Distribution System Operations:
How to Develop Training Programs that Impact Performance

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Introduction

The topic of this paper is the implementation of effective training programs for Distribution System Operators. Some of the things we will explore are:

- Whether or not what the industry has done for Transmission Operators is a good model for Distribution operators
- Appropriate uses of generic training resources
- An overview of the Systems Approach to Training\(^1\) (SAT), including its foundational premises and main benefits, general mechanics of its implementation, and the resources needed to implement it

Is What's Good for Transmission Good for Distribution Too?

As you probably already know, the North American Electric Reliability Corporation’s (NERC’s) reliability standard PER-005 mandated that Transmission Operators, Balancing Authorities, Reliability Coordinators, and some Transmission Owners implement a systematic approach to implement training for System Operators performing real time reliability related tasks on the Bulk Electric System (BES). This was done because it was recognized that the competence of these operators can have a significant impact on the reliability of the BES and therefore it is critical that they be adequately trained.

While implementing an SAT-based training program, transmission entities not only comply with PER-005 (which makes compliance departments happy), but they get appropriate, effective, and efficient training for new and veteran operators. Also inherent in the SAT approach is the addressing of both initial training for new hires as well as continuing training for veteran operators.

Now that the industry has gotten used to the idea of SAT for transmission operations, some people are speculating that similar regulations may be pushed down to the distribution level. This has influenced them to begin implementing the SAT approach for their distribution operations organizations. Others, having witnessed the approach being applied in their transmission organizations and liking what they have seen, would like to duplicate that structure and discipline in their distribution organizations too.

It is important to understand that NERC, through enacting PER-005, did not “invent” the SAT approach. SAT had been around for decades, and many utility companies applied this methodology even before NERC mandated it, because they recognized its benefits. It has always been an excellent process for creating and implementing effective training for critical jobs where accurate and reliable performance is required. PER-005 simply mandated it for the BES and perhaps by doing so brought it further into the mainstream consciousness of the industry.

So yes, in general, when it comes to SAT-based training, what’s good for transmission is also good for distribution!

\(^1\) This term has morphed into Systematic Approach to Training in recent years.
Drivers for Improved Training of Distribution System Operators

The organization depends on its ability to train new operators. A wide variety of business needs can drive the desire for better training of Distribution System Operators, but in general these will fall in to one or more of the categories of personnel and public safety, service reliability, and cost. As these categories are often interrelated, specific reasons for needing better training will often impact more than one category. Some possible specific needs may include:

- A lack of a formal training program
- A need to shorten the time required to train new operators
- Current training that is not well focused; perhaps wasting time on topics that aren’t very beneficial or omitting topics that are important
- Current training that is too generic
- Current training that is too academic (knowledge-based) and lacks practical components
- Current training that is too practical and lacks the necessary academic (knowledge-based) components
- A need to impose missing structure and discipline to achieve better consistency of results
- Failure of the current training to produce highly competent operators
- Failure of the current training to focus on job performance
- Realignment of duties within the control center
- Changes in procedures or operating technology
- Changes in the available hiring pool
- Significant numbers of retirements looming in the future
Benefits and Pitfalls of Generic Training Materials

In the absence of a systematic approach to training, many companies rely primarily on generic training resources for their Distribution System Operators. Generic training can and should be used where appropriate. However, it should never be done blindly. Some level of analysis should be done to determine what is applicable and what is not.

Generic material is likely to be appropriate for covering fundamentals, such as electrical theory, substation equipment, lines and feeders, or system protection fundamentals. For topics such as these, suitable generic materials may be available and can be cost-effective alternatives to developing material from scratch. Obviously, however, it will not address any company-specific needs you may have. A lot of what goes on in any control center will be company specific. While every distribution company in the industry may be doing essentially the same thing, they all do it in different ways and this must be reflected in your training for it to be effective.

Another caution about heavy use of generic training materials is that it can lead to a fuzzy correlation between training and job duties if it is not skillfully integrated into the overall program design. One of the keys to success in adult learning is to demonstrate a direct correlation between what is being learned and the job duties. It helps the learners identify “What’s in it for me?” and allows them to put the information into a meaningful context as they commit it to memory. The use of generic materials where company-specific materials should be presents a barrier to this process.

Main Premises of SAT

So what do we mean when we talk about SAT anyway? This paper is by no means intended to be an exhaustive primer on SAT, but following are the main “ingredients” that make up the SAT approach.

- **SAT is performance based.** This means we start with the end in mind: What do we need the operators to do as a result of the training? Then we build the learning activities accordingly. We identify what we need the Operators to do in terms of job tasks. The focus is Training, not Education. This becomes very clear if you think of Training as teaching someone how to do something, and Education as teaching someone about something.

- **SAT relies on the identification of clear and appropriate learning objectives.** These are the desired outcomes for the learner. Terminal objectives can be thought of as the tasks they are learning how to do, and enabling objectives are smaller learning outcomes that directly support their ability to achieve the terminal objectives. Enabling objectives address the skills and knowledge that are required to perform the tasks.
• During the Design phase of the SAT process, we choose learning activities, environments, and materials that are well suited to the learning objectives we want to achieve. There are a variety of ways to teach, and they are not always “one size fits all.” Some methods and tools are better suited than others for a particular purpose. Of course, resources are not endless and sometimes compromises must be made. For example, not every company has a high-fidelity simulator that can be used for training.

• Evaluation is critical in the SAT process. This applies not only to evaluating the learning that has occurred (through testing, for example), but also to evaluating the program on a macro level: What is working and what isn’t, and what adjustments can be made to improve outcomes?

• SAT is a competency based framework, not time based. Learning objectives must be met in order to advance. However, some programs may have both competency milestones as well as time based milestones based on other factors, such as bargaining agreements.

• And finally, SAT provides for both initial training and continuous training. New hires and veterans have different needs for training, and a good SAT process addresses both.

Benefits of Implementing SAT

The discipline required to faithfully implement and maintain an SAT-based training program is well worth it. Here are some of the main benefits to be gained:

• The training matches the job responsibilities. The SAT process brings into focus what needs to be learned to effectively and safely perform the job duties. Nothing more, nothing less. This helps improve efficiency (by not wasting resources training topics that aren’t pertinent and necessary) and learner motivation (by providing a more obvious correlation between training and job duties).

• Trainees are prepared to perform their job duties. SAT-based training is primarily about achieving performance, not just imparting a lot of loosely related knowledge. Yes, knowledge is required to support the desired performance, but it needs to be closely correlated to the terminal objectives (tasks that will be performed).

• The training is structured. Structure helps to ensure that the training is consistent and repeatable. It also helps improve objectivity, which is very important in evaluating trainee performance during on-the-job training portions of the training program. In the end, we wish to have assurance that each qualified employee produced by the training program has uniform competence. Lack of structure and objectivity can be a significant barrier to successful outcomes.

• Continuing training is deliberately designed. Organizational needs change over time, so it logically follows that continuing training should be intentionally tailored to meet those needs. When following an SAT process, continuing training is designed based on the dynamic needs of the organization, avoiding the rut of providing the same training over and over just because it’s available.
Mechanics of SAT

While many variations of SAT processes exist, there are some basic components that are common. Here is an overview of the main “nuts and bolts” for putting together an SAT based program:

**Task list.** Because SAT-based training focuses on the desired job performance, we must first somehow identify and describe that performance. A most common way of doing this is to create a list of tasks performed by the target job position. The task list should be organized carefully to ensure that all duties are addressed and avoid redundancy. The main challenge when documenting tasks is writing the tasks at a level of granularity that is appropriate for effective training and qualification (i.e., discerning between duty areas, tasks, and steps). Identifying tasks with too broad or too narrow a scope can hinder effective learning. Also, it is important to be mindful of the differences between tasks and skills or knowledge and make sure the task list does not contain skills or knowledge. These will be covered by the training program but should not be confused with tasks.

**Learning objectives.** Once the tasks have been identified, appropriate learning objectives must be identified and organized. The tasks themselves are typically considered terminal learning objectives, while the required skills or knowledge give rise to enabling learning objectives. These should be written with carefully chosen verbiage so as to accurately state each desired learning outcome. Required enabling learning objectives can often be discovered by examining the tools and procedures associated with a given task, as well as by considering the foundational knowledge and skills that are required for the job as a whole.

**Program design.** Once the learning objectives have been identified, the initial training program should be designed by parsing the learning objectives into groups, which eventually become courses. At the program level, the focus is on sequencing broad topics in a logical fashion to support learner mastery.

**Course design.** Once the program has been roughed out, each course should be designed in detail. Things like learning objectives to be covered, sequence of instruction within the course, mode of instruction (e.g., instructor-led vs. self-study methods), mode of evaluation (e.g., written exam vs. performance evaluation), course duration, and required training materials must be carefully considered and documented in a set of Course Design Specifications. This step is very important as it yields the “blueprint” for the development of materials to support each course. Failure to faithfully perform this step may allow for a disconnect between the analysis that was performed earlier and the materials that eventually get created.

**Material development.** Using the Course Design Specifications, the necessary supporting materials must be developed. Common materials include instructor guides, slide decks, student handouts, lab guides, field visit guides, e-learning modules, OJT guides, and test items. Alternately, off-the-shelf resources may be procured if they meet the organization’s needs as described in the Course Design Specifications.

**Implementation.** Once the training has been designed and materials developed, it is implemented according to the organization’s needs.

**Ongoing review and improvement.** It is very important to understand that the SAT process is not a “once and done” proposition. Don’t think of it as a project – think of it instead as a paradigm. It should be an iterative process that includes routinely evaluating the program and making adjustments to improve effectiveness. Methods of evaluation include student exams, student course evaluations, instructor feedback, management feedback, and routine reviews of tasks and how they are performed.
Resources for Successful Implementation

The principles of SAT may not be “rocket science,” as they say, but having a thorough understanding of the process will help avoid pitfalls that will compromise the quality of the end product. Considering the amount of time and resources that will likely be required to produce a complete training program, not to mention what’s at stake, it pays to make sure you have the right team in place.

Implementing an SAT process is a collaborative effort. Here are some of the most important roles:

- Upper management must understand the need and provide the necessary corporate support. Time and resources are always scarce, but if the right people are aware of the need and understand the impact the project will have on business goals in the long term, they may be able to remove some of the roadblocks. Taking time to clearly articulate the plan and its benefits to someone in a position of authority can definitely be a wise investment.

- Someone must be in charge of the effort and take an active role in its implementation. Often this will be the Trainer, or Training Manager, or someone who has this responsibility. Not only will they have a general understanding of the organization’s needs, culture, and resources, but they will also be the “keeper” of the training program. As stated earlier, implementing a comprehensive SAT program should not be thought of as a “once and done” proposition. Yes, it begins with a “project” but it is really a new “paradigm,” requiring ongoing evaluation and maintenance to ensure its effectiveness long into the future.

- Subject Matter Experts, or SMEs, need to be a part of the process. A lot of the company-specific information that needs to go into the training program lives inside their heads.

- Qualified and experienced consultants can be the difference between doing it right the first time and needing a costly “do over.” Let’s face it – not everyone has an extensive knowledge of the SAT process, nor a lot of free time to take on a large project such as this. Hiring a qualified consulting firm to help set up the program can help assure that it’s done correctly, and in many cases, more quickly and cost effectively than going it alone.

Summary

When considering how to best train your Distribution System Operators, consider the following:

- SAT is an excellent methodology for any situation where a performance based training program is desired. It should be implemented because it yields the desired results, not because it is required for compliance. It’s not just for Transmission Operators!

- The process is about defining and achieving the desired performance; therefore it helps ensure that the training matches the job.

- SAT helps ensure that the training methods are well suited to the content to be learned.

- SAT considers both initial and ongoing (or continuous) training. As such, continuous training becomes more deliberate and focused on achieving business goals, not just an annual “check the box” activity.

- SAT provides a means for continuous improvement of the training program.

- Successful implementation of a comprehensive SAT-based program requires adequate executive vision and support, participation of engaged SMEs, individuals with SAT expertise to ensure that the program is well designed and developed, and someone to take ownership and provide the ongoing “care and feeding” that will ensure that it evolves to continue to meet the needs of the organization.
If you need assistance in implementing an SAT-based training program for your Distribution System Operators or have questions, contact Ámos Biggers (amos@qualitytrainingsystems.com). Our team of experts can help you get where you need to be!