Document Type:	Standard Operating Procedure (SOP)	**SOP Code:**	SOP-ENG-004
Title:	Operation and Maintenance of the Purified Water System	**Version:**	1.0
Company:	NovaThera Pharmaceuticals Pvt. Ltd.	**Effective Date:**	2025-01-01
Location:	Pune, India	**Review Date:**	2026-01-01

Operation and Maintenance of the Purified Water System

Category: Engineering & Maintenance

Standard Operating Procedure (SOP)

Company: NovaThera Pharmaceuticals Pvt. Ltd.

Department: Engineering & Maintenance

Title: Operation and Maintenance of the Purified Water System

SOP No.: SOP-ENG-004

Version No.: 1.0

Effective Date: 2025-01-01

1.0 PURPOSE

This Standard Operating Procedure (SOP) describes the proper operation, maintenance, and sanitization procedures for the purified water system at NovaThera Pharmaceuticals, ensuring consistent production of high-quality purified water that meets pharmacopoeial requirements for use in pharmaceutical manufacturing processes. This SOP ensures the system operates within validated parameters and complies with GMP guidelines.

2.0 SCOPE

This SOP applies to all aspects of the purified water system at NovaThera Pharmaceuticals Pvt. Ltd., Pune, India, including pre-treatment, purification, storage, and distribution, regardless of the specific pharmaceutical product being manufactured. It covers all personnel involved in the operation, maintenance, and monitoring of the purified water system, ensuring compliance across all applicable batches and production runs. This SOP excludes the operation and maintenance of the Water for Injection (WFI) system, which is covered under a separate SOP.

3.0 RESPONSIBILITY

QC Inspector: Performs routine water sampling and testing according to approved test methods and documents results. Notifies the Production Supervisor and QA Manager immediately of any out-of-specification (OOS) results.

Production Supervisor: Oversees the daily operation of the purified water system, ensures adherence to this SOP, and coordinates maintenance activities. Investigates any deviations and implements corrective actions.

QA Manager: Reviews and approves all documentation related to the purified water system, including maintenance logs, validation reports, and deviation investigations. Ensures compliance with GMP regulations.

Head of QA: Provides final approval for this SOP and any revisions. Ensures the purified water system remains in a validated state.

4.0 MATERIALS & EQUIPMENT

PPE: Safety glasses, gloves (nitrile or equivalent), lab coat, dedicated footwear.

Equipment:

- Purified Water System (including pre-treatment, RO unit - RO-01, UV sterilizer - UV-01, EDI unit - EDI-01, storage tank - ST-01, distribution loop)
- Conductivity meter (CM-01)
- TOC analyzer (TOC-01)
- pH meter (PH-01)
- Thermometer (TM-01)
- Sanitization chemicals (e.g., hydrogen peroxide, peracetic acid, as per validated sanitization procedure)
- Calibration standards for conductivity, TOC, and pH meters
- Sample containers (sterile, pyrogen-free)
- Pressure gauges (PG-01 to PG-05)
- Flow meters (FM-01 to FM-03)
- Cleaning supplies (lint-free cloths, appropriate detergents)

Documentation:

- Purified Water System Operation Log (Form PW-OL-001)
- Purified Water System Maintenance Log (Form PW-ML-001)
- Purified Water System Sanitization Log (Form PW-SL-001)
- Purified Water System Calibration Log (Form PW-CL-001)
- Water Sampling Log (Form PW-SAL-001)
- Deviation Report Form (Form QA-DR-001)
- Out-of-Specification (OOS) Investigation Report (Form QA-OOS-001)

• SOP Training Record (Form HR-TR-001)

5.0 PROCEDURE

5.1 System Start-up

5.1.1 The Production Supervisor verifies that all pre-treatment components (e.g., multimedia filter, carbon filter) have been backwashed and are ready for operation according to their respective SOPs.

5.1.2 The Production Supervisor visually inspects the purified water system for any signs of damage or leakage. Any discrepancies are documented in the Purified Water System Operation Log (Form PW-OL-001) and reported to the Engineering department for immediate repair.

5.1.3 The Production Supervisor ensures the storage tank (ST-01) is at an acceptable level. If not, the system is started to fill the tank.

5.1.4 The Production Supervisor activates the RO unit (RO-01), UV sterilizer (UV-01), and EDI unit (EDI-01) according to their respective operating manuals and startup sequences.

5.1.5 The Production Supervisor verifies that the distribution pump is functioning correctly and the purified water is circulating through the distribution loop.

5.1.6 The Production Supervisor monitors the pressure gauges (PG-01 to PG-05) and flow meters (FM-01 to FM-03) to ensure the system is operating within validated parameters. Any deviations are documented in the Purified Water System Operation Log (Form PW-OL-001).

5.1.7 The Production Supervisor allows the system to run for at least 30 minutes before collecting samples for quality control testing.

5.2 Routine Operation and Monitoring

5.2.1 The Production Supervisor monitors the purified water system parameters (conductivity, TOC, pH, temperature, flow rate, pressure) at least twice daily and records the readings in the Purified Water System Operation Log (Form PW-OL-001).

5.2.2 The QC Inspector collects water samples from designated sampling points within the distribution loop according to the Water Sampling Log (Form PW-SAL-001). Sampling frequency is determined by the validation protocol (e.g., daily, weekly).

5.2.3 The QC Inspector tests the water samples for conductivity, TOC, pH, and microbial count using calibrated instruments (CM-01, TOC-01, PH-01) according to approved test methods.

5.2.4 The QC Inspector records the test results in the Water Sampling Log (Form PW-SAL-001).

5.2.5 If any parameter is outside the specified limits, the QC Inspector immediately notifies the Production Supervisor and QA Manager. An Out-of-Specification (OOS) Investigation is initiated using Form QA-OOS-001.

5.2.6 The Production Supervisor implements corrective actions as required based on the OOS investigation, such as adjusting system parameters, increasing the frequency of monitoring, or sanitizing the system.

5.3 System Shut-down (Planned)

5.3.1 The Production Supervisor notifies relevant personnel of the planned system shut-down.

5.3.2 The Production Supervisor gradually shuts down the RO unit (RO-01), UV sterilizer (UV-01), and EDI unit (EDI-01) according to their respective operating manuals and shutdown sequences.

5.3.3 The Production Supervisor stops the distribution pump.

5.3.4 The Production Supervisor isolates the purified water system from the distribution loop.

5.3.5 The Production Supervisor documents the shut-down procedure in the Purified Water System Operation Log (Form PW-OL-001).

5.4 System Shut-down (Emergency)

5.4.1 In the event of an emergency (e.g., power failure, equipment malfunction), the Production Supervisor immediately shuts down the purified water system.

5.4.2 The Production Supervisor isolates the system from the distribution loop.

5.4.3 The Production Supervisor documents the emergency shut-down and the reason for the shut-down in the Purified Water System Operation Log (Form PW-OL-001).

5.4.4 The Production Supervisor reports the incident to the Engineering department and QA Manager.

5.5 Routine Maintenance

5.5.1 The Engineering department performs routine maintenance on the purified water system according to the maintenance schedule outlined in the Purified Water System Maintenance Log (Form PW-ML-001).

5.5.2 Maintenance activities include:

- Replacing pre-filters
- Cleaning the RO membrane (RO-01) according to manufacturer's instructions
- Calibrating conductivity meter (CM-01), TOC analyzer (TOC-01), and pH meter (PH-01)
- Inspecting and maintaining the distribution pump
- Replacing UV lamps in the UV sterilizer (UV-01)
- Maintaining the EDI unit (EDI-01)
- Checking and maintaining the storage tank (ST-01)

5.5.3 All maintenance activities are documented in the Purified Water System Maintenance Log (Form PW-ML-001).

5.5.4 After maintenance, the Production Supervisor verifies the system is operating correctly before releasing it for use.

5.6 Sanitization

5.6.1 The purified water system is sanitized according to the validated sanitization procedure outlined in the Purified Water System Sanitization Log (Form PW-SL-001).

5.6.2 The sanitization procedure includes:

- Preparing the sanitizing solution (e.g., hydrogen peroxide, peracetic acid) at the validated concentration.
- Circulating the sanitizing solution through the entire system, including the distribution loop, for the validated contact time.
- Rinsing the system thoroughly with purified water until the sanitizing agent is completely removed.
- Verifying the removal of the sanitizing agent using appropriate test methods.

5.6.3 The Production Supervisor and QC Inspector ensure the sanitization process is performed correctly.

5.6.4 All sanitization activities are documented in the Purified Water System Sanitization Log (Form PW-SL-001).

5.6.5 After sanitization, the QC Inspector collects water samples and tests them for residual sanitizing agent and microbial count to ensure the system is adequately sanitized.

5.7 Calibration

5.7.1 Conductivity meter (CM-01), TOC analyzer (TOC-01), and pH meter (PH-01) are calibrated according to their respective SOPs and the calibration schedule outlined in the Purified Water System Calibration Log (Form PW-CL-001).

5.7.2 Calibration is performed by qualified personnel using certified calibration standards.

5.7.3 Calibration results are documented in the Purified Water System Calibration Log (Form PW-CL-001).

5.7.4 If any instrument fails calibration, it is removed from service and sent for repair or replacement.

6.0 POST-OPERATION ACTIVITIES

6.1 After each use, the Production Supervisor verifies that all valves are in the correct position and the system is ready for the next operation.

6.2 The Production Supervisor reviews the Purified Water System Operation Log (Form PW-OL-001) for any deviations or unusual occurrences.

6.3 The QC Inspector reviews the Water Sampling Log (Form PW-SAL-001) for any OOS results.

6.4 The Production Supervisor submits the completed logs to the QA Manager for review and approval.

6.5 The QA Manager reviews all documentation related to the purified water system and ensures compliance with GMP regulations.

7.0 SAFETY PRECAUTIONS

7.1 Always wear appropriate PPE (safety glasses, gloves, lab coat, dedicated footwear) when working with the purified water system and sanitization chemicals.

7.2 Handle sanitization chemicals with care and follow the manufacturer’s instructions for safe handling and disposal.

7.3 Ensure adequate ventilation when working with sanitization chemicals.

7.4 Be aware of the potential for electrical hazards when working with electrical equipment.

7.5 Report any spills or accidents immediately to the Production Supervisor.

7.6 Follow lockout/tagout procedures when performing maintenance on the purified water system.

7.7 Follow all applicable safety guidelines and procedures.

8.0 APPROVALS

Prepared By: Engineering Department

Reviewed By: QA Manager

Approved By: Head of QA

Date:

Controlled Document Notice

This is a controlled document. Unauthorized reproduction, distribution, or alteration is prohibited. Ensure you are using the latest approved version.

Document Approval

Role	Name	Signature	Date
Prepared by:	_____	_____	_____
Reviewed by (QA):	_____	_____	_____
Approved by (Head QA):	_____	_____	_____

Document Control Information

Document ID: SOP-ENG-004

Version: 1.0

Effective Date: 2025-01-01

Next Review Date: 2026-01-01

Generated by: NovaThera SOP Generator System