Logical Hazard Identification in a Workplace

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OUTLINE

- Background
  - Hazard Identification in Risk Assessment
  - Hazard Identification Training in JAPAN

- 3+1 maneuver
  - Three rules relating to the nature of energy
  - One rules relating to the nature of trigger

- Results of experiments
  - Examined the maneuver
OUTLINE of RISK ASSESSMENT PROCESS

New Hazard?

YES → Hazard Identification

NO → Risk Estimation

Risk Estimation

Risk Evaluation

YES → Risk OK?

END

NO → Risk Reduction

Compare against criteria
- regulatory criteria
- internal organisation criteria
Another benefit of hazard identification process

- help understand the nature of hazards
  - hazards accompanying activities and workplaces
  - a robust and substantial understanding of the work environment
- foster hazard awareness
  - conducive to a “safety culture”
    - The commitment fosters a safety-conscious atmosphere
Hazard Identification Training
(KIKEN YOCHI KUNREN in Japanese)

# 74.1% of companies consider the activity as effective
# The rate of lost-worktime injuries was reduced from 2.14 to 1.33 over 5 years (658 facilities)

From JISHA website : http://www.jisha.or.jp/zerosai/kyt/index.html
Hazard Identification Training
(KIKEN YOCHI KUNREN in Japanese)

- uses pictures depicting scenes of an activity
- Imagine unsafe activities, conditions and consequences

WITH CREATIVE THINKING !!

- Discuss how to avoid them
Hazard Identification without knowledge / experience

- can be unrealistic
- insufficient ideas

The current industrial situation ...

- experienced workers are retiring
- rapid turnover ...
  - training needs to be applicable to novices as well as providing refresher courses

A logical method is required!
3+1 maneuver

- designed for activities in the production phase
- “people are injured by energy released due to an action of trigger”
- Four rules
  - Five types of energy cause accidents
  - Each type of energy can convert into other types
  - A trigger is required to activate the energy to cause an accident
  - Performance of triggers can change over time
Rule 1: Five types of energy cause accidents

- Energy destroys people, equipment, and facilities
  - kinetic energy
  - potential energy
  - chemical energy
  - thermal energy
  - electrical energy

- Specific types of injuries and damage can be assigned to each type of energy
  - chemical energy $\Rightarrow$ burn, abnormal metabolic process, or respiratory damage
Rule 2: Each type of energy can convert into other types

- Chemical Energy
- Thermal Energy
- Electrical Energy
- Potential Energy
- Kinetic Energy
Rule 3: A trigger is required to activate the energy to cause an accident.
Rule 4: Performance of triggers can change over time

- Distance
- Shape
- Humidity
- Material
- Leakage
- Confinement
- Discontinuity
- Direction

Time change
Experiment Procedures

Average scores

Before

After
Results

- The result of a paired t-test ($t<0.05$) rejected the null hypothesis (no difference between before and after education)
- The level of understanding did not show any specific difficulties in understanding the maneuver.
- All subjects had studied in scientific fields and seemed accustomed to the principle of energy in physics.
- The subjects showed a relatively firm grasp of the fundamental natures and functions of each trigger.
- They understood that “new ideas” does not mean unrealistic or bizarre ideas, but gives a new perspective on accidents and organizes the rules underlying the causes of accidents.
- After the education, subjects paid more attention of the hazard led by the Rule 4, “the performance of trigger can change over time”.
Concluding remarks

- Examined the effectiveness of logical hazard identification, the “3+1” maneuver.

- Even brief education using a PowerPoint file showed improvements for finding hazards in pictures compared to the result using creative thinking alone.

- A scientific background may provide positive influence to understanding the maneuver
  - Effectiveness among individuals without background or experience should be examined in a further study.

- The method needs to be improved in various respects,
  - easy understanding, easy application, maximize subject concentration, encourage learning.

- Further development of the maneuver is expected to contribute to fostering the safety culture in workplaces.