Software Requirements Specification (SRS) for Autofill Mode

System Name: System Autofill Controller

Routine Name: Autofill
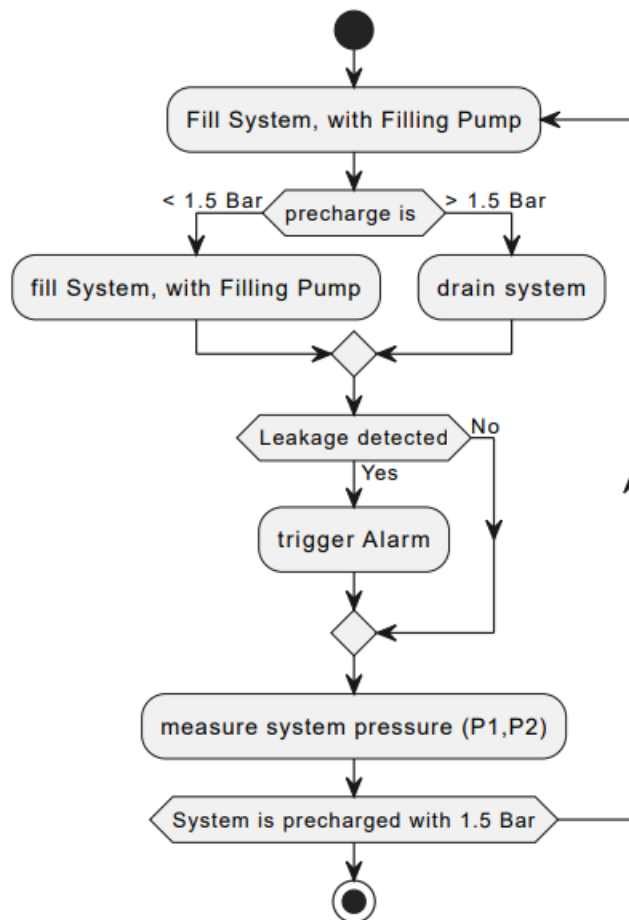
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1. Introduction

Autofill

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1.1 Purpose

The purpose of this document is to define the software requirements for the Autofill routine used to precharge a system to 1.5 Bar pressure using a filling pump, while managing pressure validation and leakage detection.

1.2 Scope

The software controls the system autofill operation by adjusting fluid levels through pumping or draining, ensuring pressure accuracy, and identifying potential leakages. Alarms are triggered for system anomalies, and system status is validated by final pressure measurement.

2. Functional Requirements

FR1: Start Autofill Routine

- The system shall initiate the Autofill process upon command.

FR2: Fill System

- The system shall activate the filling pump to begin filling the system.

FR3: Monitor Precharge Pressure

- The system shall measure the precharge pressure continuously.

FR4: Evaluate Precharge Pressure

- If the pressure is **less than 1.5 Bar**, the system shall continue to **fill the system**.
- If the pressure is **greater than 1.5 Bar**, the system shall **drain** fluid until the pressure is below or equal to 1.5 Bar.

FR5: Leak Detection

- The system shall check for leaks during the filling or draining process.

FR6: Trigger Alarm for Leak

- If a leak is detected, the system shall trigger an alarm indicating a **"Leakage Detected"** condition

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FR7: Measure System Pressure

- Once the desired pressure is reached and no leaks are detected, the system shall measure and log **system pressure (P1, P2)**.

FR8: Complete Precharge

- The system shall confirm that the system is **precharged at 1.5 Bar** and conclude the process.

3. Non-Functional Requirements

NFR1: Accuracy

- Pressure sensors must have a resolution of ±0.05 Bar.
- Leak detection mechanism must detect drops of 0.1 Bar within 1 minute.

NFR2: Performance

- System must complete autofill cycle in under 5 minutes under normal conditions.

NFR3: Reliability

- The leak detection algorithm must have a false negative rate $< 2\%$.

NFR4: Usability

- Alarm messages and pressure values must be clearly displayed on the system interface.

4. System Interfaces

4.1 Hardware Interfaces

- Filling Pump (ON/OFF and control interface)
- Drain Valve (if used)
- Pressure sensors (P1, P2)
- Alarm unit (audio/visual)

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4.2 User Interface

- Start button or command interface
- Display for pressure readings
- Alarm indicator for leakage
- Status display of process (filling, draining, completed)

5. Assumptions and Constraints

- System pressure should be initially below 1.5 Bar.
- All hardware components (pumps, sensors, valves) are assumed to be functional.
- Leak detection is based on pressure stability over a time window.

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