



» STANDARD OPERATING PROCEDURES ARE CRITICAL FOR A SAFE BOILER AND STEAM SYSTEM OPERATIONS

Today, it is necessary to have standard operating procedures (SOPs) for steam and condensate systems, boilers, deaerators, and even steam process units. An SOP is a set of instructions or steps that someone follows to complete a job safely, prevent premature failures due to improper startup or shutdowns, and maximize operational and system performance.

1. WHY ARE STANDARD OPERATING PROCEDURES (SOPS) NECESSARY?

SOPs are important because they memorialize key steps in processes and avoid problems. Having plant personnel start up a steam system without an SOP and assuming that the result will be positive is just being hopeful. A boiler or steam system contains a large amount of stored energy. Having a problem occur during startup and releasing that uncontrolled energy can pose a major safety risk and hurt the plant operation.

Moreover, if a person were to interview 10 people, as our engineering team has done, on how to properly start up a pressure-reducing station, they are likely to hear 10 different answers.

SOPs also improve consistency. Take, for example, how a plant trains new staff members how to start up a boiler. Having a lead employee teach a new employee is not very effective, because people typically retain less than 42% of the instructions. This leaves new staff members assuming how to do a task. Assuming is risky when dealing with steam, which can cause major damage in the event of an uncontrolled release. Therefore, it is important to write SOPs for all processes that an individual or group performs, including starting a steam line, shutting down a steam process, testing a boiler, repairing a valve, controlling a steam control valve, and even tuning a PID controller.

For instance, the SOP for testing steam traps is 48 pages long to ensure that everyone performs tests correctly and consistently, so the test results are extremely accurate.

SOPs can also reduce costly problems. As an example, root-cause analysis shows that a significant percentage of premature failures in the steam system result from improper startup that causes water hammer, damaging the components in the steam system. Production issues at startup often result from the fact that no one is given an SOP on how to properly vent air or ensure that condensate is properly removed from the system. Air in the steam system is detrimental to process operations.

2. 10 REASONS FOR WRITING STANDARD OPERATING PROCEDURES

Here are 10 of the most important reasons that every steam or boiler plant needs to develop a set of SOPs:

1. Providing plant personnel at all levels who perform operational tasks with all the safety, health, environmental, and operational information required to perform a job properly
2. Protecting the safety of plant personnel and plant process applications



Figure 1: Steam Supply System

3. Ensuring that operations are done consistently to maintain the safe, reliable startup or shutdown of a boiler or steam system
4. Ensuring the SOP tasks are completed on a prescribed road map throughout the operation, thus leading to successful task completion
5. Avoiding failures in the system and related processes that would cause operational issues
6. Ensuring approved procedures are followed to comply with ASME codes, industrial best practices and standards, and company standards
7. Protecting product quality and achieving production goals
8. Providing a great training document for teaching current plant personnel and new plant personnel
9. Serving as a historical record of the how, why, and when of a task in a system to use when modifications are made to that system and when an SOP must be revised
10. Building a tool that explains the different steps or tasks in a process that can be reviewed in post-incident investigations to improve safety practices and system operating conditions.

3.1 Involve the Necessary Plant Personnel

Writing an SOP should be a team effort. The writing team needs to make sure that the right plant personnel are involved in the SOP process. At least one team member must be intimately familiar with the task outlined in the SOP. That person will understand exactly what needs to be done to successfully complete the task and could have important insight and suggestions on ways to improve the SOP. Remember, an SOP is only helpful if the team members executing the task can understand what is written.

Superheated steam does have disadvantages: a low heat transfer coefficient, variable steam temperatures at constant pressures, and more expensive steam components due to the higher temperatures. Also, the vast amount of latent energy cannot be released until the steam achieves saturated conditions. Therefore, there is no superheat in the steam.

3.2 Assuming Is the Wrong Approach

One of the biggest mistakes that the writing team can make when writing the SOP is assuming that the team members executing the tasks are familiar with each task, its steps, or even a concept that is not documented or defined in the SOP. Thinking that an employee who has been working with the steam system for 22 years knows how to accomplish the task correctly and safely is the wrong approach.



Figure 2: Boiler Plant

3. HOW TO WRITE AN SOP

A good SOP is brief. It should describe the necessary tasks and steps in a way that is easy to understand and implement. When writing an SOP, remember these five points:

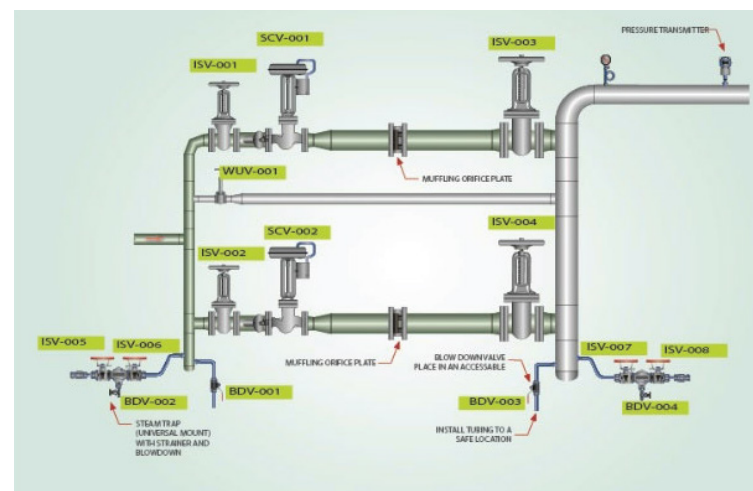


Figure 3: Example of Valve Numbering for an SOP

When the team is writing the SOP, it is better to over-inform than to provide too little information. When the writing team leaves out certain things, it could be the beginning of a serious problem.

A glossary or term list can be very helpful when the writing team is creating an SOP. The team members doing the tasks can use the glossary to learn more information about specific items, tasks, and concepts.

Including items like steam traps, control valves, and safety valve tag numbers in an SOP allows team members to ensure the correct component is being operated.

3.3 Pictures, Visual Images, and CAD Prints Are Helpful

An SOP should not be a long document that is only full of text. The writing team will want an SOP to be informative and concise above all else. Using pictures, visual images, CAD prints, etc. can help create an excellent SOP. Visual aids back up the SOP text and make the content more meaningful.

Using imagery can also help make SOPs more accessible to people. Some people are visual learners who process information better from visual aids than from written material.



3.4 It Is Critical to Test the SOP

The writing team needs to test an SOP's steps before making the tasks or steps any part of an official SOP process. Walking through the process of accomplishing a task creates an easy road map for the writing team to see how things are currently working and whether anything can be done to improve things before drafting the final SOP.

The writing team may find that something everyone assumes is well known should be documented in the SOP.

3.5 An SOP Is Never Final

The SOP is a living document. It should continue to be improved upon and revised to meet the changing requirements of the plant operation.

Figure 4: Steam Valve Station

¹ The USP is a nonprofit scientific organization that develops and disseminates public compendiums of quality standards for medicines and other products. The USP has no role in enforcement; that is left to the FDA and other government authorities in the U.S. and elsewhere.