**Outcome:** This competency is the second part of the Process Systems curriculum path. The students will continue to practice and demonstrate their ability to review and explain various process systems utilizing the process PFD’s and P&ID’s. They will demonstrate their ability to research and write a basic process description, identify and explain the function and reason for the various control loops and determine the critical control parameters. This competency will expand and concentrate on the students’ skills to troubleshoot various process systems utilizing Failure Modes and Effects Analysis /Hazardous Operations Analysis (FMEA/HazOP) techniques.

**Lecture/Demo:**

1. Instructor continuing the discussion on process systems with emphases on troubleshooting techniques.
   1. PTSE Product Flow Troubleshooting Module.
      1. Process description
      2. Identifying potential operational upsets and hazards.
      3. What-if spreadsheet
      4. Troubleshooting

**Lab/Homework:**

Location: ICC Classroom

1. PTSE Tank Troubleshooting Worksheet part one.
   1. Review and write a process description from the P&ID
   2. Describe at least six (6) potential process operational upsets and their potential hazards.
2. PTSE Tank Troubleshooting Worksheet part two
   1. Complete the worksheet self-check.
   2. Create and complete a “What-if work spreadsheet”
   3. Complete the three troubleshooting scenarios.

Location: ICC Classroom

1. PTSE Decanting Troubleshooting Worksheet part one.
   1. Review and write a process description from the P&ID
   2. Describe at least ten (10) potential process operational upsets and their potential hazards.
2. PTSE Decanting Troubleshooting Worksheet part two
   1. Complete the worksheet self-check.
   2. Create and complete a “What-if work spreadsheet”
   3. Complete the three troubleshooting scenarios.

Location: Simtronics lab

1. Simtronics SPM-3020 Three Phase Separator

**Documentation:**

1. PTSE Product Flow Troubleshooting Module
2. PTSE Tank Troubleshooting Module.
3. PTSE Decanting Troubleshooting Module.
4. Simtronics SPM-3020

**Assessment:**

1. Homework
2. Lab Work
3. Lab Safety
4. What-if Form
5. Troubleshooting Form
6. Quiz(s) & Final Exam

**Homework Details Part 1**

You and a partner will collaborate on researching and writing a position paper for the PTSE Tank Troubleshooting Worksheet process.

Your position paper will include the following:

* A process description
* A detailed description of the various control loop/strategies.
* A list of the critical process variable(s) or a ranking of their criticality.
  + Provide your reasoning
* Create and complete a “What-if” exercise spreadsheet.
* Complete the troubleshooting scenarios.

Your paper detailing your findings will be discussed in class.

The paper will be due on: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Grading Details**

The paper and presentation will go towards 100 points.

Grade Breakdown:

* **\_\_\_/25 points:** For the accuracy and completeness of the process description.
* **\_\_\_/25 points:** For the accuracy and completeness of the “what-if” Spreadsheet description.
* **\_\_\_/25 points:** For the accuracy and completeness of the troubleshooting scenarios.
* **\_\_\_/10 points:** For the accuracy and completeness of the various control loop/strategies.
* **\_\_\_/10 points:** For the accuracy and completeness of the criticality ranking
* **\_\_\_/5 points:** Class discussion participation, document content, effectiveness, neatness, and organization.
  + - Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Score: \_\_\_\_\_\_\_\_
    - Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Score: \_\_\_\_\_\_\_\_

**Homework Details Part 2**

You and a different partner will collaborate on researching and writing a position paper for the PTSE Decanting Troubleshooting Worksheet process.

Your position paper will include the following:

* A process description
* A detailed description of the various control loop/strategies.
* A list of the critical process variable(s) or a ranking of their criticality.
  + Provide your reasoning
* Create and complete a “What-if” exercise spreadsheet.
* Complete the troubleshooting scenarios.

Your paper detailing your findings will be discussed in class.

The paper will be due on: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Grading Details**

The paper and presentation will go towards 100 points.

Grade Breakdown:

* **\_\_\_/25 points:** For the accuracy and completeness of the process description.
* **\_\_\_/25 points:** For the accuracy and completeness of the “what-if” Spreadsheet description.
* **\_\_\_/25 points:** For the accuracy and completeness of the troubleshooting scenarios.
* **\_\_\_/10 points:** For the accuracy and completeness of the various control loop/strategies.
* **\_\_\_/10 points:** For the accuracy and completeness of the criticality ranking
* **\_\_\_/5 points:** Class discussion participation, document content, effectiveness, neatness, and organization.
  + - Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Score: \_\_\_\_\_\_\_\_
    - Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Score: \_\_\_\_\_\_\_\_

**Homework Details Part 3**

Individual assignment:

Simtronics SPM-3020 Three Phase Separator

* Study the given process description and basic controls.
* Based on the given process description
  + Complete the attached what-if spreadsheet with your predictions using the following indicators:

|  |  |
| --- | --- |
| Indicator | Process Variable Response |
| ↑ | PV Increases |
| ↓ | PV Decreases |
| — | PV Remains Constant or very small change |
| ±— | PV initially disturbed but returns to normal |

* Under normal operation change the various controller setpoints one at a time.
  + Observe and document the reactions to the other process variables.
* Practice starting up and shutting down the process per the recommendations.
* Complete the troubleshooting exercises 3-6, 9-17
  + Document your findings and actions on the attached Troubleshooting Form.

Your paper detailing your findings will be discussed in class.

The what-if paper will be due on: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

The Troubleshooting paper will be due on: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Grading Details**

The paper and presentation will go towards 100 points.

Grade Breakdown:

* **\_\_\_/40 points:** For the accuracy and completeness of the “what-if” Spreadsheet description.
* **\_\_\_/60 points:** For the accuracy and completeness of the troubleshooting exercises.
  + - Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Score: \_\_\_\_\_\_\_\_
    - Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Score: \_\_\_\_\_\_\_\_

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **SPM-3020 What-If Spreadsheet** | | | | | |
| Instrument | Initial PV Value | ∆ SP PIC-004 to 1500PSIG | ∆ SP of FIC-001 to 20MBPD | ∆ SP PIC-005 to 1500 | % Water in crude oil increases |
| FIC-001 |  |  |  |  |  |
| FI-004 |  |  |  |  |  |
| FI-005 |  |  |  |  |  |
| FI-006 |  |  |  |  |  |
| LIC-001 |  |  |  |  |  |
| LIC-002 |  |  |  |  |  |
| PIC-004 |  |  |  |  |  |
| TI-004 |  |  |  |  |  |
|  |  |  |  |  |  |
| Instrument | Initial PV Value | ∆ SP LIC-001 to 60% | ∆ SP of LIC-002 to 20% | Crude oil temp increases to 220F |  |
| FIC-001 |  |  |  |  |  |
| FI-004 |  |  |  |  |  |
| FI-005 |  |  |  |  |  |
| FI-006 |  |  |  |  |  |
| LIC-001 |  |  |  |  |  |
| LIC-002 |  |  |  |  |  |
| PIC-004 |  |  |  |  |  |
| TI-004 |  |  |  |  |  |