# Functional Design Specification (FDS) Water Treatment Plant HMI

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## 1. Introduction

This Functional Design Specification (FDS) document outlines the operational, display, and interface requirements for the Human Machine Interface (HMI) used in the Water Treatment Plant (WTP). This HMI enables operators to monitor and control key processes involved in raw water intake, filtration, chemical dosing, and clean water output.

## 2. System Overview

The water treatment plant automates the processing of raw water into potable water. The system consists of the following:  
- Raw Water Intake Pumps  
- Coagulation and Flocculation Tanks  
- Sand Filtration Units  
- Chlorination and pH Control Units  
- Clean Water Storage Tanks  
- Outgoing Pumps and Valves  
  
The process is monitored and controlled using a PLC connected to an HMI touch panel.

## 3. HMI Overview

The HMI interface allows operators to view real-time data, issue manual overrides, view alarms, and configure process parameters. It consists of multiple screens designed with usability, visibility, and process safety in mind. All screens follow a consistent structure with:  
- Header: Shows screen title, battery levels, date/time  
- Footer: Contains navigation buttons (Home, Alarms, Settings, etc.)

## 4. Screen Specifications

### 4.1 Main Screen

Purpose: Provide a summary of plant status and key performance metrics.  
  
Displayed Parameters:  
- Inlet Flow Rate (m³/h)  
- Clean Water Output Flow (m³/h)  
- Tank Levels (Raw Water, Treated Water)  
- Pump Status Indicators  
- Battery #1 and #2 Levels  
- Date and Time  
  
Navigation Buttons:  
- Home, Filtration, Dosing, Alarms, Settings

### 4.2 Filtration Control Screen

Purpose: Monitor and control the sand filtration units.  
  
Elements:  
- Start/Stop/Flush Buttons for each Filtration Unit  
- Pressure Differential Displays  
- Valve Open/Close Indicators  
- Manual Override Toggle  
- Alarm Indicators (e.g., high pressure, clogged media)  
- Battery Indicators, Date/Time  
- Navigation Buttons (Home, Main, Dosing, Alarms, Settings)

### 4.3 Chemical Dosing Screen

Purpose: Configure and monitor dosing of chlorine and pH adjusting agents.  
  
Elements:  
- Current Chlorine and pH Sensor Values  
- Dosing Pump Status (ON/OFF, Alarm)  
- Flow Rate Input Fields (manual entry)  
- Start/Stop Buttons for Dosing Pumps  
- Trend Graphs for historical dosing  
- Battery Indicators, Date/Time  
- Navigation Buttons (Home, Main, Filtration, Alarms, Settings)

## 5. Alarm Management

The alarm screen will display active and historical alarms with date/time, source, and acknowledgment status.  
- High/Low Flow Alarms  
- Pressure Alarms  
- Dosing Malfunctions  
- Communication Errors  
- Battery Warnings

## 6. User Management

User access will be managed with the following roles:  
- Administrator: Full access  
- Operator: Monitor and operate screens  
- Viewer: View-only access  
  
Login will require password authentication. Logout will be automatic after timeout.

## 7. Appendices

Appendix A: List of Abbreviations  
Appendix B: Troubleshooting Guidelines  
Appendix C: IO Mapping Table (available separately)