



# Teaching and Learning Symposium

## To Develop a HAZOP Study Teaching Module

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*Acknowledgements to*

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# Aim of Project

To develop a new HAZOP Teaching module to identify hazards and operability concerns in process industry plants. The module will be tailor designed to encourage student interest and learning effectiveness by incorporating a number of stimulating and creative interactive case study examples.

# Project Description

Hazards and Operability (HAZOP) study is an analysis method which identifies and minimizes the hazards of a process and improves its effectiveness. It is currently part of a final year lecture course and part of a practical exercises in the Final Year Design Project but the HAZOP study module will be modified and integrated into a new Industrial Training Unit course.



# Current Teaching Problems

The challenges with running the HAZOP exercise in the existing course mode are:

- **student difficulties in using all information they have acquired in several lecture courses and adapting to this qualitative assessment approach used in performing HAZOP Studies**
- **somewhat heavy and dry theory within the HAZOP lectures**

# Current Teaching Problems

- **the HAZOP analysis involves time-consuming study and final-year students may miss some key sessions due to job hunting**
- **the absence of an absolute correct numerical answer to HAZOP is a difficult concept for students to appreciate**
- **the development of this concept with the students presents difficulties and is time consuming for faculty because the current approach involves developing numerous alternatives**

# T&L Project Objectives

The main learning objective in terms of the HAZOP study is that by the end of the module students will:

- **better understand the basic HAZOP procedure**

Other key objectives will have be to provide students with valuable experiences for workplace skills development through:

- **Role playing meetings**
- **Communicating in groups**
- **Working in a team**



# T&L Project Objectives

- **Multidisciplinary activity**
- **Working in a simulated “Design Office” environment**
- **Systematic thinking, problem solving skills and analysis**
- **Very wide-ranging knowledge base applications**
- **Evaluation and reflection assessments for the HAZOP Teaching Module**

# Plan of Actions to Satisfy the T&L Objectives

1. Guidelines on “role tasks” will be given.
2. Guidelines on “performing well in meetings” will be included.
3. “Team selection” and “good team characteristics” will be presented in the module.
4. Participants from other subject disciplines will be invited to the HAZOP meetings to make them multidisciplinary.



# Plan of Actions Satisfy the T&L Objectives

5. Time schedules and constraints will be imposed to achieve targets and deadlines typical of Design Office pressure.
6. Examples will be provided in the module to direct the students to think independently, systematically, and solve problems using the interactive simulation examples provided by CELT.
7. An evaluation and reflection assessment process will be carried out by holding a series of meetings with the students who take the HAZOP Teaching Module in Dec04/Jan05.

# Key Novel Features

A number of novel features have been proposed to make the module stimulating.

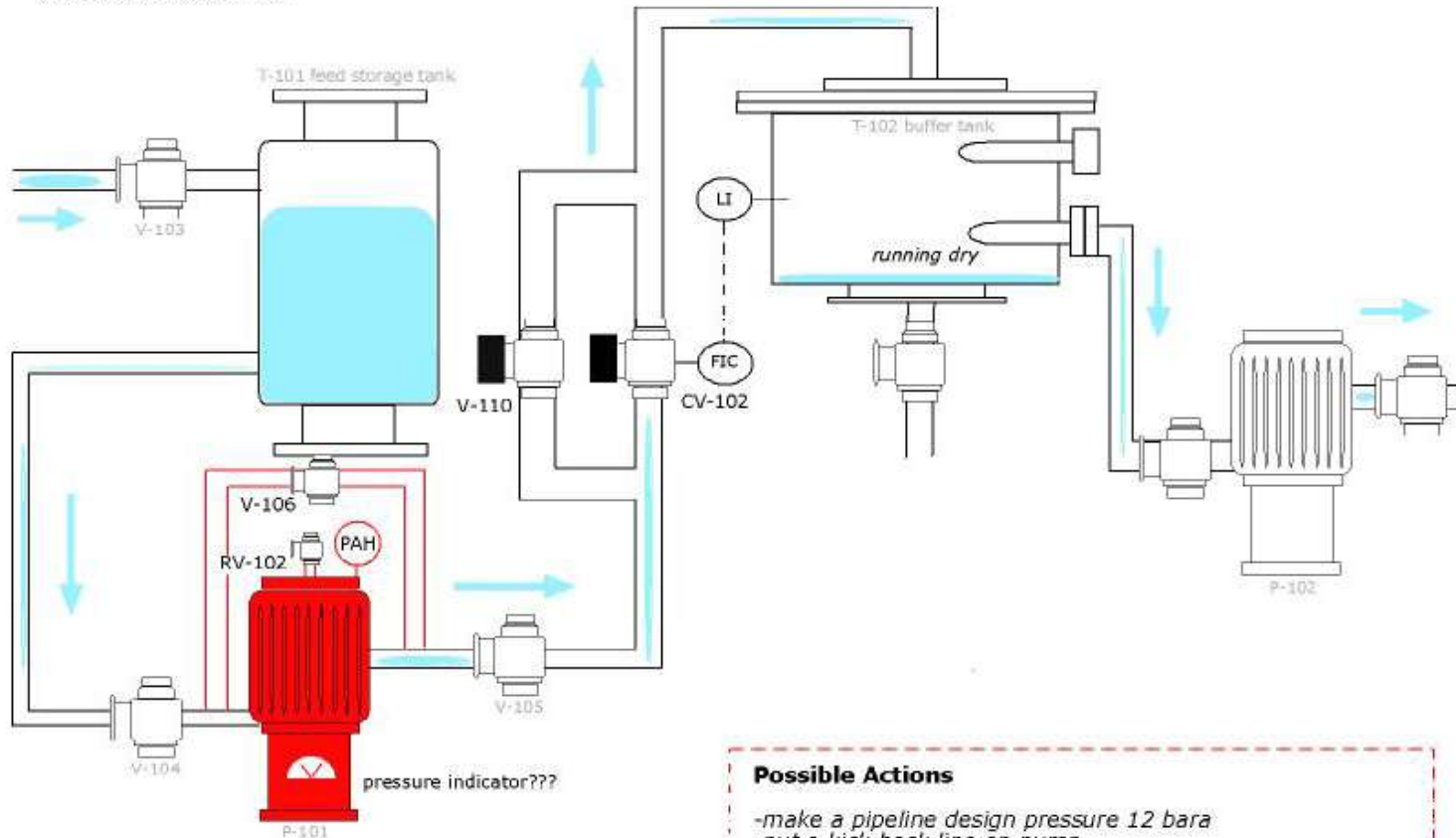
**1. Introduce the HAZOP concept through a series of Questions and Answers.**

- **WHAT is a HAZOP?**
- **WHY is a HAZOP carried out ?**

**2. The development of an attractive and stimulating T&L Interactive Case Study Unit – this will be the focus of the new HAZOP Teaching Module.**

# Schematic Diagram for HAZOP Teaching Module

Schematic A9/A10/A11  
Scenario Example 2- No flow- Pump Overheat  
Possible Actions on A8

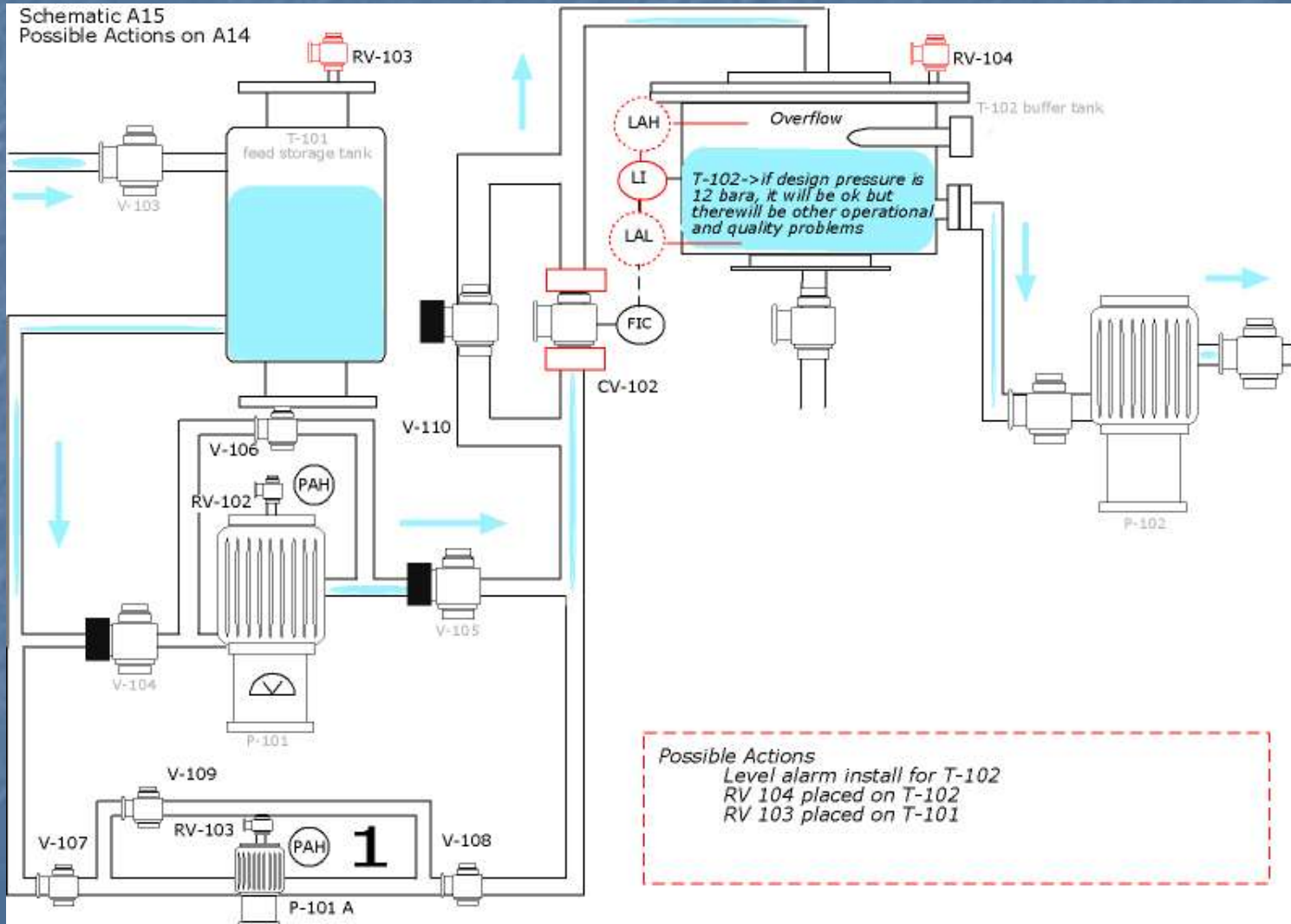


## Possible Actions

- make a pipeline design pressure 12 bara
- put a kick back line on pump
- put a relief valve on pump (RV-102)
- put a pressure indicator on pump ???
- put a pressure indicator with high level alarm on pump



# Schematic Diagram for HAZOP Teaching Module



# Key Novel Features

3. A “Multiple Choice Pre-test” will be designed for the students to pass before they can access the HAZOP Case Study Training module.
4. A multiple choice answer process will be introduced into the Case Study Unit.
5. A series of prompts will be developed to act as Case Study aids.
  - A list of Guidewords and Prompt Questions
  - Definitions of HAZOP
  - A List of Drawing Symbols
6. Automatic downloading of the HAZOP Analysis results to complete the HAZOP Actions matrix report.

# Guidewords for HAZOP Study

<b>ROOT</b>	<b>PARAMETER</b>	<b>APPLICATION</b>	<b>EXAMPLE</b>
<b>NONE</b>	FLOW	No Flow	Wrong routing, complete blockage, slip plate, incorrectly fitted non return valves, burst pipe, large leak, equipment failure (control valve or isolation valve, or pump, vessel etc.)
<b>REVERSE</b>		Reverse Flow	As above
<b>MORE OF</b>		More Flow	More than one pump, reduced delivery head, increased suction pressure, static generation under high velocity, pump gland leaks.
<b>LESS OF</b>		Less Flow	Line blockage, filter blockage, fouling in vessels, valves, etc. and restriction of orifice plates.



# **Major Outcomes Expected from Project**

- 1. Development of Educational Software package**
- 2. Experience for Students to Work in a Small Team (4-10 people)**
- 3. Experience for Students to Work in a Multidisciplinary Team**
- 4. Experience for Students Working in a Simulated Design Office Environment**
- 5. Better Student Understanding of HAZOP**

Thank You !!