SPARKLE

2018

IPS ACADEMY

Institute Of Engineering And Science

Fire Technology And Safety Engineering Department

O Agni! Help us to gain prosperity by leading us

On the righteous path,

You know all our thoughts and actions.

Redeem us from all our sins and evil ways.

We bow before you with gratitude.

-Rigveda

DEDICATION

A Fire and Safetyman is the member of that unselfish organization of men who hold devotion of duty above personal risk, who count sincerity of service above personal comfort and convenience, who strive, unceasingly to find better ways of protecting the homes of fellow citizens and property of the nation from the ravages of fire and other disasters. This journal is dedicated to all those who have sacrificed their lives in achieving this noble cause.

STUDENT CHAPTER

Department of Fire Technology & Safety Engineering established student chapter under Fire & Security Association of India (FSAI) in year 2016. Fire & Security Association of India (FSAI) is a non-profit organization representing the Fire Protection, Life Safety, Security, Building Automation, Loss Prevention and Risk Management domains. FSAI aims to work closely with the Government and all other stakeholders to enable the Indian fire and security industry to reach global pre-eminence with better regulatory framework. Since its establishment the department has been running engineering career oriented Quality Improvement Programme (Q.I.P.) to render the best Fire & Safety professionals to the corporate world. These programmes includes basic fire-fighting training, first aid paramedics training, design of fixed fire-fighting installations and national seminar/workshops that impart best training to our students.

President's Message

I have always believed that no doubt it is important to start new projects, undertake novel ventures, but more important is to insure that they do not remain one time wonders but become a continuous process, a habit, a tradition. Therefore it gives me great pleasure to see the periodic issue "SPARKLE". I congratulate the editorial team of SPARKLE and wish them to success.

Achal K Choudhary,

President,

IPS Academy Indore (MP) India

Principal's Message

Technical Education is the most potential instrument for socio-economic change. Presently, the engineer is seen as a high-tech player in the global market. Distinct separation is visible in our education between concepts and applications. Most areas of technology now change so rapidly that there is a need for professional institutes to update the knowledge and competence.

Institute of Engineering and Science, IPS Academy is a leading, premium institution devoted to imparting quality engineering education since 1999. The sustained growth with constant academic brilliance achieved by IES is due to a greater commitment from management, dynamic leadership of the president, academically distinctive and experienced faculty, disciplined students and service oriented supporting staff.

The Institute is playing a key role in creating and ambiance for the creation of novel ideas, knowledge, and graduates who will be the leaders of tomorrow. The Institute is convinced that in order to achieve this objective, we will need to pursue a strategy that fosters creativity, supports interdisciplinary research and education. This will also provide the students with an understanding and appreciation not only of the process of knowledge creation, but also of the process by which technology and knowledge may be used to create wealth as well as achieve social economic goals.

I am delighted to note that the engineering graduates of this institute have been able to demonstrate their capable identities in different spheres of life and occupied prestigious position within the country and abroad. The excellence of any institute is a measure of achievements made by the students and faculty.

All the Best.

Dr. Archana Keerti Chowdhary

Principal

HOD's Message

In order to achieve the aims and objectives of the society we plan to undertake some useful activities like organizing seminars, workshops and conferences at national and international level and publication of relevant technical literature. In this process it has been decided to publish a technical magazine entitled "Sparkle". The magazine is covering area relating to Fire, Safety and Occupational health/ hygiene. The article and research paper being contributed by the student writers with a mission of spreading awareness about Fire Prevention and Protection, Industrial Safety and Occupational health/hygiene. This will also help in generating awareness and educating the common people, which in turn will help in reducing loss of life and property. The society will provide the National Forum to meet and discuss the various issues and developments in the field of fire protection and industrial safety. The technical magazine will have a wider circulation among leading consultants, organizations concerned with the Fire, Safety and Environment protection.

Dr. Praveen Patel
Head of Department


Editorial Board

CONTENTS

PROGRAM EDUCATIONAL OBJECTIVES

PEO 1: To provide student with an academic environment aware of excellence, outstanding leadership, written, ethical codes and guidelines with moral values, and the life-long learning needed for a successful professional career.

PEO 2: To prepare students for job profile of Fire/Safety Officer with professional advancement in fire technology and safety engineering field through global education.

PEO 3: To provide students with basic foundation in mathematical, scientific and engineering fundamentals for solving complex problem in fire technology and safety engineering and to pursue higher studies.

PEO 4: To train students with good scientific, engineering and life safety breadth so as to comprehend analyze, design and create novel products and solutions for the real life problem.

PEO 5: To inculcate in students professional and ethical attitude, effective communication skills, team work skills, multidisciplinary approach and ability to relate fire and safety engineering issues to broader and social context.

PROGRAM OUTCOMES (POs)

The POs as recommended in National Board of Accreditation (NBA), New Delhi manual are as follows:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one’s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs)

1. Ability to design solution for the complex major hazardous industries in terms of fixed fire-fighting installations and fire prevention that meet the specified needs.

2. Ability to describe the impact of safety engineering solutions in environmental, economic and societal context.

Department Information

Department of Fire Technology & Safety Engineering was established in the year 1999. The Department became the first AICTE Approved Engineering Department for providing four years Bachelor degree of Engineering in Fire Technology & Safety Engineering.

Since its establishment the department has been running engineering career oriented quality improvement programme (Q.I.P.) to render the best Fire & Safety professionals to the corporate world. These programmes include basic fire-fighting training, first aid paramedics training, design of fixed fire-fighting installations and national seminar/workshops that impart best training to employee of Industries to gain skill.

Department of Fire Technology & Safety Engineering is a leading department devoted to imparting quality Fire & Safety Engineering education. Apart from AICTE New Delhi, approval and affiliation with the Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal, department got approval from the chief factory Inspectorate labour department, Govt. of M.P. as per Gazette notification dated 29.05.2009.

COURSES OFFERED:-

1. UG – B.E. in Fire Technology & Safety Engineering
2. UG – B.E. in Safety and Fire Engineering
3. PG – M.Tech. in Industrial Safety Engineering

VISION & MISSION OF THE DEPARTMENT

Vision

To generate, develop and sustain a voluntary movement on Fire & Safety Engineering at the National Level aimed at educating and influencing society to adopt appropriate policies, practices and procedures that prevent and mitigate human suffering and economic loss arising from all types of accidents.

Mission

1 To create and sustain a community of learning in which students acquire knowledge in fire, safety and hazard management and learn to apply it professionally with due consideration for ethical, human life & property safety issues.

2 To pursue research and development in fire safety engineering, hazard management and disseminate its findings.

3 To meet the challenges of today and tomorrow in the most effective, efficient and contemporary educational manner.

4 To help in building national capabilities in fire safety engineering, disaster management, hazard management, industrial safety education through practical training to ensure a fire safe nation.

Department Faculty Details

S. No.	Name of Faculty	Highest Qualification	Designation	Date of Joining
1	Dr. Praveen Patel	Ph.D	Professor	02.08.2004
2	Dr R J Lalwani	Ph.D	Professor	22.08.2016
3	Dr. S.N. Varma	Ph.D	Professor	04.01.2016
4	Mr. Praveen Badodia	M.Tech	Assist. Prof	04.03.2011
5	Mr. Vineet Banodha	M.Tech	Assist. Prof	17.08.2010
6	Mr. Veerendra Suryavanshi	M.Tech	Assist. Prof	01.01.2013
7	Mr. Yashwant Buke	M.Tech	Assist. Prof	08.10.2010
8	Mr. Aashish Yadav	M.Tech	Assist. Prof	12.01.2012
9	Mr. Vijay Kr. Shankul	M.Tech	Assist. Prof	13.03.2013
10	Ms. Shalini Bhardwaj	ME	Assist. Prof	08.08.2012
11	Mr. Vijay Kahar	M.Tech	Assist. Prof	01.08.2013
12	Mr. Sourabh Jain	ME	Assist. Prof	04.12.2017
13	Mr.Rajiv Premi	M.Tech	Assist. Prof	20.10.2009
14	Mr. Abhishek Samvatsar	M.Tech	Assist. Prof	01.08.2011
15	Mr. Pankaj Solanki	M.Tech	Assist. Prof	10.11.2008
16	Mr. Puneet Bhawar	M.Tech.	Assist. Prof	01.09.2016
17	Ms. Kirti Vyas	M.Tech.	Assist. Prof	01.08.2011
18	Mr. B.N. Phadke	M.E.	Asst. Professor	27.03.2010
19	Mr. Manish Dubey	M.Tech	Asst. Professor	14.06.2014
20	Mr N K Jain	B.Tech	Asst. Professor	09.02.2009
21	Dr Jaiveer Singh	P.hD	Assist. Prof	01.05.2010

Department Achievement

S. No.	Detail	No.
1	Seminar Organized	01
2	Workshop Organized	01
3	Expert Lectures Organized	09
4	Industrial Visit Organized	02
6	Other Events Organized	04

Faculty Achievements

S.No.	Topic	No.
1	Paper Published in Journals	01
2	Lectures Delivered By Faculties in Seminars And Workshop	06
3	Seminar & Workshop Attended	01
4	SDP/FDP Attended	02

Students Achievements

S.No.	Topic	No.
1	Special Awards	01
2	Received Vice Chancellor's Scholarship	04
3	Academic Awards	06
4	Paper Published in Journals	01
5	Paper Presented in Seminar	13

Participation in inter-institute events by students of the program of study

S.No.	DATE From	DATE To	Name of the Event	Awardees Name	Prize/ Certificate	Organized by
1	18/04/2018	18/04/2018	VINDICATOR 2018 - Cogent Fire-fighting Outdoor Competitions.	Mr. Tanmay Saxena Ms. Uma Mehra	1st position in BA Set Drill	Dept. of FT & SE IPSA
2	18/04/2018	18/04/2018	VINDICATOR 2018 - Cogent Fire-fighting Outdoor Competitions.	Mr. Pradhyumn Sharma Mr. Ritesh Asawra	1st position in Fire Extinguishers Drill	Dept. of FT & SE IPSA
3	18/04/2018	18/04/2018	VINDICATOR 2018 - Cogent Fire-fighting Outdoor Competitions.	Mr. Radheshyam Kamde	1st position in Knots & Hitches formation Drill	Dept. of FT & SE IPSA
4	18/04/2018	18/04/2018	VINDICATOR 2018 - Cogent Fire-fighting Outdoor Competitions.	Mr. Sakshine Sharma Mr. Avinash Sahu Mr. Vaibhav Shrinivas Mr. Shubham Agrawal	1st position in Casualty Carry Drill	Dept. of FT & SE IPSA
5	18/04/2018	18/04/2018	VINDICATOR 2018 - Cogent Fire-fighting Outdoor Competitions.	Mr. Kuldeep Rajput Mr. Abhishek Gupta	1st position in Unrolling & Rolling of Hose Drill	Dept. of FT & SE IPSA
6	18/04/2018	18/04/2018	VINDICATOR 2018 - Cogent Fire-fighting Outdoor Competitions.	Mr. Shan-E-Alam Mr. Shahazad Ahmad	1st position in Hydrant Drill	Dept. of FT & SE IPSA
7	18/04/2018	18/04/2018	VINDICATOR 2018 - Cogent Fire-fighting Outdoor Competitions.	Mr. Praveen Matte Mr. Akash K. Raj Mr. Aradhya Gupta Mr. Abdul Rehman Mr. Aditya Sharma Mr. Sahil Malik	1st position in Trailer Pump Drill	Dept. of FT & SE IPSA

S.No.	Date		Name of the Event	Awardees Name	Prize/ Certificate	Organized by
	From	To				
8	19/04/2018	19/04/2018	VINDICATOR 2018 - Project Competition via Paper Writing and its Presentation.	Mr. Mahendra Singh Shaktawat Mr. Rishabh Jain	1st position in Research Paper Presentation	Dept. of FT & SE IPSA
9	19/04/2018	19/04/2018	VINDICATOR 2018 - Project Competition via Paper Writing and its Presentation.	Mr. Aniruddh Mishra Mr. Ankita Mohapatra	2nd position in Research Paper Presentation	Dept. of FT & SE IPSA
10	22/02/2018	24/02/2018	Three Days Institute Annual Function Swaranjali 2018	Mr. Rishabh Jain	Student of the Year	IPS Academy, Institute of Engineering & Science.
11	2017-18	2017-18	Vice Chancellor Scholarship (2017-2018)	Rishabh Mishra (4th year) Arpita Roy (3rd Year) Mitan Vyas (2nd year) Himanshu (1st Year)	Vice Chancellor Scholarship (2017-2018)	Rajiv Gandhi Technical University, Bhopal (M.P.)
12	09/10/2017	13/10/2017	One week national seminar on "Recent Trends in Fire Technology &Safety Engineering"	Mr. Rohit Singh Mr. Shivam Marathe Mr. Veerendra Singh Mr. Soubhik Banerjee Ms. Nishita Chouhan Mr. Rahul Mahajan	1st position in Panel Discussion Competition	Dept. of FT & SE IPSA
13	09/10/2017	13/10/2017	One week national seminar on "Recent Trends in Fire Technology &Safety Engineering"	Mr. Avinash Sahu Ms. Ankita Mahapatra Mr. Gaurav Bhawsar Mr. Sahil Malik Ms. Shivani Shah Mr. Nikhil Dubey	2nd position in Panel Discussion Competition	Dept. of FT & SE IPSA

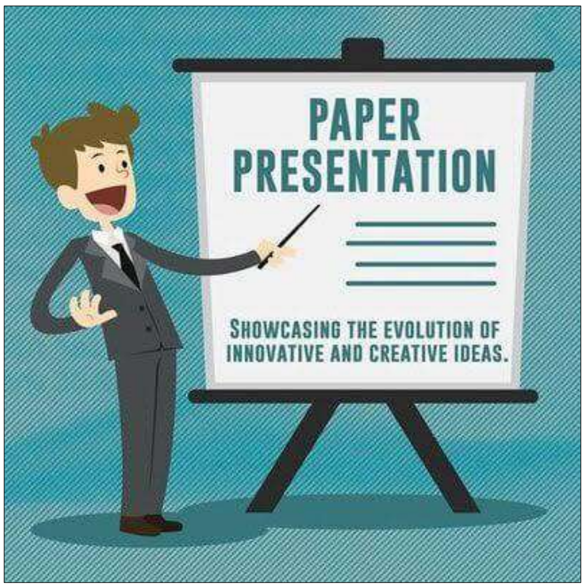
S.No.	Date		Name of the Event	Awardees Name	Prize/ Certificate	Organized by
	From	To				
14	09/10/2017	13/10/2017	One week Seminar on "Recent Trends in Fire Technology & Safety Engineering"	Mr. Mahendra Singh Saktawat Mr. Rishabh Jain	1st position in Research Paper Presentation Competition	Dept. of FT & SE IPSA
15	09/10/2017	13/10/2017	One week Seminar on "Recent Trends in Fire Technology & Safety Engineering"	Mr. Sumit Trivedi Mr. Shubham Tiwari Mr. Roopam Jharbade Mr. Rohan Patil Mr. Suyash Choukikar	2^{nd} position in Research Paper Presentation Competition	Dept. of FT & SE IPSA
16	09/10/2017	13/10/2017	One week Seminar on "Recent Trends in Fire Technology & Safety Engineering"	Mr. Rishabh Mishra	1st position in Quiz Competition	Dept. of FT & SE IPSA
17	09/10/2017	13/10/2017	One week Seminar on "Recent Trends in Fire Technology & Safety Engineering"	Mr. Shubham Pimple	2^{nd} position in Quiz Competition	Dept. of FT & SE IPSA

VINDICATOR-2018

The department of Fire Technology & Safety Engineering IPS- IES Academy organized "VINDICATOR-2018"on 18 April 2018 to 19 April 2018. Day one was planned for "Project Competition via Technical Paper Writing & its Presentation" having objective to groom and record quality project work among UG & PG students. Day second was planned for Cogent Fire-fighting outdoor competition having objective to perform and practice the available standard emergency drill with required/expected coordination and time limit in fire service.

Day1 (18/04/2018)

TITLE: "Project Competition via Technical Paper Writing & its Presentation"



OBJECTIVE: The objective of this academic event to groom and record quality project work among UG & PG students of Fire Technology & Safety Engineering domain. This activity also intends to publish research, review, and short article in this field.

FOCUSED TOPICS:

1. Fire Protection Systems
2. Occupational Health & Industrial Hygiene
3. Safety Engineering & Ergonomics
4. Concerned with Safety Domain
5. Risk Assessment & Analysis
6. Fire Dynamics and Explosion Control
7. Environment and Ecology Protection
8. Hazardous Material Storage & Transportation.
9. Nuclear Engineering & Safety, Integrated Control & Factory Act with other Important Acts

PAPER WRITING GUIDELINES: A team of maximum four members were participated in the competition and following heads were mentioned in paper and its presentation.

1. Title Introduction
2. Literature Review
3. Problem Formulation
4. Area of Study
5. Material and Methodology
6. Result & its Interpretation
7. Conclusion, Recommendation and Future Scope
8. References

REGISTRATION: There were total 12 groups compete with each other the details on the same are as follows:

Sr. No.	Name of the Students	Paper/Project Title
01	Avinash Sahu Aslam Hussain Sisgar	System Safety Assessment Based on Incidents Data in an Industry
02	Bhavesh Nagpure Dhruv Singh Chandel	Safety Performance Monitoring in a Manufacturing Unit.
03	Satyam Khare Shubham Chnadan Gaurav Kumar	Risk Analysis in Chlorine Handling Facilities
04	Rohan Patil Sujoy Saha Sumit Trivedi Shubham Tiwari	Computer Based Risk Assessment of Accident in Indian Oil and Gas Industries.
05	Aniruddh Mishra Ankita Mohapatra	Noise Level Evaluation and its Impact on Human Community in Different Part of Indore City
06	Subham Surana Rajat Patwari Ruchita Mandre Prateek Sharma	Environment Compatible Fire Protection System for Power Transformer
07	Palkesh Verma Yash Roshira	A Comparative Study of Smoke Behavior and Its Management in - A Systematic Approach towards Smart Building.
08	Shivam Shukla Shivam Gupta	A Focused Study on Testing, Examination & Maintenance of Forklift & EOTs Used in Factory.
09	Jitendra Nishad Manish Kumar Gupta	Major Accident Assessment by Incident Data Analysis in Coal Mines.
10	Mahendra Singh Shaktawat Rishabh Jain	Preparation of Onsite Emergency Plan of Institute of Engineering & Science, IPS Academy
11	Shivam Nagori Aniket Parashar	Advance-S Electronic Work Permit System
12	Mayank Gour	Development of Methodologies for Computer Aided Risk Analysis in Process Industries

PRIZES & CERTIFICATION: Two best papers among submitted one were awarded with cash prize of Rs. 5500/- and Rs. 3500/- respectively with certificate from the Institute. Details on the same are as follows:

Sr. No.	Name of of Competition	Winner's Name	Cash Prize	Certificate
01	Research Paper Presentation	Mahendra Singh Shaktawat	5500/- (Winner)	Yes
		Rishabh Jain		Yes
02	Research Paper Presentation	Ankita Mohapatra	3500/- (Runner-up	Yes
		Aniruddh Mishra		Yes

Photographs day 01 (18.04.2018)

Day 2 (19/04/2018)

TITLE: "Cogent Fire-fighting outdoor competition"

OBJECTIVE: The objective of this competition is to perform and practice the available standard emergency drill with required/expected coordination and time limit in fire service. The following exercise/Fire Fighting drills were organized with below mentioned guidelines:

FOCUSED EXERCISE:

- Knots and hitches
- BA set drill
- Fire extinguisher drill
- Casualty carrying method
- Fire tender drill
- Trailer pumps drill
- Rolling and unrolling hose
- Hydrant drill

GUIDELINES: The number of participants and things required for individual competition are as follow:-

S.No	Exercise name	No. of participants in a group	Cash Prize	Things req.	Time req. for particular exercise
1.	Trailer pump drill	06	5500.00	1 Trailer 2 Branches 2 delivery hose	05 minutes
2.	Rolling and unrolling hose	02	1000.00	2 delivery hose	05 minutes
3.	BA set drill	02	1000.00	BA set	01 minutes
4.	Casualty carrying method	04	2000.00	Casualty or dummy	05 minutes
5.	Fire extinguisher drill	02	1000.00	Required particular extinguishers	05 minutes
6.	Hydrant drill	03	1500.00	Hydrant post delivery hose	05 minutes
7.	Knots and hitches	02	1000.00	Ropes	05 minutes
8.	Fire tender drill	06	3000.00	Fire Tender	05 minutes

A circular for all students was circulated among students mentioning that-

- ✓ Students are advice to follow the standard practice for individual competition under the guidance of event coordinator.
- ✓ Participants should follow all the instructions of mentors.
- ✓ Dangri is mandatory for participants only.

PRIZES & CERTIFICATE: The two awards in each competition were awarded as winner and runner-up with the certificate. The details on the same are as follows:

Sr. No.	Name of Competition	Winner's Name	Cash Prize	Certificate
01	Trailer Pump Drill	Praveen Matte	3000/-(Winner)	Yes
		Akash K. Raj		Yes
		Aradhya Gupta		Yes
		Abdul Rehman		Yes
		Aditya Sharma		Yes
		Sahil Malik		Yes
		Palkesh Verma	2500/- (Runner-up)	Yes
		Pramod Birla		Yes
		Rajat Patwari		Yes
		Rohan Patil		Yes
		Roopam Jharbade		Yes
		Shivam Chouhan		Yes
		Vinil Luhadiya		Yes
02	Rolling & Unrolling of Hose	Kuldeep Rajput	1000/-(Winner)	Yes
		Abhishek Gupta		Yes
03	BA Set Drill	Tanmay Saxena	1000/-(Winner)	Yes
		Uma Mehra		Yes
04	Casualty Carry	Sakshine Sharma	2000/-(Winner)	Yes
		Avinash Sahu		Yes
		Vaibhav Shrinivas		Yes
		Shubham Agrawal		Yes
05	Fire Extinguishers Drill	Pradhyumn Sharma	1000/-(Winner)	Yes
		Ritesh Asawra		Yes
06	Hydrant Drill	Shan-E-Alam	1500/-(Winner)	Yes
		Shahazad Ahmad		Yes
07	Knots & Hitches	Radheshyam Kamde	1000/-(Winner)	Yes
08	Fire Tender Drill	Aman Porwal	3000/- (Winner)	Yes
		Archit Trivedi		Yes
		Awadhesh Mukati		Yes
		Hitesh Yadav		Yes
		Kuldeep Dhakad		Yes
		Mayur Jain		Yes

Entrepreneurship Awareness Camp (EAC)

The department of Fire Technology & Safety Engineering IPS- IES Academy organized "Entrepreneurship Awareness Camp" sponsored by EDI Ahmedabad from 01/11/2018 to 03/11/2018.

Date and Day	Session	Subject/Topic	Faculty
05/10/2017 1st Day	I	Become a job creator instead of job searches	Mr. Love Bhatnagar
	II	Present Perspective in Entrepreneurship and its Challenges	Mr. Abdul Rauf
06/10/2017 2nd Day	I	How to become a Successful Entrepreneur –Own Case Study	Mr. Gagan Awasthi
	II	Government Schemes and Available Financial Assistance on Entrepreneurship in Present Scenario	Mrs. Aditi Mishra
07/10/2017 3rd Day	Industrial Visit		

Photographs of Programme

Pic. Mrs. Aditi Mishra addressing students for Entrepreneurship on dated Sept. 06, 2017 Session II

Pic- Mrs. Aditi Mishra Engaging students in entrepreneurship activity

Pic. Mr. Love Bhatnagar Engaging students in entrepreneurship activity

Pic- Industrial Visit at VE Commercial Vehicles Limited Industrial Area, Pithampur, on Sept. 07, 2017.

Pic- Industrial Visit at **<u>Mahima Purespun</u>** Pvt, Pithampur on Sept. 07, 2017.

Research Papers Presented/Publication

Paper Presented in Seminar/ Conference National

S No.	Name of Students	Title of Paper	Detail of Seminar/ Conference Proceeding and organized by
1.	Shivam Shukla Shubham Dagdi Shyam Babu Dangi	Investigation and Important Finding of Nuclear Accident of Fukushima Japan	Research Paper Competition in "One week Seminar on Recent Trends in Fire Technology & Safety Engineering"
2.	Mayur Jain Mohd Fareed Pathan Akshat Kumar Jain Akshay Jain Akshay Patidar Aman Porwal Aminesh Patidar Anand Pandey Aniruddh Mishra Ankita Mohapatra	Review and Analysis of Fire Vehicle Pump	Research Paper Competition in "One week Seminar on Recent Trends in Fire Technology & Safety Engineering"
3.	Ankush Patidar Manish Bisen Ashish Gupta Aslam Hussain Sisgar Atul Prajapat Avinash Sahu Avneet Kumar Singh Awadhesh Mukati Bhagya Shree Sharma	System Safety Assessment Based on Incidents Data in an Industry	Research Paper Competition in "One week Seminar on Recent Trends in Fire Technology & Safety Engineering"
4	Bhavesh Nagpure Dharmendra Prajapapti Dhruv Singh Chandel Gautam Patidar Gyan Prakash Dharma Himanshu Malviya Hitesh Yadav Jagdish Shende	Safety Performance Monitoring in a Manufacturing Unit	Research Paper Competition in "One week Seminar on Recent Trends in Fire Technology & Safety Engineering"

S No.	Name of Students	Title of Paper	Detail of Seminar/ Conference Proceeding and organized by
5	Jay Singh Manral Jitendra Nishad Kamlendra Singh Thakur Ketan Sharma Kuldeep Dhakad Lalit Patidar Lokesh Dongre Manish Kumar Gupta Mahesh Patidar	Major Accident Assessment by Incident Data Analysis in Coal Mines	Research Paper Competition in "One week Seminar on Recent Trends in Fire Technology & Safety Engineering"
6	Abhinandan Panwar Mahendra Singh Shaktawat Abhishek Borasi Archit Trivedi Rishabh Jain Sakshine Sharma Rishabh Mishra Mohammad Aquib	Preparation of Onsite Emergency Plan of Institute of Engineering & Science IPS Academy	Research Paper Competition in "One week Seminar on Recent Trends in Fire Technology & Safety Engineering"
7	Ankit Lot Satyam Khare Shubham Chnadan Gaurav Kumar Yash Jain Vinil Luhadiya Raj Verma Pushpendra Bhardwaj Rakesh Bharti	Risk Analysis in Chlorine Handling Facilities	Research Paper Competition in "One week Seminar on Recent Trends in Fire Technology & Safety Engineering"
8	Subham Surana Rajat Patwari Ruchita Mandre Subham Verma Vivek Soliya Naveen Dhakad Mohit Kumawat Neeraj Tiwari Nikhit Pawar	Design of Fire Protection System For Transformers of Different Capacities	Research Paper Competition in "One week Seminar on Recent Trends in Fire Technology & Safety Engineering"

S No.	Name of Students	Title of Paper	Detail of Seminar/ Conference Proceeding and organized by
9	Pradeep Kumar Uplawdiya Pramod Birla Sagar Patidar Palkesh Verma Parthamesh Pankaj Modi Yaman Hirve Yash Roshira	Smoke Behavior and Its Management in Building Fire	Research Paper Competition in "One week Seminar on Recent Trends in Fire Technology & Safety Engineering"
10	Sumit Trivedi Shubham Tiwari Roopam Jharbade Rohan Patil Lokesh Rajput Sujoy Saha Suyash Choukikar Sagar Khandelwal	Computer Based Risk Assessment of Accident in Indian Oil and Gas Industries	Research Paper Competition in "One week Seminar on Recent Trends in Fire Technology & Safety Engineering"
11	Akhilesh Patidar Kapil Paraste Mohit Malviya Pranav Upadhyay Ramashankar Yadav Gourav Malviya Akshay Rathore Chetan Karwadiya Kanishk Mimrot Rahul Nagraj	Hazards of Fire and Explosion in Tire Manufacturing Industry	Research Paper Competition in "One week Seminar on Recent Trends in Fire Technology & Safety Engineering"
12	Shivam Marathe Rahul Bansod Vishnu Patidar Rohit Singh Prahlad Kumar Ra Sushmit Dubey Ganesh Patel Mitesh Piplodiya	Behavior of Reinforced Concrete Short Columns Exposed to Fire.	Research Paper Competition in "One week Seminar on Recent Trends in Fire Technology & Safety Engineering"
13	Shivam Gupta Vivek Patel Rohit Waghela	Nuclear Radioactive Waste Management.	Research Paper Competition in "One week Seminar on Recent Trends in Fire Technology & Safety Engineering"

Research Papers

“Hazard Identification and Evaluation in Construction Industry”

1. Abhishek Sharma , 2. Veerendra Suryawanshi
M. Tech Student Assistant Professor

Department of Fire Technology and Safety Engineering
IES- IPS Academy, Indore, (M.P), India

ABSTRACT

The word construction comes in light then we can say that it is a way of assembling, altering or building anything. In Construction several types of material are used like bricks, sand, cement, wood, steel and so on. Construction industry is a kind of process industry that manufactures the buildings, bridges, roads, hospital, commercial buildings, cinema hall, etc. Construction industry plays a big role in the development of a country. If we want to check the development of any country we can find this out very easily by its construction & development, because the level of country’s development is reflected by its infrastructure. The infrastructure is in the form of roads, airports, buildings, commercial buildings, offices etc. As we know that construction industry is the most hazardous industry, almost daily an accident occurs on site. Hazards in construction industry are fall from height, falling of material, failure of lifting appliance, scaffolding collapse, soil collapse, vehicle struck, electric fire, unwanted material stacking at height, ergonomic effect and temporary structure failure. In this project we are using job safety analysis (JSA) methodology to control risk factor in construction industry mainly we are using JSA for this high risk activity. In JSA methodology three main components are there Job steps : in job steps the risky activity steps are splits in two parts and we dictating every steps of an activity due to this steps we split the risk and after that, Hazard identified : in job steps how to do that work activity and in this activity hazard is identified just because of their nature and we calculate the hazard, Control measures: after that we control the hazard by the control technique and control activity to reduce the hazard. In these project can apply JSA in different type of construction activities like tower crane erection, height work (form work), slab concreting, manual material handling due to job safety analysis methodology we control the high risk in

construction industry. after that from this activity we are implemented them on construction site and calculate data from last five years than the accident ratio decreases and implemented the high risk activity covers by edge protection and fall protection system (ex. edge protection hard barricading, life line, floor opening close for fall protection system we are using full body harness, fall arrestor, safety net).

Key words: Planning, Process, Standard Operating Procedure, Safety Policy, Hazard: Construction activity, Mechanical Activity, Installation Process Safety: Methodology, Job Safety Analysis (J.S.A), Safety Task Assessment, Induction, Training Program, Job Specific Training

1. INTRODUCTION

India is a development country the construction is the back bone of our country, for the improvement and success of our country we need import and export system for this National highway , road is construct and main tend to them Airport , Ports , Dam , Tunnel , Over Bridge , Metro Line , Metro Bridge pass through Sea , High Rise Building , now the days due to construction system of India our country become very strong nation behalf of our advance technology and quick construction system due to large construction work in India economy growth is very help full for our Indian system due to Tata Projects , Hindustan Construction Company, Larson & Turbo ,Leighton, MW Group , DLF. This company works in India and Abroad and the main reason of boost of the construction industry is due to increase of Purchas power of middle class and improved living standard. Only Construction industry would provide the basic physical infrastructure for the nation. Construction work is based on temporary structure and scaffolding is main temporary structure, for quick work Using Mechanical System (Tower Crane) & Machineries. In Construction apart from other industry High Risk Work and Hazard, Unsafe Work & Unsafe Condition.

A. Safety Codes and Standards:

Every Construction Company follows government rules and regulations with standards codes:

1) Statutory Standards.

2) Indians Standards (IS) and Codes.

3) International Standards like ISO 9001 & 14001 and OHSAS 18001.

4) Building and other improvement Workers (Regulation of Employment and Conditions of Service) Act, 1996 (BOCWA)

5) Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Central Rules, 1998 (BOCWR)

6) Gas Cylinder Rules, 1981 (GCR)

7) Electricity Act, 2003 (EA)

8) Indian Electricity Rules, 1956 (ER)

2. **ANALYSIS & METHODOLOGY**

A. Job Safety Analysis

Job safety analysis is that methodology in which we can reduce the hazard through this technique in Job Safety Analysis Methodology 3 main Components are there:

In JSA Method we applied three steps of JSA just because of this three steps we can protect the hazard and their effect just because of control measures we can control the hazard

1) Job Steps: This is show the steps of that job and how to work in that job in this every activity is in that step's - That may have been overlooked at the design or planning stage of plant layout, building, machinery, equipment, tool, workstations, processes etc.

2) Hazard Identification: In this hazard identification we can see every part of that job steps after that we can identify the hazard and their effect so just because of this hazard identification we can calculate very less severity rate hazard and after that control method is applied on them -That were noticed subsequently

3) Control Method: this control method is main part in this we can show how to control by high risk work to safe and controlled form and this method can show very small –small activity of job and easy way to control them.- That were resulted from changes in work procedure or personnel. It is the first step in hazard or accident analysis and safety training.

3.JOB SAFETY ANALYSIS PROCESS CHART

The safely solution to the hazards noticed may be worked out by:

1) Provide new methodology and new process to do that job.

2) Analysis that point node of hazard and change their physical condition.

3) After analysis of Hazard Eliminate them change the work procedure and trained to other for follow safe process

4) Reducing that Job activity which is hazard and stop frequency also.

5) Give Proper P.P.E Related to that Job If Present and also Provide Why P.P.E Is Helpful for us.

After Completion of JOB SAFETY ANALYSIS also give one copy to read and understanding the safe process to relate with that supervisor & Practical knowledge of that job because it very help full to Analyses safety officer and that supervisor.

ACKNOWLEDGMENT

This Article has benefited from discussions with many people for more than can be acknowledged completely here. I would like to extend our sincere thanks to all of them. It is our great pleasure to express our profound gratitude to our esteemed guides Mr. S.N TIWARI, Assistant Manager (E.H.S Safety Lead at Indore project) MW Group of High Tech Projects (Construction Company) Mr. Veerendra Suryawanshi, Assistant Professor, Fire Technology & Safety Eng. Dept. IES, IPS Academy Indore for his valuable inspiration, able guidance and untiring help, which enabled me to carry out and complete this work. I am sincerely and heartily grateful to Prof. Praveen Patel, Head of the Department, Dept. of Fire Technology & Safety Engineering.

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"Hazards of Fire and Explosion in Tyre Manufacturing Industry"

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ABSTRACT:

The purpose of this guideline is to describe some of the hazards associated with tyres, and provide guidance and preventative measures to avoid or minimise those hazards when working with tyres or combating tyre fires, explosions and potential explosions. The information provided is derived from extensive operating experience, and is based on incidents and accidents reported to inspectors.

1. INTRODUCTION:

Most ingredients used in the manufacture of rubber products are combustible. Stored rubber tyres are a hazard because of their large potential for heat output and the air spaces present in tyre stacks. Rubber tyres don't readily ignite but once alight, the spread of fire and smoke can be rapid. The higher the storage, the greater the fire hazard and the more difficult to control by sprinklers at ceiling level. Tyres stored on their side in pallets tend to fall into the fire as they burn, and this helps to confine the spread of the fire.

Fires burning in tyres may be hard to extinguish, as it is hard for the extinguishing medium to penetrate the inside of the tyre. At approximately 200°C, rubber begins to flow as a sticky, slippery, hot mass. The rubber does not resolidify, and steps should be taken to prevent it from entering the drains. The molten rubber can also contaminate firefighting equipment, especially hose. At approximately 230°C, rubber gives off heavy flammable vapours that may be trapped in the molten rubber which may catch fire with an explosive force.

2. Nature of the hazard :

The hazards associated with tyres are considered here as:

- those relating to working with tyres
- those relating to fires and explosions in tyres in service.

3. Working with tyres

There are four major hazards when working with tyres:

- compressed air
- exploding or disintegration of wheels and tyres
- noise. As with any engineering discipline, lack of training or experience in the handling and maintenance of wheel and tyre assemblies (especially with bead lock systems) can increase the hazard potential.

3.1 Compressed air

The eyes are particularly at risk when compressed air is in use, both from high-velocity air and from particles of dust, metal, oil and other debris, which can be propelled by the air. Suitable eye protection should always be worn. Injuries to other parts of the body also present a risk when using compressed air. Suitable overalls or other substantial clothing will protect the skin from light particles and debris, provided they are not blown at a high velocity.

3.2 Manual handling of heavy objects

The tyre and wheel assemblies of large vehicles are commonly too heavy to be handled safely by one person. Even the strongest person can suffer a hernia, slipped disc, sprain or broken bone when handling loads that are too heavy. Such injuries can be very painful and limiting. The safe handling of many loads encountered in the fitting and maintenance of large earthmoving tyres and wheel assemblies can only be undertaken using specialist tyre handling equipment. Special fittings may be required to modify standard handling equipment (e.g. fork lifts) to deal appropriately with large tyres and wheels.

3.3 Exploding wheels and tyres

This hazard presents in two forms:

- in the workshop or field maintenance situation
- as a result of operating error conditions.

Large tyres and wheel assemblies are heavy objects, but when they explode they are thrown violently by the force of the escaping compressed air. An exploding wheel is a high-speed projectile that can kill or maim anyone in its path.

3.4 Noise

Hearing damage can affect tyre fitters just as easily as other at-risk occupations. Causes of noise-induced hearing loss are compressed air blowing freely, noise from impact wrenches, and wheel parts and tools dropping on concrete workshop floors. Engineering solutions to the problem of excessive noise are preferred. The selection of air-tools for their noise-level characteristics should form part of the purchasing system.

4 Tyre safety cages

All tyres on split-rim and detachable-flange wheels should be contained by a cage guard or other suitable restraining device when being inflated after being dismantled or repaired. All truck, bus, tractor, forklift or earthmoving plant tyres and other tyres that have a large volume, or are inflated to high pressures, should similarly be contained by a cage guard or other suitable restraining device when being inflated after being repaired or otherwise removed from the wheel.

5 Fires and explosions in tyres in service

5.1 Mechanisms of tyre fires and explosions Definitions:

Pyrolysis: The decomposition of a substance by the action of heat.

Flash point : Temperature at which a substance (usually a fuel) ignites when a test flame is applied under standardised conditions. This is the yardstick by which fuels are classified for safety in storage and handling.

Auto-ignition: Self-ignition or spontaneous combustion of a substance (usually a fuel) without the help of a spark or flame.

5.2 Causes of tyre fires :

Brake problems Whether induced by misuse or maintenance problems, brake problems can result in tyre fires and explosions. Operators should be trained to understand the consequences of, for example, service brake misuse. Truck manufacturers are to be encouraged to ensure that service experience worldwide is circulated to all users, no matter how trivial the issue of concern could seem.

Wheel motor problems : Wheel motor problems, including flashover and armature bearing collapse, can result in heat that makes tyre fires and explosions more likely to occur. Correct maintenance helps to avoid these problems.

Gross under-inflation or run-: flat The more important aspect with respect to this hazard is the run-flat. Because under-inflation is a relative term, gross under-inflation can result from the gross overloading of tyres that are otherwise reasonably inflated. Operators should be instructed not to drive vehicles with dual flats or with flat single tyres such as steering tyres.

Separation: The type of separation most likely to lead to a tyre fire is heat separation. Correct tyre management will minimize the incidence of this problem.

Fuel spills: Rubber commonly absorbs fuels and solvents, greatly increasing the risk of the tyre catching fire if a source of ignition is available. Fuel and lubrication bay operators should be made aware of these risks.

5.3 Prevention of tyre fires :

To prevent tyre fires, eliminate the known causes listed above and consider implementing the options listed below.

Fire-resistant hydraulic fluids: An existing fire will be easier to extinguish if flammable liquids are not feeding it.

Onboard temperature sensors: If the driver can be warned of an over-temperature situation developing, it is possible to take action to avoid a fire.

Methodology: This study adopted a methodology which was divided into five main stages. The first of these consisted of a literature review, during which one consulted scientific articles dealing with the processes analysis and improvement, as well as the philosophy of Lean Manufacturing. In the second stage, one analyzed all of the mechanisms which comprise the APEX machine under study, in order to gain a better understanding of its operation. The objective of the third stage was to identify the problems at hand, which consisted of numerous breakdowns due to problems related to the conveyor performance, cutting sub-process control and dependence on the operator to comply with the quality requirements imposed, which implied a loss of performance in the equipment operation. Inefficiencies related to lack of standardization and difficult access to tools were also detected. Also time measurements were made in order to quantify the average breakdown time per month, as well as their causes. In this case, an Ishikawa diagram was drawn based on two brainstorming meetings, taking into account the parties involved in the process. This diagram is not presented here due to space restrictions. In the fourth stage, one developed various proposals to eliminate the problems detected, namely a new drive for the main movement of the equipment (not dependent on compressed air), with higher accuracy and speed of action, new sensors and control, as well as safety devices, increasing worker protection. Finally, in the fifth stage, one carried out the implementation of the design previously developed, measuring during one month (due to time constraints) the breakdown time and the productivity rate. The results were compared allowing to observe the advantages of the implemented ideas.

Analysis and improvement of the APEX machine process: The different stages in the tire production process are divided into five departments: mixing, preparation, construction, vulcanization and final inspection. The APEX machine is allocated to the Preparation department, where tire materials are prepared for subsequent assembly in the Construction department. These machines execute an operation which applies a wedge to the tire bead.

Results and Discussion: The objective of this study, which pertains to a production line manufacturing components for vehicles, lies in presenting several different proposals to enable the improved performance of the APEX machines in use and implement them, measuring the real gains achieved through the new ideas. These constitute an important aspect of the production process at the company in question. In order to achieve these results, one identified the main problems which contribute to APEX machine downtimes and sought to analyze various solutions.

Conclusions: It was thus concluded that the improved performance of the APEX machines can be reached by implementing the following strategies: the automation of conveyor and tray movements between the cutting and application sub processes; the implementation of 5S methodology; the automation of the cutting process; the updating of safety devices; and the automated control of the separation sub process. The implementation of servomotor systems (electromechanical actuator) to replace the former pneumatic systems will allow for a greater control of movements. This will also eliminate the need for pneumatic supply and the resulting leakage of compressed air, which will in turn ultimately lead to a great reduction in the number of breakdowns on these mechanisms (the wedge applicator). All of these problems were responsible for a downtime of 1080 minutes just in one APEX machine for the year 2015. In addition, the automation of the cutting sub process will contribute to a decrease in the setup time required for APEX machines, while the implementation of 5S methodology will allow for faster setups. Furthermore, the updating of the safety devices will ensure greater safety for the workers operating the machine, and the quality of the final product will also be enhanced by means of the automated control of the separation subprocess. All of these solutions will lead to a reduction of 38% in the maintenance costs of the Apex machines, which are chiefly caused by the excessive number of breakdowns. Moreover, the breakdown time was reduced in 62%. The APEX machine performance was also improved in 9%. In this regard, the use of Lean tools supported by a rigorous mechanical design and updated control, played a key role in the development of this study.

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"Review and Analysis of Fire Vehicle Pump"

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ABSTRACT

The chapter provides a range of standard principal for specified fire pumps. The chapter also describes the essential engineering and material requirements for all types of fire-fighting trucks, emergency vehicles and fire pumps utilized petroleum industries and gives general concepts for the manufacturing design of vehicles and relevant material, and equipment which have been installed on them. The application of the chapter would make uniformity in the design of equipment, their operation and maintenance, and also will facilitate the training of fire-fighting personnel. The pumps covered are intended to include material, fabrication, design, and engineering features concerned with installation and use in water supply systems and mobile equipment.

Keywords: velocity head pumps submergence foam system fire-fighting trucks powder fire extinguishing firewater ring main system

1. Introduction:

The chapter provides a range of standard principal for specified fire pumps. A fire pump is a part of a fire sprinkler system's water supply and can be powered by electric, diesel or steam. The pump intake is either connected to the public underground water supply piping, or a static water source (eg, tank, reservoir, lake). The pump provides water flow at a higher pressure to the sprinkler system risers and hose standpipes. A fire pump is tested and listed for its use specifically for fire service by a third-party testing and listing agency, such as UL or FM Global. The main code that governs fire pump installations in North America is the National Fire Protection Association's NFPA 20 Standard for the Installation of Stationary Fire Pumps for Fire

Protection. The pumps covered are intended to include material, fabrication, design, and engineering features concerned with installation and use in water supply systems and mobile equipment in accordance with NFC Standards for centrifugal electrical and diesel engines fire pumps. Included in the chapter are trailers used for mounting “foam” and other fire extinguishing agents and equipment such as premix Foam Liquid Concentrate (FLC), dry chemical, welding, cutting, and miscellaneous tools for special tasks. Fire Pump Systems are engine drive pumps where electric power cannot be assumed or is not available and the pump is connected to an engine that runs on a 2-stroke, diesel, or unleaded fuel motor. Engine driven pumps are also ideal for water transfer, pumping water for stock watering, portable spray units, irrigation, and boom spraying.

Method of taking water:

Pump Units Taking Suction From Open Water:

At least two identical submerged pumps taking suction from open water should be installed; one electric motor driven, one diesel engine-driven, and if specified steam turbine. The power of the drives, both the electric motor and the spare unit should be rated such that it is possible to start these units against an open discharge system which can be pressurized to 3 bar. The electric motor should be provided with an automatic starting device, which should act after putting the fire alarm system into operation. The spare unit should be provided with automatic starting facilities, which should act as present time if the electric motor or the pump does not function. Manual starting and stopping of each unit should be possible from a control centre or from the fire station, and also should be possible at the pump site. Manual starting should be possible without the fire alarm coming into operation.

Pump Units Taking Suction From Stored Water:

If water for fire-fighting cannot be supplied direct from available open water under all conditions and at the required rate, or if owing to the excessively great distance it is not economically justified to install the fire-fighting pumps at that source, water storage facilities are required, for example, an open tank or pond having an adequate replenishment rate. This replenishment rate is of vital importance and the aim should be to obtain a rate equal to the installed capacity of one fire-fighting pump P-1 or P-2.

Fire-Fighting Trucks and Pumps : This section has been compiled to specify various fire trucks and pumping units used in the oil refineries, chemical plants, gas plants, and wherever applicable such as in production units, exploration, oil terminals, distributions, and affiliated industries. This standard covers a number of basic fire trucks equipped with selection of fire-fighting systems. Depending upon the risk of the plants, the size of the area and fixed fire-fighting installations or facilities, the fire trucks and fire equipment should be so designed or selected to give satisfactory performance and to act quickly, and thus reducing loss of lives, injuries, and damages.

Specification of auxiliary fire and emergency vehicles comprising of the following:

• Foam liquid dispensing truck

• Dry chemical powder fire extinguishing truck

• Twin agent fire extinguishing truck

• Water tender

• Emergency service and rescue vehicles

• Hydraulic boom • Brief description and list of proposed types of fire-fighting trucks

• Portable, trailer mounted, and fixed fire-fighting pumps

• Material procurement standard

This section describes the minimum engineering and material requirements for all types of firefighting trucks, emergency vehicles, and fire pumps utilized by petroleum industries and gives general concepts for the manufacturing design of vehicles and relevant material and equipment which have been installed on them. The application of the chapter would make uniformity in the design of equipment, their operation and maintenance, and also will facilitate the training of fire-fighting personnel.

Categories: The fire-fighting vehicles used in petroleum industries are categorized by its load, liquid pumping capacity and its pressure therefore the following categories can be used. A major fire-fighting truck with water and foam tanks in excess of 5000 L and pumping capacity of over 4000 LPM at 7 bar. General purpose or medium size fire truck with water and foam liquid tank capacity of 3000–5000 L and pumping capacity of 2000–4000 LPM at 7 bar. Auxiliary fire trucks such as fire-fighting boom, foam-liquid or water tenders, dry powder and twin agents trucks.

Light vehicles include three types as follows: light fire-fighting vehicles with foam-water capacity of 1000 L and pumping capacity of 800 LPM at 7 bar emergency combined rescue vehicles emergency equipment carrier.

Fire-Fighting Trucks, Design Specifications: The purpose of the fire-fighting trucks for petroleum industries is to carry fire fighters, foam-liquid, fire-fighting chemicals and equipment to the scene of fire and inject FLC into the water stream, generating foam and utilizing chemical for fire-fighting. The water required can be taken from the firewater main,

open water, or other sources such as water tanks.

Instruments, Warning Lights, And Controls : The minimum number of instruments, warning lights, and controls consistent with the safe and efficient operation of the vehicle, chassis, and fire-fighting system should be provided. All chassis instruments and warning lights should be grouped together on a panel in front of the driver. All fire-fighting system instruments, warning lights, and controls should be grouped together by function so that accessibility is maintained. All instruments and controls should be illuminated, with backlighting to be used where practical. Groupings of both the chassis and fire-fighting system instruments, warning lights, and controls should be easily removable and be on a panel hinged for back access by the use of quick disconnect fittings for all electrical, air, and hydraulic circuits.

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All instruments and controls should be illuminated, with backlighting to be used where practical.

Groupings of both the chassis and fire-fighting system instruments, warning lights, and controls should be easily removable and be on a panel hinged for back access by the use of quick disconnect fittings for all electrical, air, and hydraulic circuits.

Conclusions : The types of fire water sources under control and regulation can be more diversified. Through the questionnaire, we have found out that in the 18 fire water sources, over 80% of respondents approve that 12 of them should be filed and regulated so that we can exactly master fire hydrants and other types of reserved fire water sources. In addition, we have also found out that public fire hydrant has the highest usage rate, which indicates that firefighters are dependent on this water supply system to provide disaster relief. Hence, higher usage rate also means higher water outage rate. Although we can master the water pumping position, testing at scene to test if the fire hydrants at the disaster scene can pump water takes the largest proportion, which causes a crisis of confidence among basic firefighters for the maintenance and management of fire hydrants. The crisis means that although the water right organ still has not establish

management system currently, the limited basic fire-fighters are required to do regular inspection every month. However, the repair progress of fire hydrants is responsible by the water supplying enterprise, the fire departments has no right to intervene. In the face of this water source public security issue, local related governors should attach great importance on it and list it as a key in administration.

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"Safety Performance Monitoring in a Manufacturing Unit"

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ABSTRACT:

In total safety management system it is cumulative effort of the occupier, manager, safety-manager, head of the departments, supervisors, and workers etc. This gives the end result in accident prevention program. Some time it is essential to find out the comparative result of performance of the team for past" few years. Therefore we need some techniques for measuring the safety performance. Such type of monitoring or measurement helps us to identify the weakness in implementation of safety program in industries, with view to improve the safety system in future. The measurement of safety performance is useful to all management to know the progress of safety culture. It promotes safety in all walks of life like road safety, home safety, industrial safety and safety at the sea and the sky. The industries are paying crores of rupees every year in terms of workmen compensation and other benefits. Many insurance companies pay the huge amount for accident injuries, deaths, and property damage. If they know the real measurement of safety performance they may try to suggest necessary safety measures to reduce the premium amount.

This type of quantitative monitoring gives clear trend of the industry towards safety. One should find out the main departments which are the unsafe, what are the unsafe actions? How much is money lost and time lost in accidents, etc? So we can easily concentrate upon those areas and provide remedial measures to stop those losses.

Keywords: - Safety performance, Frequency rates, Severity rates, Incidence rates, Accident statistics, Safety culture, Safety leadership.

1.INTRODUCTION

The industrialization has a great contribution in national development. The globalization of trade and business has given us opportunity to improve our national economy by exporting the industrial product. When we explode the foreign markets we find the foreign customer insist our industries to follow the norm of -ISO- 18001‖. To improve the industrial production in quality in quantity is the main goal of our industries, but unfortunate the industrial accident, industrial disaster, occupational diseases, put forth hard deal in production and economy. It also affects adversely the social system of our country, therefore it is urgently necessary to implement safety program and inshore the compliance of safety loss and -ISO- CODES‖ related to health safety and environment. The safety performance is a key issue for the industries to become a world class competitor. Occupational accidents may lead to permanent disabilities or deaths and economic losses or both. Death of employees or their permanent disability causes economic loss and social problems for employers, employees and their families. Occupational accidents can be reduced through effective preventative measures by investing on safety equipments, training, and educating the employees, process design, and machinery. In order to develop a good safety culture, attitude of the workers needs to be raising reoriented by adopting best practices, good housekeeping, change in work culture, and work practices. Occupational accidents are common in India like in many other developing countries. The responsibility of the safety in an organizational context must be shared by employers, employees, trade unions, and related state authorities to determine the outcomes of present safety practices. To start with, employers should emphasize on the concept of occupational safety and invest in accident preventative measures. Further, employers and employees should receive awareness training so that employees are careful about occupational accidents and act responsibly. In the drastically change of climate, safety has always been a major concern in the Indian industrial setting.

1. PROPOSED MONITORING METHOD

The focus in this study is on safety performance monitoring in pump manufacturing industry previous five year (1st April 2008 to 31st march 2013). The data presented in this paper were compiled as a part of a research project. Accident statistics may serve as an important feedback instrument to monitor safety performance. Accident statistics are commonly expressed as rates, per unit population or per unit time worked. Computation of rates requires number of injuries and exposure. Frequency rates express injuries in terms of hours of. exposure taking into account actual exposure to the risk, e.g. including overtime hours. Severity rates express the number of days lost in terms of hours of exposure, taking into account the gravity of the injury. Incidence rates express injuries in terms of number of persons exposed to the risk per year. Rates can either be computed for (insured) employees or for workers (insured and uninsured combined). In comparison do statistics of fatalities and serious injuries provide more reliable indices of safety performance This paper deals with safety performance monitoring. It also examines some of the general limitations of statistics on occupational accidents for the pump manufacturing industry. The purpose is to provide a basis for an informed discussion on the safety performance of pump manufacturing industry, with a perspective on limitations of the data available.

Example (Calculation) As chosensr.no.5 from table no.1, year 2012-13. Details:-

- No. of Accident = 4
  (Taken from accident register,)
- No. of reportable Accident = 4 (Taken from Accident register)
- Man days lost due to reportable Accident = 49 (Taken from Accident register)
- Man hours worked = 2169344 (Taken from Attendance register)
- Avg. no. of employees present in one day = 892 (Taken from Attendance register)
- Total no. of working days in a year = 304 (Taken from Attendance register)

We know that—
Total man hours worked = Avg. no. of employees present in one day
*No. of working day in a year *8

 Total man hours worked = 892 * 304 * 8

 Total man hours worked = 2169344 Now…..

Safety Activity

- **Purpose: -** To compare safety performance of factory with respect to different time periods. Unit time period may be a month, year etc.
- **Definition: -** Safety activity number is the sum of safety activities in a year, with respect to man hours worked and average number of employees.

Safety Activity Numbers = $\sum N$ = N1+N2+N3+ N4+……………

Safety Activity Rate = Safety Activity Number*5*10^6 / Man-Hours Worked*Avg. No. of Employees

2. NEAR-MISS INCIDENTS

The near-miss incidents mean any unplanned, sudden event that could have caused injury or damage to man, materials (plant), but not resulted in any accident. We must learn from near-miss incidents and accidents to prevent recurrence. The first step in the learning process is investigation to determine the causes and underlying reasons why near-miss incidents and accidents occur. A thorough investigation of root causes will identify the management system weaknesses. Learning which management system weaknesses are leading to near- miss incidents and accidents is one of the highest value activities in which a company can invest, and learning from near misses is much cheaper than learning from accidents. Many manufacturing industry should improve safety management systems, and they should begin to focus on getting near-miss incidents report and on root cause analysis. This is a very exciting trend. So one should make groups of five employees from each department and taking the all information about the near-miss incidents in every week improve the safety system in future.

3. MOTIVATION

The factory management should reward to those workers having zero man-days lost in accidents in span of 12 months. Employee motivation is a process or program employers can initiate to motivate employees. Employers motivate employees to work harder or to reduce near-miss incidents.

4. CONCLUSION:

This monitoring we can say the safety performance was good but management should try to make safety performance status better or improve. In the safety management various elements are there like safety policy, safety committee, safety organization, planning and implementation, safety audit, safety sampling, safety survey etc. they are helpful in reducing the work place hazards, control the accident, and occupational diseases. Including the safety management in industry many accidents, hazards and occupational diseases are reduces, it can be provide information to each and every worker about the various hazards in the workplace and provide the good solutions for controlling those hazards. Provide proper training to the every employer to identify and control hazards. So with the help of the safety performance monitoring or measurement to implementation of safety program in pump manufacturing industries and improve the safety system in future.

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“Major Accident Assessment by Incident Data Analysis in Coal Mines”

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ABSTRACT:

To improve safety the application of effective risk management has become a requirement in the mining industry. The effectiveness of mining risk management essentially depends on the risk assessment process, as the output of the risk assessment process helps the mine management to decide upon the control measures to be employed to mitigate the risks identified in the mine. The application of risk assessment in mines has become important not only for ensuring a safe working environment but, also, it is now a legal requirement. The capability of a risk assessment process depends on the hazard identification phase, as unidentified hazards may lead to unknown and unmanageable risks. Therefore, it is essential to identify all the potential hazards to manage the risks in mines. hazards. Accident data collected from the Directorate General of Mines Safety in India and a public sector coal mining company was studied to identify safety hazards that may probably lead to accidents. The database could help the mine management to improve decision making after analyzing and evaluating the safety risks of identified hazards.

Keywords: Underground coal mining Hazard identification Risk assessment Safety control Accident analysis.

1. INTRODUCTION :

Mining is renowned for being one of the most hazardous sectors in the world due to its complex work environment. Workers in underground coal mines are prone to several risk conditions during their work which may cause loss of life or serious injury which has a direct and indirect cost for employees and employers. Accidents in underground mines can often have serious catastrophic consequences Over the years, the Directorate General of Mines Safety (DGMS), mining companies, research institutes and academics have made constant efforts to prevent accidents in Indian mines by proposing solutions, such as additional regulations, improved training, advanced technology and reliable equipment. The trend of fatal accidents occurring in Indian underground coal mines is higher than in the USA's and Western Australia's underground coal mines. Department of Mines, Industry Regulation and Safety, 2018; MSHA, 2017). The different fatality rates from 2002 to 2017 are represented in Fig. 2. Fig. 2 reveals that though there is a decreasing trend in the fatal accident frequency rate per lakh man shifts; the death rate per 1000 persons employed and the death rate per million tonnes in Indian coal mines, the current rates are still unsatisfactory. The fact is that underground coal mining is associated with hazards and therefore complete elimination of risks is unavoidable. To regulate the hazards in mines, risk management has been proposed, implemented and mandated by Australian, New Zealand, Canadian, British, American and South African mining industries over the last few decades. The DGMS has made it mandatory to conduct risk assessment and management in all Indian coal mines after the revision of Coal Mines Regulations in November 2017.

There are two types of approach for hazard identification: (i) an informal approach based on previous data and history (ii) a formal approach based on hazard identification techniques (Henley & Kumamoto, 1996). Ericson (2015) stated that there are over 100 hazard identification techniques in existence and many techniques are not widely practiced. The common hazard identification techniques are presented in Table 1 (Ericson, 2015; Glossop, Loannides, & Gould, 2000; Lees, 2012; McCoy et al., 1999; Mullai, 2006). As most of the hazard identification techniques are generic, they can be used to identify hazards in any workplace. However, hazards may vary from one workplace to another, and that is the reason why skilled expert experience is essential in order to identify all the hazards in a given workplace accurately. The hazard identification process shall consider the entire life cycle of a job and the potential impacts on workers.

2. LITERATURE SURVEY:

Hazard factors related to machinery, humans, the work environment and work methods were the causes identified for the different types of safety risks in underground coal mines (Badri, Nadeau, & Gbodossou, 2012). Ale et al. (2008) studied the accident statistics in the Netherlands and identified fire, explosion, contact with electricity, contact with moving parts and falls as the occupational hazards. After analysing 245 cases in two underground coal mines, Kunar, Bhattacherjee, and Chau (2010) concluded that poor working conditions, material handling, and ground control were the main job-related hazards. Lilić, Obradović, and Cvjetić (2010) stated that the safety in coal mines is based on various interdependent hazards that are classified as dust, gas, noise, vibration, illumination and geotechnical hazards. Khanzode, Maiti, and Ray (2011) listed machinery related, ground fall-related, material related and housekeeping related hazards which were identified in an underground coal mine over 15 months. Yunxiao and Ming (2012) developed a hazard list in coal mines using a systematic hazard identification method. The hazards were identified by categorising the hazard components into three parts, i.e. the hazard element, initiating mechanism, and threat and target. Bahn (2013) presented the list of identified hazards in “Hazard Identification” and “Managing Workplace Hazards” workshops conducted with 77 employees of an underground mining operation in Western Australia. Badri, Nadeau, and Gbodossou (2013) identified the risk elements of all the gold mines in the province of Quebec by studying the previous accident and incident reports, and through interviews and observations in the field. Krause and Krzemień (2014) stated that the impact of methane drainage, electrical equipment, work organization, and ventilation conditions have the most significant influence on the shaping of methane hazards in underground mines. Verma and Chaudhari (2017) presented a list of safety and health hazards identified in underground and opencast manganese mines. Dash, Bhattacharjee, Singh, Aftab, and Sagesh (2017) stated that roof and side fall, explosions, inundation, winding accidents and fire represent the major accidents which occurred in the Indian mining industry between 1901 and 2016. Other notable studies on safety risks in mines by researchers include, among others, roof fall and side fall (Kejriwal, 2002), machinery (Ruff, Coleman, & Martini, 2011), explosion (Grayson, Kinilakodi, & Kecojevic, 2009) and inundation (Luo & Liu, 2010).

3. METHOD

To achieve the objective of this paper, the authors have collected the accident statistics, incident reports and inspection reports from the DGMS and Coal India Limited. The DGMS is a governing agency under the Ministry of Labour and Employment in India that deals with matters relating to occupational safety, health and the welfare of persons employed in mines and Coal India Limited is a public sector coal mining company. The authors also visited an underground coal mine for ten days in the Orient area, Odisha, India, for data collection and observations. The details of the underground coal mine visited are that the thickness of the seam is 18–24 m and the seam is divided into sections 1, 2, 3 and 4. The thickness of the sections are 2.44 m, 1.61 m, 2.13 m, and 2.20 m respectively. The depth of the working varies from 18 m to 282 m. Mining working is mainly performed by the board-and-pillar method using solid blasting technique. The observations were carried out using the DGMS (2014) accident classification, and International Labour Organization (1994) mines safety checklist that describes the details to be observed in each district of the mine.

The first step of the creation of the safety hazards database was to analyse more than 7000 accident reports of all the coal mining companies collected from 2001 to 2014 and the observations done during mine visits. Checklists and the Workplace Risk Assessment and Control technique were used to identify the mining operation specific safety hazards for the following hazard groups: ground movement, rope haulage system, belt conveyor system, load haul dumper, shot firing and blasting, electricity, dust, gas & other combustible materials, and inundation.

The following safety hazards would be identified: • Improper signalling,

- Deployment of an unauthorised or untrained trammer or clip-man,
- Failure to inspect and maintain haulage road regularly,
- Failure of drawbar,
- Defective rope, rope splicing, rope capel or shackles,
- Lack of proper illumination and whitewash at coupling and uncoupling points.

4. RESULTS AND DISCUSSION

A comprehensive list of safety hazards identified in underground coal mines is represented in Table . To the best of their knowledge, the authors have found no research work that identifies safety hazards associated with workers actions, machines, tools, job procedures and overall work environment collectively. This is a preliminary hazard portrait, organised and intended to be a checklist covering all the safety hazards involved in the underground mining operation. From the evidence and findings obtained from the collected reports, the activities that led to multiple fatalities in the past have been selected as the hazard groups. In Table , the hazard groups were categorized as the cause of the accident category presented in DGMS (2014) and the associated risks of the identified hazards were also presented. It is practical to categorise a hazard group for the better application of industrial risk assessment techniques in the later stages of the risk assessment process. As it is difficult to identify all the safety hazards in a mine due to changes in the mine environment, emerging factors and unknown phenomena hazard identification should be treated as a continuous process and the list of hazards should be updated regularly.

5. CONCLUSION

The hazard identification stage is crucial in the risk assessment process, as unidentified hazards may lead to unmanageable risks and reduce the efficiency of the risk management process. This paper concentrates on the first stage of the risk assessment process in underground coal mines. The other stages of the risk assessment process, i.e., analysis and evaluation of the identified safety hazards and their associated risks should be carried out to improve safety in mines. In this study, checklist, Workplace Risk Assessment and Control, and Failure Mode and Effects Analysis techniques were used to identify the hazards in underground coal mines. Altogether 172 hazard events were identified and categorized into six categories of hazard groups: geo-mechanical (ground movement), mechanical (rope haulage system, belt conveyor system, load haul dumper), chemical (shot firing and blasting), electrical (electricity), geochemical (dust, gas & other combustible materials), and environmental (inundation). The hazard events were further categorized as human, machine/tool, work methods/procedural, and work environment/managerial hazards. The associated risks of the identified hazards were also presented.

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"Investigation and Important Finding in the Nuclear accident of Fukushima Japan"

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ABSTRACT

Public opinion on nuclear accidents has important implications regarding energy planning and policy making. However, the long-term impacts of these event on citizens' opinions is unclear. This question assumes relevance especially in the context of rising citizen involvement in development and decision making. This study compiles and examines seven years of public opinion survey data to investigate whether there was a long-term change in support for nuclear energy in the US following the Fukushima nuclear accident in Japan. The analysis uses a logistic regression model to estimate the long-term trends in opinion on nuclear power among the US public and its major drivers. Results show that public support for nuclear energy has not rebounded to its pre-accident levels. While it isn't clear whether the accident in Fukushima was the only driving factor, there has been a gradual decline in support following the incident, suggesting that short-term negative changes in public support for nuclear power have long-term consequences for energy policy. These findings have implications for policymakers since short-term impacts can be mitigated but long-term opposition is more difficult to address, especially in the context of developing countries that are investing in nuclear energy to meet growing demand.

Keywords: Nuclear energy Public opinion Fukushima nuclear accident Logistic Regression.

1. INTRODUCTION

The risks and benefits of nuclear energy continue to be a popular topic of debate among the United States public. Major incidents like the Arab Oil Embargo, the Three Mile Island accident, and the Chernobyl disaster affect the overall sentiment towards nuclear facilities and act as focusing events where the issue is brought to the forefront and is in the public's psyche. In particular, due to their potentially disastrous consequences, accidents in nuclear facilities have been known to impact public opinion at least in the short-term. The Three Mile Island incident in Pennsylvania in 1979 resulted in a decrease in support for nuclear energy which was sustained for over 2 years (Rosa and of the disaster was the press coverage it received in over 1200 newspaper articles written over the next year.1 Likewise, domestic support for nuclear energy in the US declined after the 1986 Chernobyl disaster, although support for nuclear power was already on a downward trend (Rosa and Dunlap, 1994). The most recent major nuclear accident was at the Fukushima Daiichi nuclear plant in Japan in 2011 when an earthquake, 9.1 in magnitude, hit off the eastern coast of the Oshika Peninsula in Japan. The resulting 40.3-meter high tsunami caused massive humanitarian and economic damage (Hasegawa et al., 2015; Hiraoka et al., 2015; Tanigawa et al., 2012). The impact of the immediate damage notwithstanding, a more long-term effect of the tsunami was to be witnessed on the Fukushima Daiichi nuclear power plant which was hit by a 15-meter high wave (WNA, 2017), and went through a series of losses until it was shut down in the following days. The incident was followed by a flurry of news reports both locally and internationally, leading countries to rethink their energy strategies, adversely affecting the nuclear renaissance that had started in countries across the world in the 2000s (Goodfellow et al., 2011; Siegrist and Visschers, 2013).

This paper examines the public response to adding nuclear power capacity in the US with the aim of finding whether the 2011 earthquake in Japan Dunlap, 1994). Another indication of the salience fundamentally affected the support for nuclear power generation in the US. The analysis is based on a repeated cross-section dataset compiled from public opinion surveys conducted by the Pew Research Center over the period 2008–2014. The next section describes the literature on public opinion, and the specific analysis of the Fukushima disaster. This is followed by a discussion of the data and methodology of this paper, and the results. The subsequent sections expound on the conclusions and briefly discuss the potential future work.

2. LITERATURE

Establishment of nuclear facilities is often classified as locally unwanted land use (LULU) and suffers from 'not in my backyard' or NIMBY sentiments wherein the local communities around the facilities object to their development (Benford et al., 1993; Greenberg, 2009b; Jenkins-Smith et al., 2011). Another relevant stream of literature emerges from agenda setting in public policy where Baumgartner and Jones (1993) examine the use of images and their interaction with different venues to alter policies. Public opinion on nuclear energy has been analyzed in detail in the literature and can broadly be assessed in two ways: examining opinions on nuclear energy specifically in the context of major incidents or accidents, and seeking opinions on nuclear energy.

2.1. Emerging implications of the fukushima meltdown

Nearly six years after the event, news from Fukushima continues to emerge. News coverage includes a report of the first thyroid cancer case linked to the nuclear disaster (Jiji, 2017), rising costs of clean-up (Obayashi and Hamada, 2016), and radiation implications on the western continental United States (Tan, 2016). The impact of the disaster brought discussions of safety and even the necessity of investing in nuclear power to the forefront.

2.2. Role of public opinion

Public opinion plays an important role in determining the course of development and investment in large infrastructure projects, especially in the case of large energy facilities (Boholm and Lofstedt, 2013). Public opinions against nuclear power plants (Benford et al., 1993), hydropower dams, and more recently, unconventional hydrocarbon extraction (such as fracking) (Boudet et al., 2014; Smith and Ferguson, 2013), carbon capture and storage facilities (Krause et al., 2014), and even renewable energy have affected the adoption of these technologies all across the world (Dimitropoulos and Kontoleon, 2009). Of these, public opinion on nuclear power appears to be particularly driven by the perception of the threat of accidents in energy facilities.

2.3. Public opinion after accidents

The results on nuclear energy preferences in the aftermath of (or atomic power) in general. The following sub-sections expound on these large accidents are mixed. In their analysis of three decades of public perception of nuclear power following an accident, Rosa and Dunlap (1994) find that in the long-term, the ‘rebound hypothesis’ does not hold true and that support for nuclear power typically does not return to the pre-accident levels. The authors also point out that contextualization of the question is an important aspect of survey design, i.e. whether the response is elicited with a reference to the country's energy problems, or the risk of nuclear power. In the 1970s, issues of the energy crisis (due to the Arab oil embargo) were prominent whereas, after the Three Mile Accident in 1979, factors of risk played heavily on the respondents' psyche. These "focusing events" (Latré et al., 2017) have implications on public opinion. However, it remains to be seen whether these cognitive effects last longer than in the immediate period after the event. In a review of public opinion after the Chernobyl accident, Renn (1990) finds that support for nuclear energy declined in almost all countries for which the data was available.

3. METHODS

3.1. Data The dataset is developed by accessing seven years of data from the Table 1 A summary of the survey period and sample size.

Year	Time period	Number of Observations Included in the Analysis
2008	September 9–14	1115
2009	March 31-April 6, and April 14-21	577
2010	October 13-18	1629
2011	March 17-20	743
2011	November 3–6	769
2012	March 7–11	1252
2013	September 4–8	1264
2014	December 3–7	1247

The surveys were conducted by Princeton Survey Research Associates International using Random Digit Dialing (RDD) for landline and cellular phones and up to 10 attempts were made to contact a sampled respondent. The data for all the years except 2011 are obtained from an annual survey conducted during the year. For 2011, the data is collected from two different surveys, one conducted in the week immediately after the incident and the next a few months later in November. The survey sample is designed keeping strong effect in the period immediately after the in view the demographic distribution among the US population. The merged dataset has 14,771 observations, and after dropping missing values and cleaning the variables, the final analysis comprises 8596 data points as shown in Table 1.

5. DISCUSSION

Results confirm the overall declining trend in support for nuclear energy. Support for nuclear power declined in the years following the Fukushima earthquake with a very

incident and lower, possibly even unstable effects in the latter years. It is not clear whether the accident in Fukushima had a substantial impact on long-term support for nuclear energy in the US, but the level of support has not bounced back to the pre-incident levels. In general, however, the difference in the values of coefficients for the time periods before and after the incident indicate a result contrary to previous studies which showed only marginal and non-persistent changes in public opinion in the context of the Fukushima incident.

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"Nuclear Radioactive Waste Management"

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ABSTRACT

The role nuclear data plays in determining the source term of radiation emitted by spent fuel and radioactive waste arising from nuclear activities is described. The isotopes most contributing to this source for different fuel cycles are identified. Current international activities aiming at improving the existing data bases, in particular as concerns data uncertainties are addressed.

Keywords: Nuclear data, radioactive waste, spent fuel

1. INTRODUCTION

The use of graphite in nuclear reactors worldwide as a moderator, reflector, or operational material results in an accumulation of radioactivity by neutron activation both of the constituent elements of graphite and of impurities, as well as potential contamination of its surface. This irradiated graphite (i-graphite) presents a major waste management challenge due to the presence of long lived radionuclide species such as 14C and 36Cl, together with shorter-lived species including 3 H and 60Co, and small quantities of fission products and actinides.

2. CHARACTERISTICS OF I-GRAPHITE

The behavior of graphite during irradiation and its final condition as a waste material will depend on the range of raw materials used in the manufacturing process; its physical, mechanical, and thermal properties; and its role in the reactor (e.g., moderator/ shield/reflector/fuel assembly), which will determine its exposure environment. As such, there is no generic radionuclide inventory of i-graphite. While radionuclide inventories can be estimated using activation modeling [5,6], these will only be accurate if the quantities of impurities are well characterized. There also needs to be a certain amount of direct measurement of representative material to understand more fully the distribution of radioactive species, and the total inventory, within a particular source of graphite.

3. INTEGRATED WASTE MANAGEMENT APPROACH

An integrated waste management approach for i-graphite enables a comprehensive analysis of the key stages from in-reactor storage through to final disposal, accounting for economic, safety, environmental, and sociopolitical factors. The approach developed within the CARBOWASTE project constitutes an pioneering study that could be used to inform national waste management approaches, but recognizes that some countries already have approaches in operation or planning. The approach involves the definition of a generic route map for i-graphite, followed by a series of detailed waste management scenarios (options) that are evaluated against specific criteria. This approach is supported and underpinned by information relating to the current strategies and technologies associated with the management of i-graphite and other radioactive wastes both nationally [7] and internationally, together with experimental, modeling, and other analyses performed within the CARBOWASTE project. The generic integrated waste management methodology is applicable to other radioactive waste management challenges, beyond i-graphite.

4. TREATMENT PROCESSES

Treatment of i-graphite may be undertaken for a variety of reasons: (1) to reduce dose to workers; (2) to reduce volumes of waste for disposal; (3) to achieve the radiological requirements for disposal; and (4) to facilitate recycle or reuse of isotopes or graphite. Walbridge et al. [14] identified, through lifecycle analysis, that the majority of environmental impacts from decommissioning a power station are directly related to the amount of waste that needs to be packaged and stored. Decontamination processes are, therefore, advantageous for removing a substantial proportion of the radionuclide inventory from the primary waste form. They also affect the form and properties of the end product, and define the form and nature of the waste streams produced. It is recognized that the requirement, or otherwise, for graphite treatment varies from country to country, and some nations may determine that treatment is not required. The desired end point for i-graphite can have a large influence on the choice of treatment process. For example, waste acceptance criteria for a near-surface disposal facility are likely to place more rigorous constraints on activity levels than for a deep geological disposal facility. Therefore, i-graphite to be routed to a near-surface disposal facility may require more significant decontamination or treatment prior to packaging and disposal. Conversely, i-graphite waste destined for a geological disposal facility may not require any treatment.

5. DEVELOPMENT OF WASTE MANAGEMENT OPTIONS

The objective of this task was to define a comprehensive set of plausible options that cover the range of i-graphite wastes, facilities, and waste management policies relevant to different European countries. The options encompass both mature and established technologies, as well as technologies that are more novel but have the potential to provide advantages over more established technologies. In this way, the integrated waste management approach provides a "toolbox" of options that is flexible enough to be applied to different situations and countries. The full list of options can be screened using constraints that address the specific context, policies, and regulations of a particular country.

5. CONCLUSION

Over 250,000 tons of i-graphite have been accumulated worldwide, ranging from countries with a fleet of several graphite moderated power reactors to prototypes, production, and single experimental reactors. The i-graphite is a complex type of waste due to its specific characteristics relating to its irradiation history when used in a nuclear reactor. Owing to its heterogeneous nature and presence of long-lived radionuclide species, i-graphite requires special consideration in terms of its long-term management. This presents specific challenges for the characterization, retrieval, treatment, and disposal of i-graphite.

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"A Focused Study on Behavior of Load Bearing Structures of a Building at Elevated Temperature"

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ABSTRACT

The paper presents an analysis of elevated temperature influence on the load bearing capacity of rectangular doubly-reinforced concrete cross-sections. The numerical analysis was carried out basing on authors' experiments on fine-grained concrete subjected to elevated temperature in the range from +20 oC to +600 oC and using the Eurocode 2 relation between the plastic limit of steel and temperature. The load bearing capacity of cross-sections with various amount of reinforcement – symmetric and non-symmetric, was investigated using limit state interaction diagrams.

Keywords: elevated temperature, cross-section load bearing capacity, fine-grained concrete, limit state interaction diagrams.

1. INTRODUCTION

Durability of structures is an aspect especially emphasized by Eurocode regulations. A durable structure has to fulfill the requirements related to its serviceability, load bearing capacity and stability without any substantial decrease of its functionality or unexpected maintenance costs during the entire service period [1]. Thus, the durability of structures depends on material properties and service environment conditions. Environmental aspects involve various chemical and physical hazards. Among the physical ones, an influence of elevated temperature plays an important role in the behavior of structures [2]. Hence, the analysis of concrete properties in the case of elevated temperature is very important from the practical point of view [3,4]. Information on strength of the material in the structure subjected to such conditions allows to assess a degree of its degradation. There are many papers including results of testing and analysis of elevated temperature influence on concrete and reinforcing steel [5,6,7,8]. The present paper reports such an influence on fine-aggregate concrete. Variation of concrete compressive strength with the temperature is considered. The focus is put on the fine-aggregate concrete but similar changes in concrete compressive strength are observed for ordinary concrete, too.

Nomenclature :

εc strain in concrete

εs strain in steel

σc stress in concrete

σs stress in steel

VRd resisting shear force

MRd resisting bending moment

As1 tension reinforcement

As2 compression reinforcement

Ra degree of discrepancy

R notion of discrepancy

s notion of tensile reinforcement

Us reinforcement ratio

2. RESULTS OF THE EXPERIMENTS

The presented results concern a 28-day old concrete based on a fine aggregate. The tested elements were cast using an aggregate with fraction up to 4 mm, which is a by-product of gravel selection, coming from Dębówko deposit, and a Portland cement of 32.5 N class from Górażdże plant. The aggregate was described as medium-size because its mean dimension was dm = 0.7 mm. The influence of elevated temperature from the range between +20 and +600 o C onto the strength of fine-aggregate concrete is presented graphically.

At +100 o C an increase of concrete compressive strength is observed. It results from evaporation of chemically unbound water. The further increase of temperature leads to a decrease of concrete strength. Temperature of +600 o C is considered as the value practically limiting a structural integrity of concrete based on Portland cement. This temperature is related to concrete itself, not necessarily to the exposition conditions.

3. ASSUMPTIONS FOR COMPUTATIONS AND THE SOLUTION

Method Influence of temperature on the load bearing capacity of RC cross-sections was assessed using their limit state interaction diagrams. The following assumptions were taken into account in the computations:

- plane sections remain plane,
- strain in tensile and compressed reinforcing bars adhering to concrete is identical to that in adjacent concrete,

4. NUMERICAL ANALYSIS

Assessment of the influence of elevated temperature of concrete on the ultimate limit state of RC rectangular cross-sections with compressed reinforcement was carried out for the temperature range between +20 o C and +500 o C. The temperature value of +20 o C was taken as reference. The assumptions of the isotherm 500 oC method were used. In the temperature exceeding +500 oC a significant deterioration of concrete strength is observed. In the majority of cases concrete has to be considered as destroyed [3]. In the present paper the numerical analysis is restricted to a rectangular cross-section made of fine-aggregate concrete with the strength parameters obtained from authors' experiments described in Section 2. Reinforcing steel with the characteristic plasticity limit of fyk = 500 MPa was considered. The following dimensions of the cross-section were assumed: width b = 0.30 m, depth h = 0.50 m. A constant localization of rebars, independent of the reinforcement amount, was considered as a1 = a2 = 0.05 m.

5. CONCLUSIONS

The numerical analysis of the influence of elevated temperature in the range from +20 o C to +500 o C on the load bearing capacity of RC cross-sections with compressed reinforcement made of fine-aggregate concrete allow to formulate the following conclusions: x the influence of the elevated temperature on the load bearing capacity of RC cross-sections with compressed reinforcement depends on the reinforcement amount Us and the component of tensile reinforcement s, x in the temperature range between +20 o C and +100 o C a small increase of load bearing capacity is observed independently of the type of the cross-section and the reinforcement amount Us, x for the cross-sections subjected to bending without axial force the extreme decrease of the capacity amounts to 57% and this value is decreasing with the increase of reinforcement amount Us as well as with the increasing component of tensile reinforcement s, x for the pure bending case with symmetric reinforcement the amount of reinforcement Us does not condition the level of capacity decrease, which is equal to 57% at the temperature of +500 o C, x for axially compressed elements the extreme capacity decrease is equal to 53% and this value is decreasing with the decreasing amount of reinforcement Us and the decreasing component of tensile reinforcement s, x for axially compressed elements with the maximal amount of non-symmetric reinforcement (s = smax) the amount of reinforcement Us does not condition the degree of capacity decrease, which is equal to 46% at the temperature of +500 o C.

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PLACEMENT DETAILS