

## 『Formulation of annual safety training』

- When handling gases, improper operations can lead to accidents such as poisoning, oxygen deficiency, abnormal pressure or gas leakage which potentially affecting customer's production. Therefore, providing education and training to employees is essential and it is important for companies to establish and thoroughly implement an annual training plan.
- Training on gas knowledge and equipment handling not only improves employees' knowledge levels but also helps prevent operational errors in daily tasks and improves emergency response capabilities.
- Please ensure that the safety officer and equipment manager at the customer's factory fully understands the importance of safety training and develop a training plan tailored to the actual situation.



### 【The importance of safety training and planning】

The causes of accident vary depending on the condition of the equipment and the site. Generally, the main causes of accidents can be divided into **physical factors** and **human factors**. In the case of **physical factors**, accidents caused by this factor can essentially be prevented by the design, equipment, correct usage of equipment and proper maintenance management, considering intrinsic safety (fail-safe) are properly implemented.

However, in the case of **[human factors]**, accidents cannot be restrained simply by using certain equipment. Generally, new operators has low awareness against hazards and do not understand the basic operation and how to manage the equipment, there is possibility can cause equipment damage and injury or death due to mishandling.

Therefore, employee training is one of the most important issue for company to manage.

Moreover, safety training is usually provided to employees after an accident occurred.

Training is an importance way of action for employees to gain knowledge and

understand the operational hazards. Without clear training objectives and plans,

company cannot achieve effective training outcomes from the employees.

Thus, by preparing training plan suited to the experience and knowledge levels of workers, preparing relevant training materials and conducting training, it will improve workers safety awareness and operational skills which will prevent accidents caused by **human factors**.

### 【Examples of accidents】

#### Death of two workers due to oxygen deficiency (China 2004)

**Situation:** Nitrogen purging was conducted to remove toxic gases from a storage tank. Two workers entered the tank without measuring the oxygen concentration inside and collapsed due to oxygen deficiency. (Normal oxygen concentration in air is 21%) Since there were no supervisor other than the two workers on site, no emergency response could be taken, and as a result, both workers died.

**Cause:** Lack of understanding of the properties of gases (asphyxiant).

#### Carbon monoxide poisoning accidents at power stations. (Japan 2023)

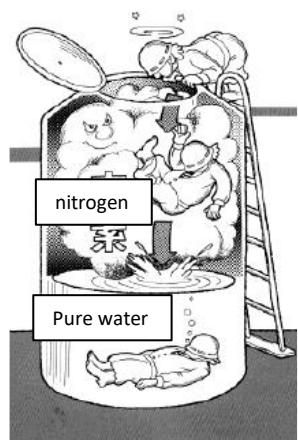
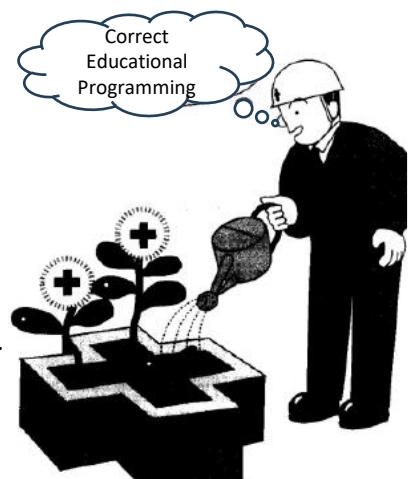
**Situation:** At a construction site of a power plant, while using a high pressure gas consumption equipment (temporary burner) to burn flammable gas (Liquefied Petroleum Gas), carbon monoxide poisoning occurred due to incomplete combustion. One worker died and ten workers sustained minor injuries.

**Cause:** Lack of understanding of the dangers of carbon monoxide poisoning.

#### Asphyxiation accidents due to misconnection of nitrogen supply pipes. (Japan 2023)

**Situation:** A worker was found collapsed in front of a reaction tank by a supervisor, then was rushed to the hospital and was later confirmed dead. During cleaning work in the reaction tank, the air hose supply of the mask was connected to a nitrogen supply pipe by mistake and that was the cause of accident.

**Cause:** Accidents caused by human error (wrong connection).



Safety Information provides info about safety manage of gas & gas facility.

Please make use of it to prevent accident and for safety operation.

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## 【 Developing safety training plan 】

### □ Setting up target plan and developing training plan

When setting up a plan, the training plans are classified according to the job description and the level of knowledge of person who are going to be trained. ( See table below )

Target of training	Field worker	Inexperienced person	Subcontractor worker
Schedule of training	<b>Periodic training</b> (Schedule according to the actual situation, example once/month)		
Training provider	1. In-house safety personnel/Facilities officer 2. External trainer		
<b>Special training:</b> <ul style="list-style-type: none"> <li>1. When new equipment was installed.</li> <li>2. When changing equipment, operating procedures and etc.</li> <li>3. The change of legislation and regulations.</li> <li>4. When there is change of workers.</li> <li>5. When taking the competency examination.</li> <li>6. When an abnormal condition occurs</li> <li>7. When a serious incident or disaster occurs at other company.</li> <li>8. When someone violates the law or company regulations.</li> </ul>			

### □ Developing a reasonable training plan base on the current situation

The content of the educational training has a direct impact to training effectiveness. Improper training plan with lack of preparation will cause the effectiveness of the training will be not as expected. It is necessary to make a proper plan of the training before implementing them. (See table below)

Group training	Lecture / Seminar	1. Suitable for beginner level of knowledge training. (e.g. training for new employees.) 2. The use of audio and visual equipment enhances understanding.
	Discussion / forum	1. The target is for worker who has knowledge and experience with the work. 2. Representative from different companies will have discussion on the problems and examples of case study. 3. The panelist must be knowledgeable and have a lot of experiences.
	Problem solving	Suitable for employees who is leaning about safety knowledge. The given questions will develop the thinking ability of the person.
	By project method	1. Develop employees' capability to do independent research. 2. Improving employees' learning awareness through the presentation of research findings.
	Safety training	The training will be more effective if it is conducted by external trainer.
Personal training	Work base	Do the work according to the work standards. Repeat the work again if there is a mistake.
	By follow-up	Evaluate the results and repeat the work with a guide if the objective value was not achieved.
	safety attitude training	“Unsafe attitude” is situation when individuals know the correct actions to take but choose not to act or have the ability to do the tasks correctly but fail to do so. The reasons of this behaviors must be identified and corrected.

### □ On-site guidance to improve understanding

There is a difference between a worker “understanding” knowledge and being “able to operate”. For worker to go from “understanding” and become “able to operate”, instructor must guide the worker and do actual hands-on training on site. After teach them the theory, it is importance to have the worker to practice what they learned on actual operations and gestures at the site. As shown in the table on the right, one-to-one teaching is proven to be very effective. It's not just about repeating operation, workers must be able to apply them under various conditions.

### □ Conduct regular training, get used to it rather than just learning.

Even if workers have acquired skills during training, they may not be able to act with the same calm judgement as in daily operation during emergency situation. To ensure workers are able to respond appropriately during emergency, it is importance to conduct regular training to enhance their sense of responsibility and effective training to make the worker respond efficiently.

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Means of understanding	Memory retention rate	
	3 hours later	3 days later
Language	70%	10%
Show	72%	20%
Talk and showing	25%	65%

### 【 3 methods of communication and effectiveness 】



【 Firefighting drills 】