

# SUFFOCATION OF WORKERS IN A CO CONVERTER

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There has been a most unusual response, worldwide to the Safety in Air Separation and Ammonia Plants' symposia presented by A.I.Ch.E. There has been unbelievable correspondence from England, South Africa, and Japan. Some of the people that have corresponded have made a special effort to have available reports on their accidents, one of which I will attempt to present now, was submitted by the Asahi Chemical Industry Co., Ltd., in Japan. The report was transmitted to me by Mr. Kazuo Itoh, manager of the Merchandise Pioneering Laboratory.

This is a report of a CO converter accident and the countermeasures which were taken to prevent its recurrence. The accident occurred on December 17, 1960. Three men died from suffocation. There was no equipment damage.

## Artificial ventilation for safety

The situation under which the accident occurred was as follows:

The ammonia plant is a crude oil gasification process by Texaco-Chemico. The conversion section consists of three catalyst chambers of upper, middle, and lower stages. The catalyst life differs according to the stage, so it is sometimes necessary to change catalysts of only the first stage. In such a case, it is required that the second and third chambers be filled with nitrogen atmosphere to prevent the oxidation of catalyst, while the first chamber is filled with air for exchange work.

Though the first chamber is segregated from the second and third chambers, a small amount of nitrogen gas leaks in from the second and third chambers. Therefore, artificial ventilation by an air blower is needed to guarantee the safety of workers in the chamber.

The accident occurred while a nitrogen atmosphere was being filled in, as catalyst changing work had

been finished. The air blower had been removed and there had been no need of entering the chamber any more. It is presumed that if the manhole of the first chamber had been kept open, the worker might have entered the first chamber, forgetting for one moment that nitrogen atmosphere was being filled, and was suffocated.

Other workers who saw a man fall entered the chamber to rescue the man and were suffocated, too.

## Safety countermeasures

Following the accident, safety countermeasures have been reinforced in many ways. In particular, when work is done inside a vessel, or a cellar, the following rules are being observed to insure the safety of the work.

1. When it was deemed necessary to enter a tank or a vessel, we strictly check for the existence of any toxic gas, combustible gas, or suffocating gas and at the same time measure the concentration of oxygen gas necessary for work, even if such a tank or vessel has been exposed to the air.
2. Work inside a vessel is always done by two men, one standing outside to watch while the other works inside.
3. A life rope is tied to the workman doing work inside a vessel.
4. In order to shorten the time of work inside the catalyst chambers, used catalysts are sucked out of the chamber by vacuum equipment. The time of change has also been shortened by taking the catalyst out before it is oxidized.

Since the above rules were adopted such accidents have not occurred, and work is being done safely and easily.

## DISCUSSION

SIMMS: Some of you may feel that this accident was repeated years ago in United States plants, but here again, as industry expands worldwide, we find repetition in some form.

WHITE—Smith-Douglass Co.: Just to emphasize this,

it not only happens in Japan; 3 weeks ago a man was asphyxiated in a tank under somewhat similar conditions. In this case, it was realized that the man needed some ventilation so an air hose was stuck in to give him ventilation. The only trouble was that a mistake was made: it was a nitrogen line.