thank Mr. Mukundan Pillai, General Manager, Travancore Sugars and Chemicals Limited, Thiruvalla, I also thank Mr. Rajesh Kumar, works manager for allowing us to undergo training at KSRTC Regional workshop, Mavelikara. Now I would like to extend my gratitude to all the workers, engineers and other staffs of Cochin Shipyard Limited, Travancore Sugars and Chemicals Limited and KSRTC Mavelikara, who played a great role in imparting the knowledge available with them, always eager to share the facts with us. They taught us the use of those which we studied in college, in real time world. Last, but not the least, I would like to thank my parents and my friends, who always extended their helping hand whenever we faced with problems. 5. CONTENTS SL NO TITLE PAGE NO COCHIN SHIPYARD LIMITED 1 INTRODUCTION 2 2 DEPARTMENT 4 2.1 SHIP BUILDING 4 2.2 SHIP REPAIR 5 2.3 SHIP DESIGN 5 2.4 OFFSHORE 5 2.5 MATERIALS 6 2.6 UTILITY AND MAINTENANCE 6 2.7 QUALITY ASSURANCE 6 2.8 STORE 8 2.9 OTHERS 8 3 TRANSPORT SERVICES 9 4 PARTS OF A SHIP 11 5 TYPES OF SHIPS 12 5.1 SEASONING COMMERCIAL VESSEL 12 5.2 NAVAL VESSEL 13 5.3 BULKER 14 6 PROPULSION SYSTEM 15 6.1 EQUIPMENTS 15 6.2 SHIP ENGINE 16 9 CONCLUSION 17 KSRTC REGIONAL WORKSHOP 1 1 INTRODUCTION 2 2 REVIEW OF VARIOUS SECTIONS 3 2.1 BODY BUILDING SECTION 3 2.2 ENGINE SECTION 4 2.3 FRONT AXLE AND PROPELLER SHAFT 6 2.4 PROPELLER SHAFT 6 2.5 FUEL INJECTION PUMP AND FUEL INJECTOR 9 2.6 FUEL INJECTOR 12 2.7 GEARBOX SECTION 13 2.8 CLUTCH AND SMALL UNIT SECTION 15 2.9 AIR DRYER 17 2.10 CROWN AND PINION SECTION 18 2.11 BRAKE AND BRAKE CHAMBER 19 2.12 LATHE WELDING AND RECOVERY SECTION 20 2.13 TIRE SHOP 21 2.14 POWER STEERING 22 2.15 ELECTRICAL SECTION 23 3 CONCLUSION 25 25 TRAVANCORE SUGARS AND CHEMICALS LTD. 1 INTRODUCTION 2 2 INDIAN MADE FOREIGN LIQUOR (IMEFL) 3 3 COMPONENTS 5 3.1 CONVEYOR 5 3.2 SCREW CAP 7 3.3 EXTRA NEUTRAL ALCOHOL 8 3.4 ROLLER SLEAT PRINTER 9 4 CONCLUSION 10 7. 1 COCHIN SHIPYARD LIMITED 8. 2 CHAPTER 1 INTRODUCTION Cochin Shipyard Limited was established in 1941 at Visakhapatnam. It is one of the largest shipbuilding yards in India. It is a part of a line of maritime-related facilities in the port-city of Kochi, in the state of Kerala, India. Of the services provided by the shipyard are building platform supply vessels and double-hulled oil tankers. Presently it is building the first indigenous aircraft carrier for the Indian Navy. Cochin Shipyard was incorporated in 1972 as a Government of India company, with the first phase of facilities coming online in 1982. The yard has facilities to build vessels up to 1.1 million tons and repair vessels up to 1.25 million tons, the largest such facilities in India. In August 2012, the Government of India announced plans of divestment to raise capital of 15,000 million rupees (Rs1,500crore) for further expansion through an Initial Public Offering (IPO) towards the end of the fiscal year. Figure 1.1 9. 3 Govt of India Finalise the decision of Stake sells on 18 November, 2015. 3.39 Cr Shares of Face value ₹10 each will sold. Out of which Govt is holding 1,13,000 Share. Others are fresh Equity. The shipyard also trains graduate engineers in marine engineering. Around one hundred students are trained each year. In the last three decades, the company has emerged a forerunner in the Indian shipbuilding and ship repair industry. It can build ships up to 110000 DWT and repair ships up to 125000 DWT. Cochin Shipyard Limited has secured shipbuilding order from internationally renowned companies from Europe and Middle East and is nominated to build the country's first indigenous air defense ship. Cochin Shipyard Limited commenced ship repair in the year 1982 and as undertaken repairs of all types of ships including up gradation of ships of oil exploration industry, as well as periodical layup repairs and life extension of ships of Navy, UTL, Coast Guards, Fisheries and Port Trust. The yard has developed adequate capabilities to handle complex and sophisticated jobs. 10. 4 CHAPTER 2 DEPARTMENTS 2.1 SHIPBUILDING CSL is the only shipyard in India which can build up to 1,10,000 DWT. It has built various types of vessels including tankers, Bulk carriers, port crafts, passenger vessels etc. and is currently building Platform supply vessels for exports and Aircraft carrier for the Indian Navy. The first ship to roll out of the Cochin Shipyard was the MV Rani Padmini in 1981. The yard has delivered two of India's largest double-hull ballistic missile submarines. Until the end of World War II the primary role of the diesel/electric submarine was anti-ship warfare, inserting and removing covert agents and military forces, and intelligence-gathering. With the development of the homing torpedo, better sonar systems, and nuclear propulsion, submarines also became able to effectively hunt each other. The development of submarine and cruise missiles gave submarines a substantial and long-ranged ability to attack both land and sea targets with a variety of weapons ranging from cluster to nuclear weapons. Most navies also include many types of support and auxiliary vessels, as minesweepers, patrol boats, offshore patrol vessels, replenishment and hospital ships which are designated medical treatment facilities. 20. 14 Fast combat vessels such as cruisers and destroyers usually have fine hulls to maximize speed and maneuverability. They also usually have advanced marine electronics and communication systems, as well as weapons. 5.3 BULK ER A bulk carrier ship is used transport dry or liquid bulk cargo, such as grains, coal, iron ore, and cement. Over the years this ship type has grown in size and sophistication. Today's bulkers are specially designed to maximize capacity, safety, efficiency, and to be able to withstand the rigors of their work. Bulker's represents about 40% of the world's merchant fleet and the development of freight prizes are often used as an indicator of the world economy through the Baltic Dry Index. 21. 15 CHAPTER 6 PROPULSION SYSTEMS Mechanical propulsion systems generally consist of a motor or engine turning a propeller, or less frequently, an impeller or wave propulsion fins. Steam engines were first used for this purpose, but have mostly been replaced by two-stroke or four-stroke diesel engines, outboard motors, and gas turbine engines on faster ships. Nuclear reactors producing steam are used to propel warships and icebreakers, and there have been attempts to utilize them to power commercial vessels In addition to traditional fixed and controllable pitch propellers there are many specialized variations, such as contra-rotating and nozzle-style propellers. Most vessels have a single propeller, but some large vessels may have up to four propellers supplemented with transverse thrusters for maneuvering at ports. The propeller is connected to the main engine via a propeller shaft and, in case of medium- and high-speed engines, a reduction gearbox. Some modern vessels have a diesel-electric power train in which the propeller is turned by an electric motor powered by the ship's generators. 6.1 EQUIPMENTS Shipboard equipment varies from ship to ship depending on such factors as the ship's era, design, area of operation, and purpose. Some types of equipment that are widely found include: Masts can be the home of antennas, navigation lights, radar transponders, fog signals, and similar devices often required by law. Ground tackle includes equipment such as mooring winches, windlasses, and anchors. Anchors are used to moor ships in shallow water. They are connected to the ship by a rope or chain. On larger vessels, the chain runs through a hawse pipe. Cargo equipment such as cranes and cargo booms are used to load and unload cargo and ship's stores. Safety equipment such as lifeboats, life rafts, and survival suits are carried aboard many vessels for emergency use. 22. 16 CHAPTER 7 SHIP ENGINE Most modern ships use a reciprocating diesel engine as their prime mover, due to their operating simplicity, robustness and fuel economy compared to most other prime mover mechanisms. The rotating crankshaft can be directly coupled to the propeller with slow speed engines, via a reduction gearbox for medium and high speed engines, or via an alternator and electric motor in diesel-electric vessels. The rotation of the crankshaft is connected to the camshaft or a hydraulic pump. Diesel engines soon offered greater efficiency than the steam turbine, but for many years had an inferior power-to-space ratio. The advent of turbo charging however hastened their adoption, by permitting greater power densities. The engine room houses the vessel's prime mover, usually some variations of a heat engine - diesel engine, gas or steam turbine. On some ships, the machinery space may comprise more than one engine room. 23. 17 CHAPTER 8 CONCLUSION The visit to Cochin Shipyard Limited was unique in many aspects. Theoretical knowledge that we had gained from the college could be practically understood. The experience taught us about the various categories of ships, their engine and its parts, propulsion systems and about the different functions and jobs performed in the industry. The various machines used in the Shipyard were also studied. Various applications of these devices were studied in detail. We also got a chance to know about various processes involved. This will also help us to concentrate better for the upcoming semesters and gives us a broader knowledge. The valid guidance and warmth of the employees were very enriching. The experience taught us not only the importance of technical knowledge but it also taught importance of working ethics a good work culture and importance of team work. The visit definitely transformed each candidate who went there. 24. 1 KSRTC REGIONAL WORKSHOP 25. 2 CHAPTER 1 INTRODUCTION A group consisting of ten students of fifth semester B-Tech Mechanical Engineering students, Saintgits College of Engineering conducted an industrial training at the KSRTC Regional Workshop, Mavelikara. The prime objective of the training was to acquire knowledge and skills on technical subject's. As Mechanical Engineering students it is very much essential for us to have hands on experience on various practical applications of the subjects we study. It is very hard to achieve such practical experience by only availing the facilities and practical sessions of our college. So we saw an opportunity to get this practical experience by undergoing industrial training at KSRTC Regional Workshop, Mavelikara where repair, maintenance, and body building of KSRTC buses is done. This is the report of our industrial training at KSRTC Regional Workshop, Mavelikara dated from 23/12/2016 to 31/12/2016. 26. 3 CHAPTER 2 REVIEW OF VARIOUS SECTIONS 2.1 BODY BUILDING SECTION The coach building section in K.S.R.T.C deals with construction and repair works of buses. The building houses many buses at a time and different works take place inside. For construction of bodies of buses, the first step is to make a steel floor by placing steel sections on top of the base frame. Then the body is separately made by using sheets of metals. These sheets are made by suitable sheet metal processes Before the body can be built using the sheets, the required shape of the coach is made by using steel skeleton structure placed on

the base. The sheets are then placed around this structure. The required processes such as painting and attaching of other accessories are done afterwards. 27. 4 2.2 ENGINE SECTION The automobile engine is the power plant of the engine. The main parts of an automobile engine are: Valves The intake and exhaust valves open at the proper time to let in air and fuel and to let out exhaust. Note that both valves are closed during compression and combustion so that the combustion chamber is sealed. Piston A piston is a cylindrical pellet of metal that moves up and down inside the cylinder. Piston rings Piston rings provide a sliding seal between the outer edge of the piston and the inner edge of the cylinder. The rings serve two purposes: • They prevent the fuel/air mixture and exhaust in the combustion chamber from leaking into the sump during compression and combustion. • They keep oil in the sump from leaking into the combustion area, where it would be burned and lost. Connecting rod The connecting rod connects the piston to the crankshaft. It can rotate at both ends so that its angle can change as the piston moves and the crankshaft rotates. 28. 5 Crankshaft The crankshaft turns the piston's up and down motion into circular motion just like a crank on a jackin-the-box does. Sump The sump surrounds the crankshaft. It contains some amount of oil, which collects in the bottom of the sump (the oil pan). Dealing with the type of engines in the regional workshop, there are two major brands namely TATA and Ashok Leyland. Tata Cummins Engine (Various models including 12 valve and 24 valve) and Leyland B51, B52, B53 (BS-Bharath Stage Emission Standards) engines are the major models in this regional workshop. The engine section can inspect 2-3 engines a time. The main problems for the engines are: • Wear and tear of piston rings • Block in the fuel inlet line • Cracks in engine casing • Bending of connecting rod • Engine head and valve Complaints • Wear and tear in inner lining of engine cylinder • Damage to Engine piston While some of these problems are natural as the engine becomes old, some of these problems may occur due to poor maintenance or improper usage. There are four major process in the inspection of an engine in the engine overhauling section: 1. Dismantling of the engine: The engine is dismantled carefully removing each and every part. 2. Cleaning of the parts: For the smooth working of the engine all the parts are embedded in a sea of lubricating oil. On dismantling an engine, the parts embedded in oil are cleaned. Initially the parts are cleaned using diesel. Then it is washed in a high speed jet of water. 3. Checking for malfunction of parts: The cleaned parts are dried with cotton waste or using air from an air compressor. The parts are clearly inspected and parts with malfunction are replaced. 4. Re-assembly of the engine: The parts with malfunction are replaced and the engine is reassembled and tested for one last time. 29. 6 2.3 FRONT AXLE AND PROPELLER SHAFT An axle is a central shaft for a rotating wheel or gear. On wheeled vehicles, the axle may be fixed to the wheels, rotating with them, or fixed to the vehicle, with the wheels rotating around the axle. In the former case, bearings or bushings are provided at the mounting points where the axle is supported. In the latter case, a bearing or bushing sits inside a central hole in the wheel to allow the wheel or gear to rotate around the axle. Axles are an integral component of most practical wheeled vehicles. In a live-axle suspension system, the axles serve to transmit driving torque to the wheel, as well as to maintain the position of the wheels relative to each other and to the vehicle body. The axles in this system must also bear the weight of the vehicle plus any cargo. The axle section in the regional workshop deals with the problems for the front axle of the buses. The main problems for the axles in K.S.R.T.C buses are its short life time. The axles may fail due to • Breaking of axle pin • Overload for long distances • Usage of sub quality parts • Wear and tear in the bearings 30. 7 31. 8 2.4 PROPELLER SHAFT A drive shaft, driveshaft, driving shaft, propeller shaft (prop shaft), or Cardan shaft is a mechanical component for transmitting torque and rotation, usually used to connect other components of a drive train that cannot be connected directly because of distance or the need to allow for relative movement between them. As torque carriers, drive shafts are subject to torsion and shear stress, equivalent to the difference between the input torque and the load. They must therefore be strong enough to bear the stress, whilst avoiding too much additional weight as that would in turn increase their inertia. The main problems associated with a propeller shaft include wear and tear which causes noise and loss in power transmitted. In most case the yoke is replaced along with bearings. In some cases where it cannot be repaired then it is classified as scrap. Usually the propeller shaft of a bus consist of three pieces which are connected together. The size of the shaft differ on different models 32. 9 2.5 FUEL INJECTION PUMP AND FUEL INJECTOR An injection pump is the device that pumps diesel (as the fuel) into the cylinders of a diesel engine. Traditionally, the injection pump is driven indirectly from the crankshaft by gears, chains or a toothed belt (often the timing belt) that also drives the camshaft. It rotates at half crankshaft speed in a conventional four-stroke diesel engine. Its timing is such that the fuel is injected only very slightly before top dead centre of that cylinder's compression stroke. It is also common for the pump belt on gasoline engines to be driven directly from the camshaft. The engines that the K.S.R.T.C use, mainly Tata and Leyland, have two type of pumps namely rotary pump and in-line pump 1. Rotary pump Components: 1. Drive Shaft 2. Distributor Rotor 3. Hydraulic Head 4. Delivery Valve 5. Transfer Pump 6. Pressure Regulator 7. Discharge Fitting 8. Metering Valve 9. Pumping Plungers 10. Internal Cam Ring 11. Governor 12. Governor Weights 13. Advance 14. Drive Shaft Bushing 15. Housing 16. Rollers 33. 10 2. In line pump This is a typical in-line multi-element injection system present in the Leyland engine. It consists of the following basic units: • Cam shaft • Lift pump • In-line injector pump with four pumping elements, one element per cylinder • Injectors The cam shaft carries five cams. The first one is the eccentric cam to actuate the lift pump. The remaining four are intended to drive plungers of the pump. The cams are installed in such a way that pumping elements deliver fuel in the firing order and at the correct instant in the engine's cycle of operation. The lift pump supplies fluid to the intake of injector pump elements. Each element of the pump consists of a cam-driven plunger, delivery valve, and the governor assembly. The purpose of 34. 11 the governor is to control the volume of the fuel delivered by the plunger to a cylinder. It is attained by rotating the plunger with the helical groove with respect to the spill orifice. Inline pump is advanced than rotary pump. CRDI technology is not commonly used in K.S.R.T.C buses except in VOLVO low floor buses. The main malfunctions for these pumps are due to: • Misalignment of valve springs • Presence of impurities in the fuel due to improper working of fuel filter • Improper working of governor assembly 35. 12 2.6 FUEL INJECTOR Fuel injectors are electromechanical valves, usually one per cylinder, situated so that they deliver fuel either directly into the engine's combustion chamber. These injectors are fed with fuel by a mechanical pump with a small separate chamber for each cylinder, feeding separate fuel lines and individual injectors. Most such pumps were in-line, though some were rotary. Most modern diesel engines use common rail or unit injector direct injection systems. In most of the K.S.R.T.C buses currently running indirect fuel injection system is used. It is less complicated and less expensive to maintain. The fuel injectors differ from model to model. Different fuel injectors have different no. of openings on their nozzle. The as designed keeping the pollution norms in mind. Latest buses come equipped with Common rail direct injection which reduces pollution improves power and efficiency of engine. The entire system is controlled by an Electronic control unit and hence it is more expensive and complicated. The parts inside the fuel injectors are usually replaced with new ones if they become faulty. 36. 13 2.7 GEARBOX SECTION The most common use is in motor vehicles, where the transmission adapts the output of the internal combustion engine to the drive wheels. Such engines need to operate at a relatively high rotational speed, which is inappropriate for starting, stopping, and slower travel. Transmission reduces the higher engine speed to the slower wheel speed, increasing torque in the process. Transmissions are also used on pedal bicycles, fixed machines, and where different rotational speeds and torques are adapted In motor vehicles, the transmission generally is connected to the engine crankshaft via a flywheel and/or clutch and/or fluid coupling, partly because internal combustion engines cannot run below a particular speed. The output of the transmission is transmitted via the driveshaft to one or more differentials, which drives the wheels. While a differential may also provide gear reduction, its primary purpose is to permit the wheels at either end of an axle to rotate at different speeds (essential to avoid wheel slippage on turns) as it changes the direction of rotation. Malfunction in the gearbox assembly is mainly due to: • Wear and tear in bearings • Cracks in the gear tooth • Improper lubrication of the meshed gears and associated parts • Repeated use of old spares • A delay in shifting • Clutch less gear shifts 37. 14 On dismantling a gear box, initially the outer casing in the front side is separated from the assembly. Then the covering is removed. Inside the gear box, there is a main shaft and a counter shaft. Both of them are separated from the casing. The gears on the main shaft and counter shaft are separated. The whole parts are washed and cleaned. The problem with the gear box is analysed and any parts with complaints are replaced. The gear box is re-assembled and tested. 38. 15 2.8 CLUTCH AND SMALL UNIT SECTION A clutch is a mechanical device that engages and disengages the power transmission, especially from driving shaft to drive shaft. Clutches are used whenever the transmission of power or motion must be controlled either in amount or over time (e.g., electric screwdrivers limit how much torque is transmitted through use of a clutch; clutches control whether automobiles transmit engine power to the wheels).In the simplest application, clutches connect and disconnect two rotating shafts (drive shafts or line shafts). In these devices, one shaft is typically attached to an engine or other power unit (the driving member) while the other shaft (the driven member) provides output power for work. While typically the motions involved are rotary, linear clutches are also possible. Most light vehicles use a single-plate clutch to transmit torque from the engine to the transmission input shaft. The flywheel is the clutch driving member. The clutch unit is mounted on the flywheel's machined rear face, so that the unit rotates with the flywheel. The clutch unit consists of - a friction- type disc, with 2 friction facings and a central splined hub. - A pressure plate assembly, consisting of a pressed steel cover, a pressure plate with a machined flat face, and a segmented diaphragm spring. And a release bearing and operating fork. The friction disc is sandwiched between the machined surfaces of the flywheel and the pressure plate when the pressure plate is bolted to the outer edge of the flywheel face. The clamping force on the friction facings is provided by the diaphragm spring. Unloaded, it is a dishd shape. As the pressure plate cover tightens, it pivots on its fulcrum rings, and flattens out to exert a force on the pressure plate, and on the facings. The transmission input shaft passes through the centre of the pressure plate. Its parallel splines engage 39. 16 with the internal splines of the central hub, on the friction disc. With engine rotation, torque can now be transmitted from the flywheel, through the friction disc, to the central hub, and to the transmission. When the clutch pedal is depressed, the movement is transferred through the operating mechanism, to the operating fork and the release bearing. The release bearing moves forward and pushes the center of the diaphragm spring towards the flywheel. The diaphragm pivots on its fulcrum rings causing the outer edge to move in the opposite direction and act on the pressure-plate retraction clips. The pressure plate disengages, and drive is no longer transmitted. Releasing the pedal allows the diaphragm to re-apply its clamping force and engage the clutch, and drive is restored. Clutch disc of a Tata Cummins Engine Clutch disc of an Ashok Leyland Engine The regional workshop takes care of two major types of clutch assemblies namely Tata and Leyland. Both are almost similar. Usually problems include wear and tear of arms. Wear of clutch plate, breaking of springs etc. Full Clutch assembly Sectional view 40. 17 2.9 Air Dryer Air dryer is used to remove moisture from air used in brake lines. Installed between the compressor and reservoirs, the air dryer collects and removes solid, liquid, and aerosol contaminants such as water and oil before they enter the air brake system and jeopardize efficient operation. Oil if present in air needs to be removed. Oil can contribute to premature damage in a variety of components such as push-pull dash valves, spring brake modulating valves, and brake chamber diaphragms. And oil-deteriorated seals can cause air system leaks which may cause brake failure. 41. 18 2.10 CROWN AND PINION SECTION In automobiles and other wheeled vehicles, the differential allows the outer drive wheel to rotate faster than the inner drive wheel during a turn. This is necessary when the vehicle turns, making the wheel that is traveling around the outside of the turning curve roll farther and faster than the other. The average of the rotational speed of the two driving wheels equals the input rotational speed of the drive shaft. An increase in the speed of one wheel is balanced by a decrease in the speed of the other. A differential consists of one input, the drive shaft, and two outputs which are the two drive wheels, however the rotation of the drive wheels are coupled by their connection to the roadway. Under normal conditions, with small tyre slip, the ratio of the speeds of the two driving wheels is defined by the ratio of the radii of the paths around which the two wheels are rolling, which in turn is determined by the track-width of the vehicle (the distance between the driving wheels) and the radius of the turn. 42. 19 2.11 BRAKE AND BRAKE CHAMBER An air brake or, more formally, a compressed air brake system, is a type of friction brake for vehicles in pressing on a piston is used to apply pressure to the brake pad needed to stop the vehicle. Air brakes are used in large heavy vehicles, particularly those having multiple trailers which must be linked into the brake system, such as trucks, buses, trailers, and semi-trailers in addition to their use in railroad trains. The air is fed into the air tank via an air compressor connected to the engine. When the tank gets filled the excess air is released through the safety valve. The brake chamber consist of a piston, which moves under the air pressure. It is connected to an S-cam which pushes the brake liner against the brake drum. Brake Chamber The brake liner needs to be changed periodically. Also there are various rubber seals and a rubber diaphragm inside the brake chamber which gets damaged over time due to moisture or wear and tear. These needs to be changed else it would result in leakage of air and poor braking performance. 43. 20 2.12 LATHE WELDING AND RECOVERY SECTION The lathe is used for different turning processes and is used for removing the weld of propeller shaft, taper turning, cutting, sanding, knurling, drilling, or deformation, facing, turning, with tools that are applied to the work piece. The welding section deals with welding of different machine parts to precision. The drilling and other miscellaneous operations are carried out. Slack adjuster The slack adjuster is the part of an air-brake system that is used to adjust the brakes when needed. The slack adjuster is located on the air canister on the axle housing near the wheel. On vehicles with drum brakes, it is between the pushrod and the S-cam. On vehicles with disc brakes, it is between the pushrod and the power screw. Air-brake systems use compressed air to transmit pressure from the brake pedal to the brake pads. They are typically used in larger vehicles such as trucks and buses. All air-brake systems run the risk of moving out of adjustment over time. Out-of-adjustment brakes are the most reported problem from roadside vehicle safety inspectors. Out-of-adjustment brakes constitute a safety hazard, as vehicles with excessive brake slack can be difficult to stop. All vehicles manufactured since 1994 have automatic slack adjusters that adjust themselves during full brake applications. Automatic adjusters should only require manual adjustment during installation. If a brake system with automatic slack adjusters requires periodic adjustments, it is an indication that the automatic slack adjusters are defective and should be repaired. All brake systems, whether they have automatic or manual slack adjusters, should receive regularly scheduled maintenance checkups 44. 21 2.13 TYRE SHOP The tyre shop in the garage is being used to re-tread old tyres by saving money and material. It involves three processes. It starts off where the outer surface of the tyre is shredded against fast rotating sets of blades to ensure a homogenous and even surface. In the next process new treads are glued on to the surface and in the third and final stage, the tyres are baked in an oven for 150 minutes. 45. 22 2.14 POWER STEERING In automobiles, power steering (also power assisted steering (PAS) or steering assist system) helps drivers steer by augmenting steering effort of the steering wheel. Hydraulic or electric actuators add controlled energy to the steering mechanism, so the driver needs to provide only modest effort regardless of conditions. Power steering pump Power steering helps considerably when a vehicle is stopped or moving slowly. Also, power steering provides some feedback of forces acting on the front wheels to give an ongoing sense of how the wheels are interacting with the road; this is typically called "road feel". Representative power steering systems for cars augment steering effort via an actuator, a hydraulic cylinder, which is part of a servo system. These systems have a direct mechanical connection between the steering wheel and the linkage that steers the wheels. This means that power-steering system failure (to augment effort) still permits the vehicle to be steered using manual effort alone. 0 46. 23 2.15 ELECTRICAL SECTION STARTER MOTOR A Starter is device used for rotating an internal-combustion engine so as to initiate the engine's operation under its own power. Engines are feedback systems which once started, rely on the inertia from each cycle to initiate the next cycle. In a four-stroke engine, the third stroke releases energy from the fuel, powering the fourth (exhaust) stroke and also the first two (intake, compression) strokes of the next cycle, as well as powering the engine's external load. To start the first cycle of engine's run session, the first two strokes must be powered in some other way. The starter motor is used for this purpose and is not required once the system starts running. This is simply an electric motor. The power source is the battery of the vehicle. A solenoid switch is used to engage and disengage the starter. ALTERNATOR An alternator is an electrical generator that converts mechanical energy to electrical energy in the form of alternating current. For reasons of cost and simplicity, most alternators use a rotating 47. 24 magnetic field with a stationary armature. This is simply a generator which powers the vehicle once the engine stars running. It also charge the battery. A conductor moving relative to a magnetic field develops an electromotive force (EMF) in it (Faraday's Law). This emf reverses its polarity when it moves under magnetic poles of opposite polarity. Typically, a rotating magnet, called the rotor turns within a stationary set of conductors wound in coils on an iron core, called the stator. The field cuts across the conductors, generating an induced EMF (electromotive force), as the mechanical input causes the rotor to turn. The rotating magnetic field induces an AC voltage in the stator windings. Usual Problems encountered with both these devices are burning of stator coil due to overheating or damage of bearings due to water entry. 48. 25 CHAPTER 3 CONCLUSION The Industrial Training at KSRTC R/W, Mavelikara was a very fruitful experience as pursuing Mechanical Engineering students. The training definitely gave us an opportunity to be a part of a Government institution which has vast experience in repair, maintenance and building of buses. The training at the regional workshop will definitely help us in our future endeavours. We take this moment to thank the Depot Manager, Assistant depot Engineer, Charge Men and all the employees of KSRTC Regional Workshop, Mavelikara for helping us to complete this industrial training. 49. 1 TRAVANCORE SUGARS AND CHEMICALS LIMITED 50. 2 CHAPTER 1 INTRODUCTION The Travancore Sugars & Chemicals Ltd. (TSCCL), a Kerala Government Company incorporated in 1937 with Registered Office and Factory at Valanjavattom about 7 Kms from Thiruvalla in Pathanamthitta District, Kerala commenced commercial production on 12.11.1948. The Company which had three divisions viz Sugar division, Distillery division and Blending & Bottling division was originally owned by M/s Parry & Co. Government of Kerala (GOK) took over the company in 1974. Due to non-availability of the raw material i.e. sugarcane, the sugar division was closed in the year 1998. The distillery division was manufacturing and supplying arrack to Abkari Contractors and until 1992, the company was enjoying a more or less monopoly status in this activity. The competition arising due to liberalization of arrack purchase after 1992 and the subsequent ban by GOK on production and consumption of arrack Distillery division was also closed. The Company is at present engaged in the manufacture of Indian Made Foreign Liquor(IMFL) only and the products are sold through Kerala State Beverages Corporation Ltd. KSBC a Company wholly owned by Government of Kerala, which is a monopoly procurement Agency of IMFL. At present major activities of the company is blending and Bottling and sale of Indian Made Foreign Liquor. Apart from this Company is engaged in the manufacture and sale of Denatured spirit, Rectified spirit and Methylated spirit which are sold to Hospitals and Government/Private Institutions/Research Institutions, Colleges etc. The major departments are Production department, Finance, Accounts Department, Secretarial, Personnel & Administration Department, Purchase & Stores Department etc. Our product "Jawan Deluxe XXX Rum " is a very popular brand in Kerala with superior quality and competitive price. 51. 3 CHAPTER 2 INDIAN MADE FOREIGN LIQUOR (IMFL) Travancore Sugars and Chemicals (TSCCL) is a Kerala government enterprise that no longer produces sugar; yet, it makes profit -unlike many other haemorrhaging state PSUs - from a single product; the state's favourite tippie. Jawan Deluxe XXX Rum has resurrected the fortunes of the company saving it from the brink of closure after the sugar and distillery divisions folded up. Today, its survival hinges on this rum, which has become a rage among the common public in the state. The balance sheet of the nearly 70-year-old TSCCL began to look up after its administrative control was taken over by the excise department from the industry department eight years ago. From 20,000 cases a month then, the sales of Jawan rum have zoomed to 1.25 lakh cases now. Currently, the demand is such that, the company is able to distribute the product only in the southern and central parts of Kerala. The stock is insufficient to cover the entire state. TSCCL is planning to add another assembly line to its existing three to ramp up production. Except blending, the bottling and labelling are managed by Kudumbashree women workers who have been engaged on contract basis. Kudumbashree is a women-empowerment programme of the government aimed at poverty 52. 4 Production of ENA (EXTRA NEUTRAL ALCOHOL) is not done in Travancore sugars and chemical they buy ENA from outside and blend it by adding food colour, flavour and water as shown in the below diagram in a secret signature blending proportion. Flavour ENA food colour water JAWAN XXX RUM 53. 5 CHAPTER 3 COMPONENTS 3.1 CONVEYOR Conveyor, any of various devices that provide mechanized movement of material, as in a factory; they are used principally in industrial applications but also on large farms, in warehousing and freight-handling, and in movement of raw materials. Conveyors may be only a few inches in length, or they may be integrated systems several miles long. Gravity-roller conveyors consist of a series of parallel rollers fastened to a metal frame supported at intervals. The frame can be inclined slightly for gravity flow, but objects and packages may also be rolled along manually. Gravity-wheel conveyors are similar but consist of skate wheels instead of rollers and are usually used for lighter loads. Live-roller conveyors are gravity-roller conveyors that are power driven by means of a belt snubbed against the underpart of the rolls or by a chain driving sprockets attached to the rolls. 54. 6 Belt conveyors of fabric, rubber, plastic, leather, or metal are driven by a power-operated roll mounted underneath or at one end of the conveyor. The belt forms a continuous loop and is supported either on rollers, for heavy loads, or on a metal slider pan when the load is light enough to prevent frictional drag on the belt. Electric motors operating through constant- or variable-speed reduction gears usually provide the power. Floor conveyors use chain, cable, or other linkage mounted in or close to the floor in an endless track. They are usually designed to drag a train of four-wheeled carts around in a loop to carry large products or materials for assembly on the conveying system. Power is furnished to the chain by guiding rollers. Slat conveyors consist of endless chains, driven by electric motors operating through reduction gears and sprockets, with attached spaced slats to carry objects that would damage a belt because of sharp edges or heavy weights. Flight conveyors have scrapers, or flights, mounted at intervals perpendicular to the direction of travel on endless power-driven chains operating within a trough. Bulk materials such as sawdust, sand, gravel, coal, and chemicals may be pushed along the trough. Apron conveyors consist of endless chains with attached overlapping and interlocking plates to provide a continuous-carrying surface that forms a leakproof bed suitable for bulk materials without containers. Vibrating conveyors consist of troughs or tubes flexibly supported and vibrated by mechanical or electrical means to convey objects or bulk materials; vibration takes place in an inclined, elliptical pattern to cause directional as well as upward movement of the material. In trolley conveyors an overhead rail carries a series of load-bearing containers (trolleys) that are coupled together on an endless propelling medium such as cable, chain, or other linkage. The trolleys may be hooks, magnets, or various carriers designed for the particular load to be handled. The rails are usually supported by the framework of the plant building. The masse conveyors use skeletal or solid flights mounted at intervals on a cable or chain power driven within a closely fitting casing. Designed for bulk materials that must be enclosed to 55. 7 prevent leakage or explosion, the conveyors can operate in horizontal, vertical, or inclined positions. Bucket conveyors consist of endless chains or belts to which are attached buckets to convey bulk material in horizontal, inclined, and vertical paths. The buckets remain in a carrying position until they are tipped to discharge the material. Various discharging mechanisms are available. Screw conveyors consist of revolving shafts with continuous or broken spiral flighting that operates inside a casing. Powered by an electric motor and suitable gearing, the screw conveyor usually operates in one direction only to move fine bulk material such as meal, seed, and coal. Pneumatic conveyors use air pressure or vacuum to move bulk material in tubes or ducts. Tow conveyors may be overhead trolley cars or floor conveyors adapted for handling dollies, trucks, and cars, which are locked into the towing chain to be moved from any point in the system to any other point. Various conveyors may be mounted on mobile supports, particularly gravity roller and wheel conveyors and short belt conveyors, for adaptation to portable use. During the 1960s, air-float conveyors were introduced consisting of a platform, or pallet, equipped with air jets underneath to provide levitation. This supported, the platform can be easily moved in any direction over a flat surface. 3.2 SCREW CAP Screw caps' use as an alternative to cork for sealing wine bottles is gaining increasing support. A screw cap is a metal cap that screws onto threads on the neck of a bottle, generally with a metal skirt down the neck to resemble the traditional wine capsule ("foil"). A layer of plastic (often PVDC), cork, rubber, or other soft material is used as wad to make a seal with the mouth of the bottle. The most known brand of wine screw caps is Stelvin and like the brand names Xerox or Kleenex, has become so established it is commonly used in the wine industry as generic 56. 8 trademark for any brand of screwcap. The caps have a long outside skirt, intended to resemble the traditional wine capsule ("foil"), and use plastic PVDC (Polyvinylidene chloride) as a neutral liner on the inside wadding. The Stelvin was developed in the late 1960s and early 1970s by a French company Le Bouchage Mécanique at the behest of Peter Wall, the then Production Director of the Australian Yalumba winery.In 1964 Peter Wall approached Le Bouchage Mécanique. The Stelvin cap was trialed in 1970 and 1971 with the Swiss wine Chasselas, which was particularly affected by cork taint, and was first used commercially in 1972 by the Swiss winery Hämmerl. From about 1973 Yalumba and a group of other wineries - Hardys, McWilliams, Penfolds, Seppelt, Brown Bros and Tahbik - were involved in developing and proving up the concept and began using it commercially in 1976. Le Bouchage Mécanique was later acquired by Pea-Pechiney, which became part of Alcan, then Rio Tinto Alcan and now Amcor.The brand was developed by Rio Tinto Alcan. It was trademarked in 1975. It was preceded as a closure by a Stelcap/cork combination (closed with cork, with a Stelcap on top); the Stelcap was also a long-skirted screw cap, but with a different inner lining (paper over cork, instead of PVDC or PVDC covered by foil-covered paper in a Stelvin). In 2005, a modified Stelvin cap, Stelvin Lux, was introduced. Like the standard Stelvin cap, the outer shell is aluminum, but there is no externally visible screw thread or knurling, giving the closure a cleaner look more like a traditional foil capsule. Internally, there is a pre-formed thread, and the sealing materials are the same as the standard Stelvin cap. 3.3 ENA-EXTRA NEUTRAL ALCOHOL (ENA) 57. 9 The Extra Neutral alcohol or ENA is a high distilled alcohol without any impurities and others estimated to be used in the high cosmetic industry, perfumeries as well as for the production of alcoholic beverages such as whisky, vodka, gin, cane, liqueurs and alcoholic fruit beverages and aperitifs. This colorless alcohol has a neutral smell and taste. It is used in the production of potable alcohol and also as a solvent and reactant in the pharmaceutical industry and as a carrier of flavor and fragrances. APPLICATIONS ENA is mainly used in the production of potable alcohol, in the pharmaceutical industry. In the flavors and fragrance industry, dilute ethanol is used to produce distilled vinegar, flavor extracts and concentrates for soft drinks and food products. General Application: Alcoholic beverages incl. whisky, rum, vodka, gin, cane, liqueurs and alcoholic fruit beverages. 3.4 ROLLER SEAL PRINTER It is a roller printer on which the image or data to be printed is made as projections and then the roller is curved surface is applied by ink and rolled above the paper. 58. 10 CHAPTER 4 CONCLUSION As the sugarcane is transported in large quantities by lorries, country boats and bullock carts, the sugar factory had undertaken the construction of roads in its command area. The State government provides area development funds for this purpose. The good quality roads were responsible in reducing the cost of transportation as well as time also. In short, it may be concluded that the region of this sugar factory experienced tremendous change in socioeconomic development during the period of 1960 to 1985. The socio-economic conditions of the people concerned in the region have improved a lot and people have benefited in all sectors of the economy by the Travancore sugar factory. The main advantage of the factory was the abundant availability of raw material. The location of the factory was more favorable for the cultivation, availability of laborer's and cheap transportation of sugarcane. The fertility and soil conditions of that particular region were also hold significant importance for the sugarcane cultivation. There are certain areas on the both sides of the river banks in this factory were sugarcane is the only sure crop which will not be damaged by floods and all such lands are rendered useful to the cultivators after the establishment of this 2 Report of the committee Travancore Sugars and Chemicals Ltd 1974, P 77. 60 sugar factory. Even though the company enjoyed these facilities, due to a lot of internal and external problems the performance of company down to slow pace day by day.

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