Dr. Bhimrao Ambedkar University, Agra

A State University of Uttar Pradesh (Formerly: Agra University, Agra)

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Sample evaluated project report/field work report submitted by the students

Research work Report

A Literature Review on Parallel Algorithms

DEPARTMENT OF COMPUTER SCIENCE

LITERATURE REVIEW

Session: 2022-2024

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COURSE : M.Sc. (C.S.)

SEMESTER : III

COLLEGE: INSTITUTE OF ENGINEERING & TECHNOLOGY

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PARALLEL ALGORITHMS

INTRODUCTION

The subject of is the design and analysis of parallel algorithms. Most of today's algorithms are sequential, that is, they specify a sequence of steps in which each step consists of a single operation. These algorithms are well suited to today's computers, which basically perform operations in a sequential fashion. Although the speed at which sequential computers operate has been improving at an exponential rate for many years, the improvement is now coming at greater and greater cost. As a consequence, researchers have sought more cost-effective improvements by building "parallel" computers – computers that perform multiple operations in a single step. In order to solve a problem efficiently on a parallel machine, it is usually necessary to design an algorithm that specifies multiple operations on each step, i.e., a parallel algorithm.

As an example, consider the problem of computing the sum of a sequence A of n numbers. The standard algorithm computes the sum by making a single pass through the sequence, keeping a running sum of the numbers seen so far. It is not difficult however, to devise an algorithm for computing the sum that performs many operations in parallel. For example, suppose that, in parallel, each element of A with an even index is paired and summed with the next element of A, which has an odd index, i.e., A[0] is paired with A[1], A[2] with A[3], and so on. The result is a new sequence of ⌈n/2⌉ numbers that sum to the same value as the sum that we wish to compute. This pairing and summing step can be repeated until, after ⌈log2 n⌉ steps, a sequence consisting of a single value is produced, and this value is equal to the final sum.

The parallelism in an algorithm can yield improved performance on many different kinds of computers. For example, on a parallel computer, the operations in a parallel algorithm can be performed simultaneously by different processors. Furthermore, even on a single-processor computer the parallelism in an algorithm can be exploited by using multiple functional units, pipelined functional units, or pipelined memory systems. Thus, it is important to make a distinction between the parallelism in an algorithm and the ability of any particular computer to perform multiple operations in parallel. Of course, in order for a parallel algorithm to run efficiently on any type of computer, the algorithm must contain at least as much parallelism as the computer, for otherwise resources would be left idle. Unfortunately, the converse does not always hold some parallel computers cannot efficiently execute all algorithms, even if the algorithms contain a great deal of parallelism. Experience has shown that it is more difficult to build a general-purpose parallel machine than a general-purpose sequential machine.

An algorithm is a sequence of steps that take inputs from the user and after some computation, produces an output. A parallel algorithm is an algorithm that can execute several instructions simultaneously on different processing devices and then combine all the individual outputs to produce the final result. The easy availability of computers along with the growth of Internet has changed the way we store and process data. We are living in a day and age where data is available in abundance. Every day we deal with huge volumes of data that require complex computing and that too, in quick time. Sometimes, we need to fetch data from similar or interrelated events that occur simultaneously. This is where we require concurrent processing that can divide a complex task and process it multiple systems to produce the output in quick time. Concurrent

REVIEW ON PARALLEL ALGORITHM

Guy E. Blelloch And Bruce M. Maggs "Parallel Algorithm",2006

By this article the research on parallel algorithms has shifted to pragmatic issues. The theoretical work on algorithms has been complemented by extensive experimentation. This experimental work has yielded insights into how to build parallel machines [Almasi and Gottlieb 1994], how to make parallel algorithms perform well in practice [Sabot 1995], how to model parallel machines more accurately, and how to express parallel algorithms in parallel programming languages. Two effective parallel programming paradigms have emerged: control-parallel programming and data-parallel programming. In a control-parallel program, multiple independent processes or functions may execute simultaneously on different processors and communicate with each other. Some of the most successful control-parallel programming systems are Linda, MPI, and PVM. In each step of a data-parallel program an operation is performed in parallel across a set of data. Successful data-parallel programming languages include *Lisp, NESL, and HPF. Although the data-parallel programming paradigm might appear to be less general than the control-parallel paradigm, most parallel algorithms found in the literature can be expressed more naturally using data-parallel constructs. There has also been a focus on solving problems from applied domains, including computational biology, astronomy, seismology, fluid dynamics, scientific visualization, computer-aided design, and database management. Interesting algorithmic problems arising from these domains include generating meshes for finite element analysis, solving sparse linear systems, solving n-body problems, pattern matching, ray tracing, and many others. Commodity personal computers with multiple processors have begun to appear on the market. As this trend continues, we expect the use of parallel algorithms to increase dramatically.

Clark F. Olson "Parallel Algorithms For Hierarchical Clustering",2010

We have considered parallel algorithms for hierarchical clustering using several intercluster distance metrics and parallel computer architectures. The complexities achieved. In addition to the results discussed here, O(n) time algorithms for n processor CRCW PRAMS exist for each metric except for the general case . We have achieved optimal efficiency for each metric on a PRAM and for the single link, centroid, median, and minimum variance metrics on a butterfly or tree. Due to the nature of the average link and complete link metrics, we hypothesize that optimal parallel performance is not possible for them on parallel architectures with local memory.

T. Y. Zhang And C. Y. Suen "A Fast Parallel Algorithm For Thinning Digital Patterns"2016

A parallel algorithm for thinning different types of digital patterns is presented in this paper. Each iteration is divided into two subiterations that remove the boundary and corner points of the digital patterns. After several iterations, only a skeleton of the pattern remains. The proposed algorithm appears to be very efficient in the thinning of digital patterns and it compares favorably with those described in . This indicate that by parallel algorithm it become 1.5 to 2.3 times faster than the four-step and two-step methods while the resulting skeletons look very much the same.

H. T. KUNG "The Structure of Parallel Algorithms",2018

We view a parallel algorithm as a collection of independent task modules that can be executed in parallel and that communicate with each other during the execution of the algorithm.we identify three orthogonal dimensions of the space of parallel algorithms: concurrency control, module granularity, and communication geometry. Along each dimension, we illustrate some important positions that parallel algorithms can assume, but no attempt will be made to list all possible positions. we characterize parallel algorithms that correspond to three important parallel architectures along the concurrency control and module granularity dimensions. this characterization together with the third dimension (communication geometry) forms a taxonomy for parallel algorithms. Our taxonomy is crude and is by no means meant to be complete. The main purpose of introducing it here is to provide a framework for later discussions in this article. We hope that future work on the taxonomy will make it possible to unambiguously classify parallel algorithms at a conceptual level, and to relate each parallel algorithm to those parallel architectures to which it naturally corresponds.

7. SUMMARY

Recent work on parallel algorithms has focused on solving problems from domains such as pattern matching, data structures, sorting, computational geometry, combinatorial optimization, linear algebra, and linear and integer programming.

Algorithms have also been designed specifically for the types of parallel computers that are available today. Particular attention has been paid to machines with limited communication bandwidth. For example, there is a growing library of software developed for the BSP model.

The parallel computer industry has been through a period of financial turbulence, with several manufacturers failing or discontinuing sales of parallel machines. In the past few years, however, a large number of inexpensive small-scale parallel machines have been sold. These machines typically consist of 4 to 8 commodity processors connected by a bus to a shared-memory system. As these machines reach the limit in size imposed by the bus architecture, manufacturers have reintroduced parallel machines based on the hypercube network topology.

8. DEFINING TERMS

CRCW. A shared memory model that allows for concurrent reads (CR) and concurrent writes (CW) to the memory.

CREW. This refers to a shared memory model that allows for Concurrent reads (CR) but only exclusive writes (EW) to the memory.

Depth. The longest chain of sequential dependences in a computation.

EREW A shared memory model that allows for only exclusive reads (ER) and exclusive writes (EW) to the memory.

Graph Contraction. Contracting a graph by removing a subset of the vertices.

List Contraction. Contracting a list by removing a subset of the nodes.

Multiprefix. A generalization of the scan (prefix sums) operation in which the partial sums are grouped by keys.

Multiprocessor Model. A model of parallel computation based on a set of communicating se- quential processors.

Pipelined Divide-and-Conquer. A divide-and-conquer paradigm in which partial results from recursive calls can be used before the calls complete. The technique is often useful for reducing the depth of an algorithm.

Pointer Jumping. In a linked structure replacing a pointer with the pointer it points to. Used for various algorithms on lists and trees.

PRAM model. A multiprocessor model in which all processors can access a shared memory for reading or writing with uniform cost.

Prefix Sums. A parallel operation in which each element in an array or linked-list receives the sum of all the previous elements.

Random Sampling. Using a randomly selected sample of the data to help solve a problem on the whole data.

Recursive Doubling. The same as pointer jumping.

Scan. A parallel operation in which each element in an array receives the sum of all the previous elements.

Shortcutting. Same as pointer jumping.

Tree Contraction. Contracting a tree by removing a subset of the nodes.

Symmetry Breaking. A technique to break the symmetry in a structure such as a graph which can locally look the same to all the vertices. Usually implemented with randomization.

Work. The total number of operations taken by a computation.

Work-Depth Model. A model of parallel computation in which one keeps track of the total work and depth of a computation without worrying about how it maps onto a machine.

Work-Efficient. A parallel algorithm is work-efficient if asymptotically (as the problem size grows) it requires at most a constant factor more work than the best know sequential algorithm (or the optimal work).

Work-Preserving. A translation of an algorithm from one model to another is work-preserving if the work is the same in both models, to within a constant factor.

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Internship Report

INSTITUTE OF ENGINEERING & TECHNOLOGY

DR. BHIMRAO AMBEDKAR UNIVERSITY,

KHANDARI CAMPUS AGRA

INTERNSHIP REPORT

(Air Spring used DEMU with its Function & Overhauling)

INTERNSHIP DATE (19-06-2023 to 15-07-2023)

Submitted in partial fulfillment of the Requirement of the award of the degree of

BACHELOR OF ENGINEERING IN MECHANICAL ENGINEERING

Submitted by:

(Divyaditya Kumar Gaurav)

7th Semester 4th Year

Roll no: 2009005531014

<u>DECLARATION</u>

I hereby certify that the work which is being presented in the report entitled **"Air Spring used DEMU with its Function & Overhauling** in fulfillment of the requirement for completion of one-month Summer Training in (Locomotive Workshop, Northern Railway, Charbagh, Lucknow) of **INSTITUTE OF ENGINEERING AND TECHNOLOGY, DBRAU AGRA** is an authentic

Record of my own work carried out during Summer Training.

Divyaditya Kumar Gaurav

Name and Signature of Student

Summer training viva-voce examination of

Mr. <u>Divyaditya Kumar Gaurav</u> , B.E (Mechanical Engineering) has been

held on <u>(19-06-2023 to 15-07-2023)</u>

Signature:

Er. Nagendra Singh

(Department of Mechanical Engineering)

ACKNOWLEDGEMENT

I am highly grateful to **Prof. Manu Pratap Singh, Director IET Khandari Campus, Dr. Bhimrao Ambedkar University Agra,** for providing this opportunity to carry out Summer Training at **(Locomotive Workshop, Northern Railway, Charbagh, Lucknow)**

The constant guidance and encouragement received from **Er. VIPIN KUMAR, INCHARGE Mechanical Engineering,** has been of great help.

I would like to express a deep sense of gratitude and thanks profusely to **(Mr. S. S. Tripathi), Instructor,** without the wise counsel and able guidance, it would have been impossible to complete the report in this manner.

I would like to express gratitude to other faculty members of Mechanical department for their intellectual support throughout the course of this work.

Finally, I am indebted to all whosoever have contributed in this report work.

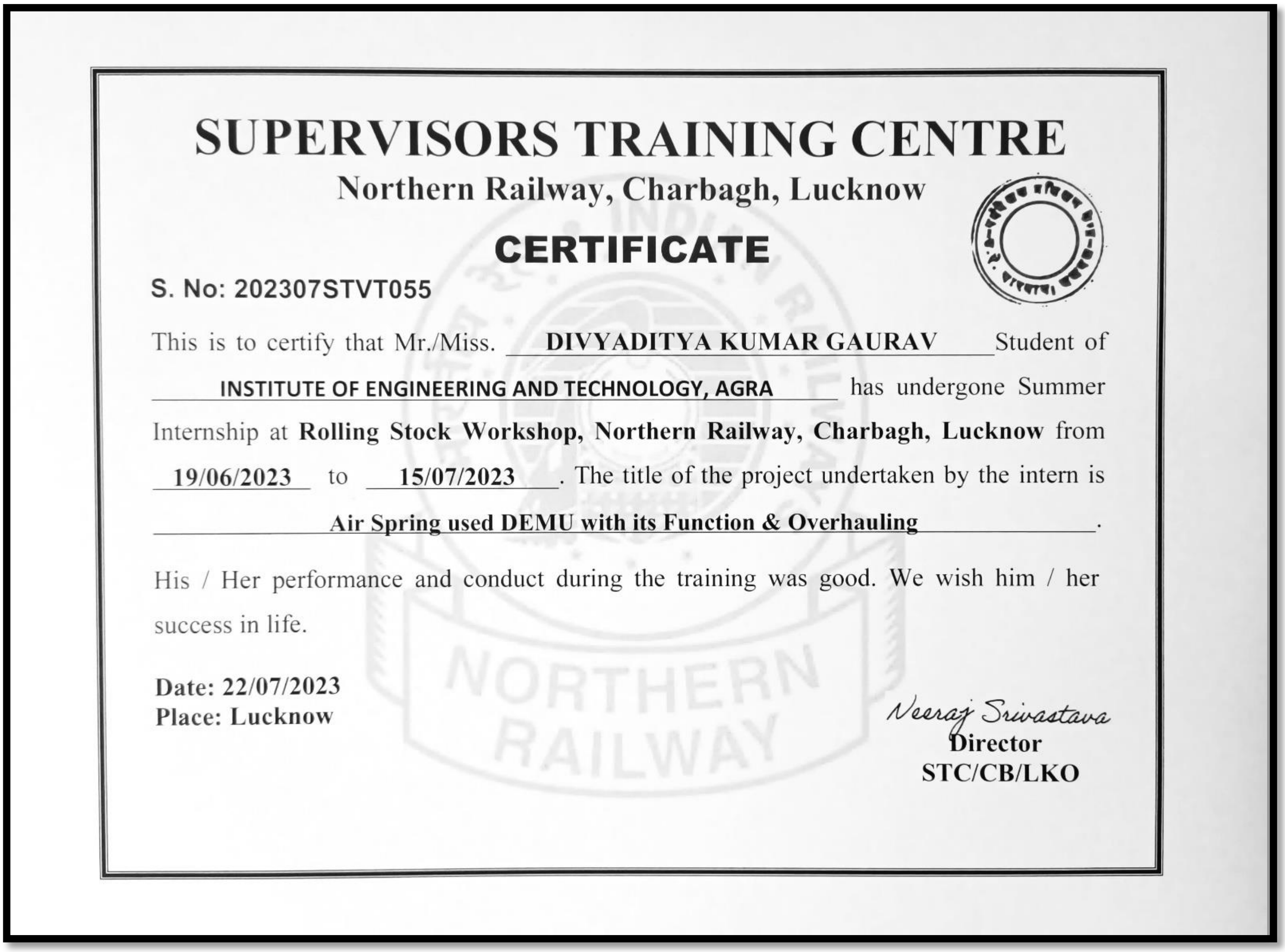
Divyaditya

Divyaditya Kumar Gaurav

B.E. (Mech. Engg.)

7th Semester, 4th Year

Roll No. 2009005531014



SUPERVISORS TRAINING CENTRE

Northern Railway, Charbagh, Lucknow

CERTIFICATE

S. No: 202307STVT055

This is to certify that Mr./Miss. DIVYADITYA KUMAR GAURAV Student of INSTITUTE OF ENGINEERING AND TECHNOLOGY, AGRA has undergone Summer Internship at **Rolling Stock Workshop, Northern Railway, Charbagh, Lucknow** from 19/06/2023 to 15/07/2023. The title of the project undertaken by the intern is Air Spring used DEMU with its Function & Overhauling.

His / Her performance and conduct during the training was good. We wish him / her success in life.

Date: 22/07/2023
Place: Lucknow

Neeraj Srivastava
Director
STC/CB/LKO

AIR SUSPENSION

❖ INTRODUCTION

The loading on DEMU coaches has increased from designed value (in a trailer coach) of 18 t to 34 t, popularly known as super dense crush load. With the existing coil spring type bogie suspension of ICF coaches, the bogies clearance basically meant for absorbing dynamic movement of the coach just vanish, resulting into severe hitting between various bogie components. This leads to premature failure of bogie components and poor riding behavior of the coach.

Pneumatic suspension (Air spring) at secondary stage has been taken up with optimized

values of stiffness and damping characteristics to over come this problem.

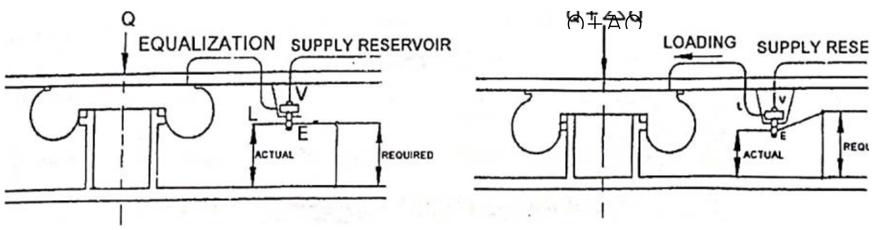
Advantages of air suspension

- Capable to sustain Super Dense Crush Loads of sub-urban traffic
- Constant floor height of coach.
- Excellent ride comfort
- Safe running
- Virtually Constant natural frequency from tare to full loads.
- Low design height
- Integral input signal for load dependent braking and acceleration.
- Isolation of structure borne noise.
- Improved reliability, reduced maintenance
- High durability
- Possibility of voluntarily spring characteristics.

- WORKING PRINCIPLE

  In this system the properties o ai are use for cuShioning effect (springiness). Enclosed pressurized air in a predefine —chamber air spring, provides various suspension characteristics including [I]damping Air spring—i height controlled load leveling suspension device. With changing loads air spring reacts»nitially by changing the distance between air spring supports and vehicle body. The leveling valve 'is, in turn, actuated, either getting thecompressed air pressure to the air spring or releasing air pressure from it to the atmosphere. This process continues until original height is-restored.

AIR SUSPENSION CONTROL LOOP



SUPPLY RESERVOIR

Q—AQ UNLOADING

SERVOIR

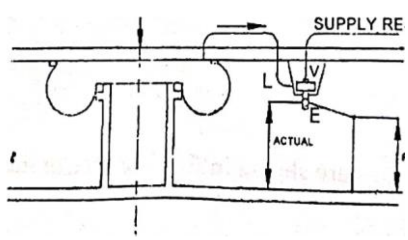


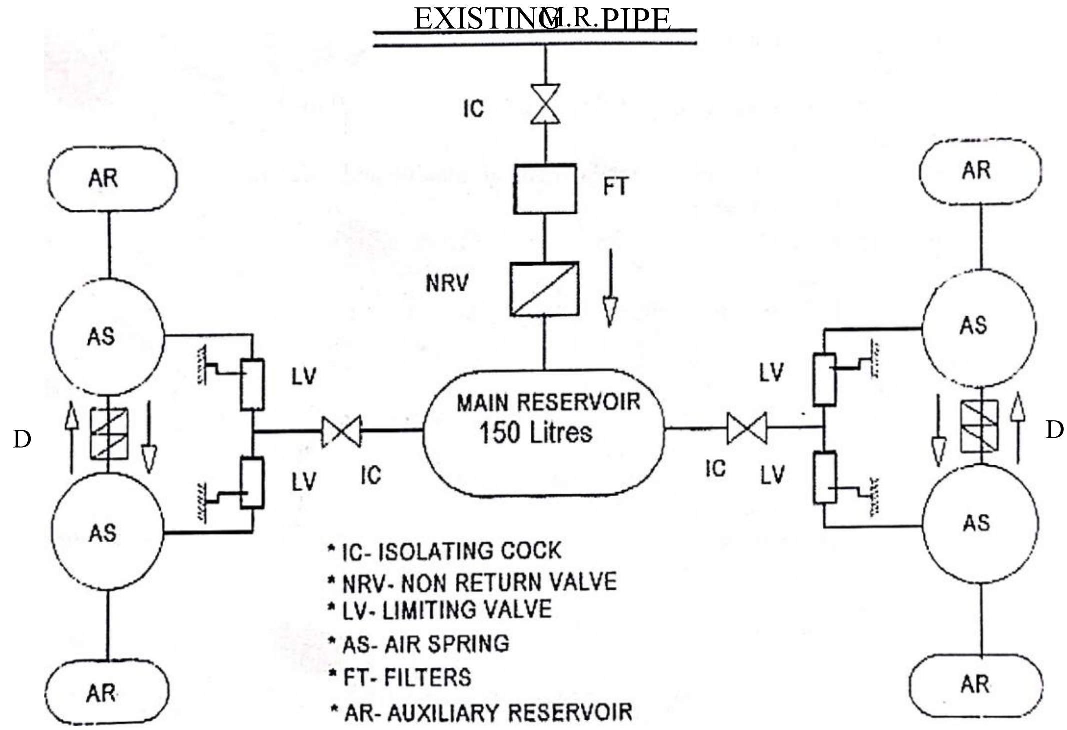
Fig. 1 Working principle of Air spring

❖ ACHIVING OF ITS CHARACTERISTICS

- A soft flexible characteristic under vertical direction is achieved by compression of the air.
- An excellent lateral spring characteristic is achieved by variation in effective area in lateral direction.
- Good self damping is achieved by placing an optimized orifice between air spring and additional reservoir.
- To avoid unnecessary air consumption due to all modes of vehicle oscillation or change in air pressure is achieved by designing delayed reaction of leveling valve.

❖ SCHEMATIC LAYOUT

A Schematic layout of pneumatic suspension control equipments is explained in Fig.2.



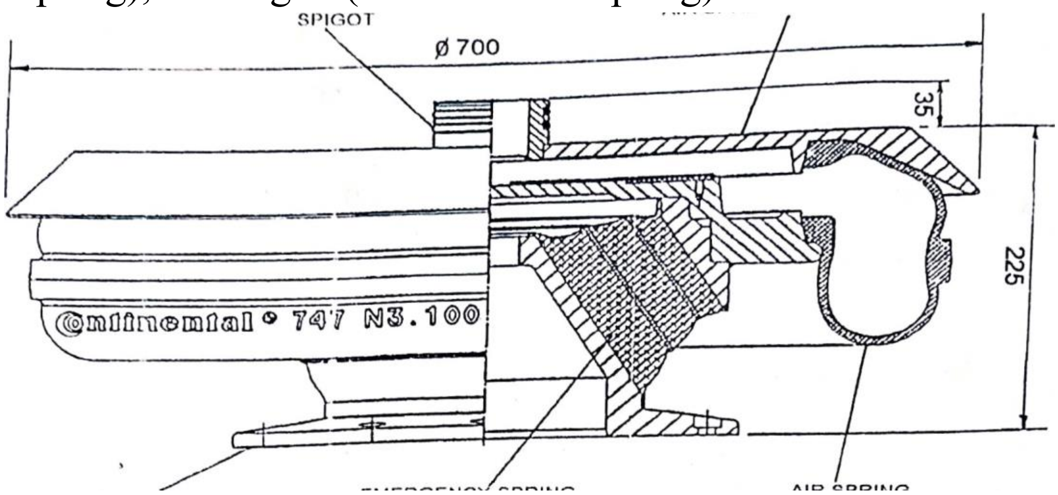
- IC- ISOLATING COCK
- NRV. NON RETURN VALVE
- LV, LIMITING VALVE
- AS- AIR SPRING
- FT. FILTERS

Fig. 2 Schematic layout of air suspension equipments

There are two types (makes) of air suspension used in DEMU bogies

1. Contitech
2. Firestone

Construction details of air springs are shown in fig. 3 & 4 (Contitech air spring), and Fig. 8 (Fire stone air spring).



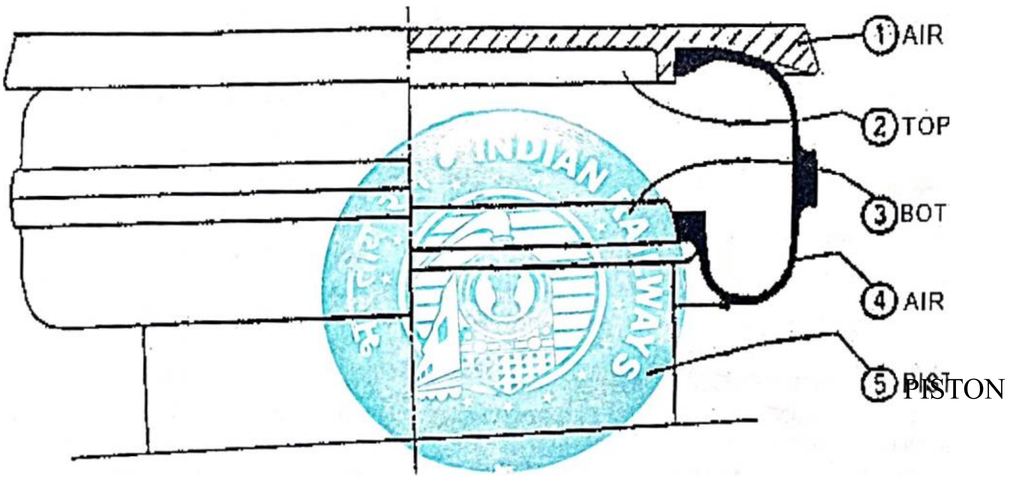


Fig. 3 Constructional details of CONTITECH air spring

Functional description of the structural elements:

Attachment wire core:	Steel wire- guarantees stable seating of the sealing bead on the rim and sealin of the airs rin late or iston.
External protective coat:	100% highly flexible neoprene for protection against the effects of the weather, faces and extensivel a ainst oil.
Reinforcement:	Polyamide fabric —guarantees operation, bursting pressure protection and service life.
Belt:	S ecific functional element
Internal cover coat:	100% highly flexible neoprene guarantees sealing of the internal space of the air s rin a ainst atmos here.

Field work Report

DR. BR AMBEDKAR UNIVERSITY, AGRA

Department of Pharmacy

Community Pharmacy Internship Report

Academic year: 2022/2023

Name: Reliance Pharmacy

Pharmacy: Reliance Netmeds Limited

Pharmacy Address: Agra, Uttar Pradesh

Signature Not Verified
RAJEEV KUMAR
Digitally Signed By: Registrar

Introduction

Practical pharmacy experience is part of the total education of an intern that results in a competent professional. The intern is to be exposed to the duties and responsibilities of the pharmacist in pharmacy practice settings. This experience occurs after the completion of the second professional year, a period in which the knowledge gained during academic studies is applied to pharmacy practice. During this time, the intern pharmacist should acquire a mature and responsible attitude towards the practice of pharmacy in relation to patient, professional colleagues and the general public. The student will be exposed to:

- Logistics
- Professional policies
- Interactive work experience with health care professionals
- Business management
- Quality management system
- Human resources management
- Initiation to communicate with patient

This document will be used as a practical roadmap to enhance understanding of the pharmacist role and responsibilities in the practice of pharmacy to:

A. Develop confidence in his or her ability to apply academic knowledge in a professional patient care setting.

B. Recognize and work through the daily activities and responsibilities of a pharmacist in a variety of work settings.

C. Acquire knowledge and competency in the areas of:

1. Drug distribution systems including dispensing activities.
2. The use of drug products and dosage forms in practice settings.
3. Sterile and/or non-sterile compounding activities.
4. Daily operations and routines of the pharmacy.
5. Management of inventory, purchasing, recalls.

6. Accounting, budgeting, and data management.
7. Providing direct patient pharmaceutical care.
8. Counseling and monitoring for prescription and OTC products.
9. Teaching about medical/surgical supplies, devices and equipment.
10. Counseling and assessment for naturopathic, herbal, and other alternative products.
11. Participation as a member of the health care team.
12. Responding professionally to drug information requests.
13. Application of the laws and regulations governing the practice of pharmacy

D. Become ethically trained as a member of the health care team to recognize and follow practice standards established by professional organizations, to become familiar with and demonstrate an ability to practice under the codes of professional conduct.

Objectives

To achieve the cited objectives, the intern must perform professional patient-oriented activities encountered in daily practice of pharmacy, designed so that the student integrates the process of pharmaceutical care practice grouped into five experiences:

A. Knowledge of the training environment.
B. Preparation, administration and storage of medicines.
C. Dispensing, prescription processing.
D. Clinical activities.

Suggested activities

Some learning activities proposed in the implementation guides help the tutor and student to jointly establish a program of activities likely to promote the objectives of this course. If necessary, the supervisor may also assign to the student some designed activities in order to achieve the mentioned objectives.

Experience	Objective	Activities
Knowledge of the training environment: Laws and regulations, Administration, Internal organization	1. Explain the role of the personnel 2. Understand the area repartition: dispensing area, storage, preparation area, refrigerators, required equipment 3. Understand the code of conduct governing relations between the pharmacist and his staff, colleagues, doctors and patients	Please refer to the detailed activities related to this section part A
Dispensing, processing prescription	1. Dispensation and validation of an order	• Verification of delivered prescription
Clinical Activities, patient management and counseling	Communication with patient, counseling, analysis of therapy	**Get familiar with** drug properties, names, patient management

GENERAL AND SPECIFIC LEARNING:

- Human Resources Management
- Finance: Taxation regulations, Knowledge of different types of declarations
- Pharmacist business relations with the health care partners
- Information Management System
- Stock management: Drug order
- Make extemporaneous preparation of medicinal products
- Dispensing, Processing the Prescription
- Prescription and validation: the pharmacist facing the patient
- Patient Management
- Patient counseling