

## SIGNIFICANT ACCIDENTS IN SEPTEMBER- OCTOBER 2020

### Indian Oil Corp- Chartered Tanker With 2 Million Barrels of Oil Catches Fire Off Sri Lanka



An oil tanker loaded with 2 million barrels of Kuwaiti crude sailing toward the Paradip refinery caught fire on morning of 3<sup>rd</sup> Sept 2020, off Sri Lanka's coast, raising concerns about an oil spill.

### Pasadena Residents Wake Up To Smoke After Fire At Nearby Refinery



An oil tank caught fire at Chevron Refinery in Pasadena on 18<sup>th</sup> Aug 2020. The East Harris County community alert system, known as CAER, issued an update before 6 am. That it discovered the fire on an oil tank in the northeast corner of the property near the Houston Ship Channel.



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## EDITORIAL

Dear Readers,

Greetings for the season...

We are happy to share 2<sup>nd</sup> Issue of Safexcellence.

We are thankful to your overwhelming response for the [first issue](#) and sharing your valuable views and worthy suggestions.

Fire incidents in Surat, Kurkumbh, blast in a gas plant at Bengaluru, toxic-flammable-gas-blast at Vadodara residential society, accident occurred in a Tarapur pharma-drug factory while transporting the reactive fluid from the reactor are but a few incidents juxtaposing in print media, and many others in air through social media suffocating common man while reading, are sending poignant warnings to professionals about planning and operations at the one end and indicating dire need of training for safety at the other.

The Centre of Excellence (CoE) in Industrial Safety at SRICT has inched forward with the help of professionals from Gexcon (Norway and India) and experts from UPL Ltd.

The participants of the CoE have successfully completed the FLACS Foundation certification training program. We congratulate them. Expert from Gexcon, UK, Mr. Gary Pilkington conducted Virtual capacity building sessions on "Process Safety Management in Managing Hazardous Chemicals & Processes" for Directorate of Industrial Safety & Health (DISH) and GPCB officers jointly with, Government of Gujarat & Centre of excellence, Shroff S R Rotary Institute of Chemical Technology (SRICT) sponsored by UPL.

Wishing you safe and healthy days ahead!

### Boisar Factory Gas Leak Leaves 6 Workers Ill



At least six workers took ill on 7<sup>th</sup> Sept 2020 after being exposed to a toxic gas that leaked from a factory in MIDC industrial estate in Boisar, Palghar. An officer at the Boisar MIDC fire station said the gas leaked from a tank of the factory containing formaldehyde.

### Oil Tanker Topples On Mumbai- Pune Expressway



A multi-axle oil laden tanker toppled on the downward slope near Khopoli exit in the Bhor ghat while heading towards Mumbai along Mumbai- Pune expressway on 7<sup>th</sup> Sept 2020, around 12 noon.

### Seven Killed In Blast At Firecracker Unit In Tamil Nadu



Seven women, were killed and two workers critically injured in an explosion at a fireworks factory in Kattumannarkoil on 4<sup>th</sup> Sept 2020. Four who were injured were rescued from the debris by the locals and admitted to a hospital here and two succumbed to the injuries.

## FEEDBACK ON COE ACTIVITIES

Centre of Excellence-Process Safety at SRICT conducted a program for DISH officials on Process Safety Management by a Gexcon UK PSM expert, especially with reference to Hazardous Chemicals Management in Chemical Industry. The program was truly well received, and I am sure has added value in terms of DISH officials for better implementation on Process Safety Management. I truly welcome this endeavor wherein Regulatory Agency, Academia and Industry collaborated extremely well in capacity building on PSM in Gujarat, Chemical hub of India. Please continue this endeavor of yours to spread the awareness and knowledge on making Gujarat an incident free and safer state.



Shri. P. M. Shah (DISH, Gujrat)



Thanks to all for setting the historic webinar "Make India Safer While Make in India".

Mr. Shakeel Kadri (Executive Director & CEO, CCPS, AIChE)

## SERIES OF PROCESS SAFETY MANAGEMENT TRAINING PROGRAM FOR DISH / GPCB OFFICIALS BY UK TRAINER



Hazardous Chemicals Management & PSM



Ensuring Process Safety in Design- Basic Requirement



Managing Hazardous Chemical Reactions



Mr. Gary Pilkington  
Principal Process Safety,  
GEXCON UK Ltd



Emergency Preparedness and Response

# CoE ACTIVITIES

## FLACS FOUNDATION CERTIFICATION EXAMINATION

FLACS is a 3D-CFD advanced tool for performing engineering calculations to predict reliable consequences of Fire, explosion scenarios. These results are used in designing to optimizing gas & flame detectors and pre plan the mitigation measures. It improves overall plant safety and reduce the project cost.

The course on FLACS is conducted and certified by GEXCON-Norway though hands on training with the required quality standards. Following CoE members have successfully completed the FLACS -Software training and Certification Examination in the month of September 2020.

### FLACS-CFD

Explosion, Fire & Dispersion Modelling Software. Our powerful industry-leading computational fluid dynamics (CFD) software simulates the dispersion of hazardous materials, fire and explosion with results that you can trust.



### FLACS-EFFECTS

EFFECTS is easy-to-use, cost-effective software that helps safety professionals calculate and analyze the effects of release, fire, explosion, etc. scenarios and develop the appropriate prevention or containment protocols.



### FLACS-RISKCURVES

RISKCURVES presents calculation results in a range of ways, from the physical effects of the individual scenarios to the resulting iso-risk curves, FN curves for societal risks and risk ranking reports.



## TRAINING ON FLACS-EFFECTS AND RISKCURVES

Currently the CoE member are undergoing training on FLACS EFFECTS and RISKCURVES. This training is aimed at introducing the principles of consequence modelling and risk analysis. The consequence modelling using EFFECTS gives an overview of all the models available within the software: release, pool evaporation, fire, explosion, dispersion, damage, and combined models.

RISKCURVES software introduces to the calculation of individual risk and societal risk. This course comprises Risk Analysis theoretical background that is fortified with multiple practical exercises.

## PLANT VISIT TO UPL-UNIT-5 BY CoE MEMBERS

The plant visit was planned to provide participants the perspective of plant layout and congestion. This enhanced actual visualization and helped in geometry designing using the FLACS.



## Emission From Phillips Carbon Black, Palej



The Phillips Carbon Black Ltd. Company of Palej emitted carbon into air which struck on people's homes, vehicles and clothes on 3<sup>rd</sup> Sept 2020. The hands and feet of locals also turned black, which proves to be dangerous to health.

## Bhubaneswar: CNG Station Blowout Near Raj Bhawan.



Bhubaneswar: A loud explosion ripped through a petrol pump station near Raj Bhawan in the State capital. As many as three fire tenders have been pressed into service to douse the flames at the spot after a huge fire spit out from the spot following the explosion.

## Gas Leak In Aarti Industries, Jhaghadia



A major gas leakage was reported in the plant of Aarti Industries, a chemical and pharmaceutical intermediate (API) manufacturing company located at Jhaghadia GIDC in Bharuch district on 14<sup>th</sup> Sept 2020. Sources said the incident occurred at around 3 pm during transfer of 3,4-dichloroaniline chemical into the storage tank from the plant.

# PROCESS SAFETY MANAGEMENT – HUMAN FACTOR

In last issue of [SAFEXCELLENCE](#), we discussed 'Elements of Process Safety Management'. It explains 17 elements for analysing disasters for the probable cause/s. The 13<sup>th</sup> element – Conduct of Operation explains human factor as one of the important root causes, observed in most of catastrophes that are analysed. This article defines human error and categories that can be used to identify solutions to human performance issues. In subsequent issues, it will examine the relationship between conduct of operation/ operational discipline (COO/OD) and common performance programs (behaviour-based programs, antecedent-behaviour consequence programs, and human performance technology). Human factors issues underlie from management leadership to implementation, through COO/OD system development.

Human error is often recognized as being a contributor to incidents and accidents, however, very few organizations are able to proactively manage this. Human error is influenced by human behaviour and thus is the very essence of the field human factor.

## WHAT IS A HUMAN ERROR?

Human errors are gaps or differences between acceptable and actual behaviour or performance. For example, If the procedure specifies that the flow rate should be set at 45 to 55 litres per minutes, then it would be a human error to set the flow rate to any value outside the specified range.

The table below shows some examples of typical human errors, might be present at a facility. Most of these errors do not result in immediate consequences, however they are still considered human errors.

Situation	Acceptable performance	Actual performance (Error)
Preparing to work on a valve	<ul style="list-style-type: none"> <li>Operations and maintenance personnel work together to prepare the valve for the work.</li> <li>Maintenance communicates to the operations group the work that will be done.</li> <li>Operations puts the process in a safe condition.</li> <li>Maintenance verifies that the equipment is properly isolated</li> </ul>	<ul style="list-style-type: none"> <li>Maintenance does not always verify proper isolation of the equipment because they rarely find problems and sometimes, they are pressured to complete the job quickly</li> </ul>
Shift turnovers	<ul style="list-style-type: none"> <li>Operators from both shifts (on-coming and outgoing) discuss the work performed on the previous shift, equipment out of service, plans for the on-coming shift, and panel indications.</li> <li>The turnover lasts long enough that the on-coming operators are comfortable with their understanding of the facility status and planned activities</li> </ul>	<ul style="list-style-type: none"> <li>Shift turnover gets shortened because one operator arrives late or the other needs to depart the facility "on time".</li> </ul>
Switching operating equipment	<ul style="list-style-type: none"> <li>The operator opens and closes specified valves in the sequence dictated by the operating procedure.</li> </ul>	<ul style="list-style-type: none"> <li>The operator manipulates the valves in a more convenient, but incorrect, sequence to save a few steps.</li> </ul>
Filling a tank	<ul style="list-style-type: none"> <li>The operator is supposed to set the fill rate at 45 to 55 LPM.</li> </ul>	<ul style="list-style-type: none"> <li>The operator sets the fill rate at 75LPM to complete the job faster</li> </ul>
Reviewing a new operating procedure	<ul style="list-style-type: none"> <li>Once the procedure is written, it is reviewed for technical issues by two operators: an operator normally assigned to the task and an operator who may be assigned to the task when the facility is operating short-handed.</li> </ul>	<ul style="list-style-type: none"> <li>The normally assigned operator signs off on the procedure without reviewing it, believing that the other operator will review the procedure in detail</li> </ul>
Designing a new control system	<ul style="list-style-type: none"> <li>The design of the process requires multiple power sources to meet reliability requirements.</li> </ul>	<ul style="list-style-type: none"> <li>The designer eliminates one of the backup power supplies to meet budget constraints without getting approval for changing the reliability target.</li> </ul>

## Human Behaviour Issues

### People are fallible, and even the best make errors

To prevent and mitigate human errors, organizations must plan for them by implementing prevention, detection, and correction.

### Error-likely situations are predictable, manageable, and preventable

Organizations must spend time identifying error likely situations and implementing systems to manage these situations.

### Organizational processes and values influence individuals.

Discourage undesirable behaviours. The design and implementation of the management systems related to equipment design, operation, maintenance, procedures, supervision, incentives, training, and many other activities all influence the behaviour of personnel.

### People achieve high levels of performance based on expectations and feedback.

Rewards and punishments should be focused on behaviours, not outcomes. Achieving the proper outcome using undesirable methods should be strongly and consistently discouraged. Many rewards and punishments are non-monetary. Receiving recognition for a good idea, being able to select the tasks one performs, and being assigned to desirable or undesirable shifts or tasks are just some examples.

### Personnel who are committed to their jobs perform better.

People tend to be committed to doing their best when they:

1. Clearly understand the core values and performance goals.
2. Have influence over what they do.
3. Have the competencies to perform the jobs that are expected of them, and
4. Are appreciated for their performance.

### Incidents can be avoided by understanding the reasons why human errors occur.

Systematic analyses of human behaviour before incidents occur (proactive analyses) and systematic analyses of incidents themselves (reactive analyses) provide insight on how to design systems for successful human performance.

## Common Misconceptions About Human Performance

### Punishing the people who make mistakes, eliminates the mistakes.

Blaming people will temporarily reduce errors only in situations where fear of punishment is the primary driver behind personnel performance. However, this is just one of many drivers behind human performance. If the organization sets personnel up for failure and then blames individuals when they fail to perform well, punishment usually results in worse performance as personnel become resentful.

### Training is the solution to all human performance problems.

Training can help one's knowledge and/or his skill and thus lack of training cannot be the only contributor for most human errors. In many cases, errors are the product of a poorly designed human-machine interface (poor labelling, poor lighting, poor layout, etc.). Sometimes, people know what to do and how to do it, but they choose to do it differently.

### Reward the right outcomes and everyone will behave properly.

Rewarding the desired outcomes encourages achievement of the goal by whatever means necessary. Shortcuts will often be used to achieve high production rates if the reward is based only on the outcome and there is no punishment for achieving the goal using undesirable methods. A better approach is to reward and reinforce the use of the right process. Reinforcing the desired behaviours should result in the right outcomes.

### Experienced personnel do not make errors.

Experienced personnel do err. The overall frequency of errors may be lower, and they may be more likely to detect and correct their errors before they have an adverse outcome. However, experienced personnel are more likely to make some errors of omission precisely because they are so familiar with routine tasks. Experienced workers who are bored or complacent are also more likely to make errors.

### All errors must be eliminated.

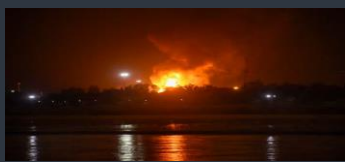
It would be nice to eliminate all human errors. However, setting this as a goal or believing that this is possible leads to poor use of the organization's resources. When errors will have unacceptable consequences, methods for preventing the error, as well as detecting and correcting the effects of the errors, must be put in place to reduce the associated risk to a tolerable level. Organizations should not expend undue effort addressing performance variations with tolerable risk.

### If everyone is held accountable, they will do the right thing.

Accountability is an important aspect of human performance management, and it is a tenet of COO/OD. No management system can function without a degree of personal accountability. However, holding personnel accountable for problems in the management systems they cannot control does not reduce human errors; it simply causes frustration, resentment, and poor performance.

To be continued.....

**Fire At Ongc's Hazira Plant**



A fire broke out at the Oil and Natural Gas Corporation's Hazira gas processing plant, in Surat district on 24<sup>th</sup> Sept 2020. The fire broke out in the inlet gas terminal after three massive blasts at 3:05 am. The compressed gas was depressurized to bring the fire under control.

**Minor Blast In Bengaluru Gas Power Plant**



A "minor" explosion was reported at a 370 MW gas power plant of the state-run Karnataka Power Corporation Ltd in Bengaluru early on 2<sup>nd</sup> Oct 2020, leaving 15 persons injured, including two critically.

**Major Fire Breaks Out At Chemical Factory In Kurkumbh Industrial Cluster**



A major fire broke out at a chemical processing factory located in the industrial cluster at Kurkumbh, off Pune-Solapur Road, in the early hours of 1<sup>st</sup> Oct 2020. As the unit had been storing many types of solvents, which are highly flammable, the fire went on spreading for a while across its premises.

**Explosion occurs at Florida chemical facility**



An explosion occurred at a chemical facility in Florida, US, on 8<sup>th</sup> Sept 2020 in a storage area for an isopropyl alcohol-based solution. The explosion occurred at the FAR Chemical facility in Palm Bay at around 10:30 am.

# ELEMENTS OF PROCESS SAFETY MANAGEMENT

In the 1<sup>st</sup> Issue of **SAFEXCELLENCE**, SRICT CoE has selected 17 process safety elements and based on these, shall attempt to analyze disaster for the probable cause/s. **SAFEXCELLENCE** team will collate data of major accidents took place during the month and will publish the missing process safety element/s in the news letter.

**MISSING PSM ELEMENTS WHICH CAUSED THE ACCIDENT**

**SEPTEMBER - OCTOBER 2020**

ACCIDENTS	PSM MISSING ELEMENTS																
	MANAGEMENT COMMITMENT			HIRA		OPERATIONAL										LEARNING	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Fire - IOCL Chartered Tanker	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Fire - Pasadena Refinery	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Toxic Gas Leak- Boisar Factory	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Blast - In firecracker unit Tamil Nadu	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Carbon Emission- Phillips Carbon Black	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Explosion - Petrol Pump, Bhubaneswar	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Toxic Gas leakage - Aarti Industries	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Fire - ONGC Hazira	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Blast- Bengaluru gas power plant	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Fire - Kurkumbh Industrial Cluster	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Explosion - Telangana Chemical Factory	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Florida Explosion	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Ammonia gas leak - Seafood processing unit, Goa	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17

**REPORTED INDUSTRIAL ACCIDENTS AND DEATHS IN 2020**

**(JAN 2020 – OCT 2020)**

Sr. No.	State	City	Date	No of Deaths	Cause of Accident
1	Andhra Pradesh	Visakhapatnam	May 7	12	Styrene Gas Leak
		Visakhapatnam	June 30	2	Benzimidazole Gas Leak
		Kurnool	June 27	1	Ammonia Pipeline Blast
2	Assam	Bagjan	June 10	2	Oil Well Blowout
3	Delhi	Peeragarhi	Jan 02	1	Fire Explosion
		Vadodara	Jan 11	6	Explosion
4	Gujarat	Bharuch	June 03	10	Boiler Explosion
		Bharuch	Jan 06	2	Boiler Explosion
		Ankleshwar	June 10	1	Explosion
		Ahmedabad	July 18	2	Inhalation of Noxious Gas
		Ahmedabad	July 19	4	Inhalation of Noxious Gas
		Dahej	June 03	10	Plant Blast
		Udhana	Aug 11	1	Oxygen Cylinder Blast
5	Goa	Cuncolim	Oct 9	1	Ammonia Gas Leakage
6	Haryana	Bahadurgarh	Feb 28	6	Explosion
7	Himachal Pradesh	Baddi	April 16	1	Explosion
8	Madhya Pradesh	Singrauli	April 10	3	Fly Ash Flood
9	Maharashtra	Nagpur	Aug 01	5	Boiler Explosion
		Palghar	April 13	2	Explosion
		Boisar	Jan 11	8	Explosion
		Thane	Jan 22	1	Dust Explosion
		Tarapur	Aug 17	1	Reactor Blast
10	Tamil Nadu	Neyveli	May 07	13	Boiler Explosion
		Neyveli	July 01	8	Boiler Explosion
		Kattumannarkoil	Sep 4	7	Explosion
11	Telangana	Srisailem	Aug 21	9	Fire
		Pedapalli	June 02	4	Mine Explosion
		Sangareddy	Sep 04	2	Explosion
12	Uttar Pradesh	Ghaziabad	July 05	8	Fire
		Kanpur	Aug 23	2	Inhaling the Toxic Fumes
		Agra	Oct 18	3	Explosion
13	West Bengal	North 24 Parganas	Jan 03	4	Explosion
<b>Total No of Deaths</b>				<b>142</b>	

## Two Employees Die In Accident At Telangana Chemical Factory



Two employees at chemical factory in neighbouring Sangareddy district died in an accident on 19<sup>th</sup> Sept 2020. The two employees included a manager and an engineer, who were involved in carrying out some welding work to a structure where gas is stored after being produced from waste material and they climbed the structure during the process.

## Toxic gas from drainage triggers blast, two hurt



Two persons suffered burns when toxic gas accumulated in the bathroom of a house. The blast in Madhukunj Society on 9<sup>th</sup> Oct 2020 late evening shook many houses in the neighbourhood. The poisonous gas emanating from the drainage pipe was accumulated as there was no proper ventilation in the bathroom and when the occupants switched on the bulb a minor spark must have happened and the gas acted as a fuel.

## One Dead In Ammonia Gas Leak At Goa Factory



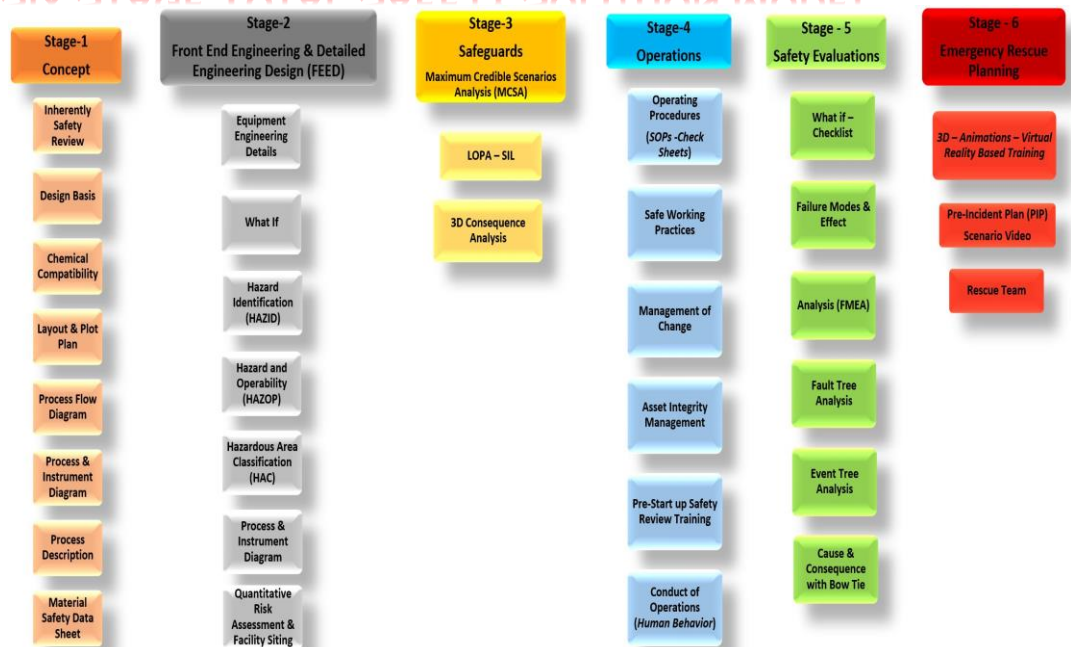
One worker died and four others were critically injured after ammonia gas leaked in a seafood processing unit at Cuncolim industrial estate in South Goa on 9<sup>th</sup> Oct 2020. One worker died after inhaling ammonia gas that leaked on the premises of the plant. Four others were admitted to a hospital.

# CoE – TOTAL SAFETY SOLUTION MODEL

**142 fatalities in last 10 months averaging more than 14 deaths per month!** It's an alarming statistic by any standard. This further strengthens the public perception of chemical industry as a dangerous and highly polluted industry. This is the high time we as a chemical industry think out of box and take some drastic steps to change the perception and reduce the incidents. There is an increased emphasis on chemical process safety as a result of highly publicized accidents. Public awareness of these accidents has provided a driving force for industry to improve upon its safety record.

The chemical industry is one of the safest industries, but its safety record in the eyes of the public domain has suffered. Perhaps this is because sometimes when there is an accident in a chemical plant, it is spectacular and receives a great deal of attention. The public often associates the chemical industry with environmental and safety problems, which result in a negative image of the industry.

## SIX STAGE TOTAL SAFETY SOLUTION MODEL :



SRICT – CoE has developed a new model called Total Safety Solution (TSS). It has a unique concept of accommodating not only the elements of process safety management (PSM) in practical but merging it with Evacuation, Escape and Rescue (EER) concept by developing a video training. Taking outcomes of CFD based consequence analysis and animating it with advanced virtual reality (VR), for training to employees and members of rescue team will undoubtedly help reducing the time element to control the (undesirable and unplanned) event sequence and reducing the severity of consequence. Thus, the TSS will ensure achieving all three goals of saving human life, environmental damage and assets.

We, at CoE have come up with a new concept of Common Facility Centre (CFC) which will have common fire hydrant system with operating staff and fire-engine, medical Centre with staff and ambulance, Central Safety Training Centre and Common Rescue Squad (CRS). Chemical companies can come together to form a Cluster Chemical Safety Facility (CCSF). This will not only reduce the financial and operating burden on individual units for maintaining the facility but strengthen the mitigation measures to control the (undesirable) disasters too.

**FOR MORE  
INFORMATION  
ABOUT TOTAL  
SAFETY SOLUTION  
MODEL, CONTACT  
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## CoE UPCOMING ACTIVITIES

**FLACS-CFD V.20 TRAINING PROGRAM BY NORWEGIAN TRAINER DR. FRANZ ZDRAVITSCH (PRINCIPAL ENGINEER / CHIEF TRAINING OFFICER, GEXCON) TO CoE MEMBERS**



**PROCESS SAFETY MANAGEMENT TRAINING BY UK TRAINER TO STATUTORY AUTHORITIES MR. GARY PILKINGTON PRINCIPAL PROCESS SAFETY, GEXCON UK**

**IChemE ACCREDITED PROCESS SAFETY MANAGEMENT FOUNDATION COURSE**



**TRAINING PROGRAMME ON PROCESS SAFETY MANAGEMENT**

**SIGNING MOU WITH DIRECTORATE OF TORATE OF TORATE OF INDUSTRIAL SAFETY AND HEALTH (DISH)**



**ASSISTING INDUSTRIES IN IMPLEMENTATION OF PROCESS SAFETY MANAGEMENT**

**PSM CONSULTING ASSIGNMENTS TO MEDIUM/LARGE CHEMICAL COMPANIES**



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