

STANDARDIZED WORK

2ND SESSION

STANDARDIZED WORK AND WORK STANDARDS - SESSION 2

AIM	(1) Understand the Importance of Standardization in TPS (2) Introduce Various Standards Sheets and Basics of Creation (3) Understand the Difference Between Standardized Work & Work Standards
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III	Work Standards	(1) Work Standards (2) Focus of Work Standards (3) Various Forms of Work Standards (4) Filling Out Work Standards (5) Purpose of Work Standards (6) Implementation of Work Standards		
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Things to Prepare

1	Instructors Guide, Participants Guide, Transparencies, Work Stds. Poster
2	White Board, Flip chart
3	Overhead Projector, Screen, Pointer

Items to Distribute

1	Work Standards Forms
2	Work Standard Examples
3	

Standardized Work and Work Standards - Session 2

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***NOTE:** You will need to gather examples for several of these and create them yourself in order to fit your environment.

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Session 2

I. Opening the Meeting

Opening Remarks & Greeting

- Welcome participants to session 2 of Standardized Work Training
- Create an informal atmosphere. Put the audience at ease. Remind people attendance is recorded but not tests will be given.
- Introduce yourself, and conduct participant introductions if necessary.
- Thank and or remind people to be on time to class.
- Remember to encourage participation so that the participants will most most benefit from the class.

Review Of Session 1

Show Slide 2 - 1 “Main Points of Session 1” and review the following points.

Ask the following points in question format and check audience retention of items covered in session one.

- What are typical work site problems & role of a supervisor?
 - Many problems on the shop floor. Work site improvement & standardization is vital.
 - One role of a leader is kaizen (continuous improvement)
- What are the circumstances surrounding the company?
 - Pursuit of profit
 - Competitive reality. We must reduce cost to remain competitive.
 - Development of our own manufacturing & engineering capabilities
- What is the TPS basic philosophy & 2 main pillars?
 - 4 goals
 - 2 Pillars (Just in Time & In Station Process Control)

Main Emphasis of Session 2

Today we will be covering the following topics in a little more detail.

- Importance of standardization
- Importance of work standards in setting standardized work
- Creating work standards using various forms
- Understanding and applying work standards

A key point of focus today will be understanding the difference between work standards and standardized work.

This session should take about 2 hours to cover depending upon the extent of your questions.

II. TPS & Standardization

Importance of Standardization

As expressed in our basic company philosophy, it is our job to manufacture high quality products at a low cost and supply them to our customer.

In order for us to secure a profit we must supply world class products with total customer satisfaction by building in quality at all stages of our production processes.

Also in order for us reduce costs it is necessary for us to produce parts in a stable environment while also working to eliminate all forms of waste.

In order for this to occur it is extremely vital for us to drive standardization in our respective work areas.

Expected Benefits Of Standardization

Next I want to investigate what types of results you can expect from standardization.

Question: What types of benefits would you expect to see in your work areas by achieving better standardization?

Examples include:

- Stabilization of quality
- Stabilization of work methods
- Elimination of wastes that increase cost
- Better determination of normal vs. abnormal situations
- Increase safety
- Easier to totally evaluate shop floor status

Show Slide 2 - 2 “Benefits of Standardization” and summarize.

As you can see there are various types of benefits that you can expect from standardization.

Focus Of Standardization On the Plant Floor

Now I'd like to discuss with you what areas need attention in order to achieve benefits from standardization. Together let's consider what types of things can be standardized.

Question: What types of things in your work areas can be standardized?

Elicit responses that are similar to the following examples.

- Operation Methods
 - Work Instruction & Procedures
 - Safety Methods & Instructions
 - Work Time & Break Time

- Process Methods
 - Equipment & Tools
 - Cutting conditions, tools, and tool life
 - Conveyance methods
 - Heating, cooling, lubrication, etc.

- Control Methods
 - Machine maintenance
 - Rules
 - Quality standards
 - Measuring & gage standards
 - Raw material, WIP, & finished goods storage locations

- Other
 - Trouble Shooting

Show Slide 2 - 3 “Subjects For Standardization”

As you see there are many items within our work areas where we can conduct standardization. It is necessary for us as leaders to constantly think about the status of standardization in our work areas.

Categories Of Standards

In order to drive effective standardization it is necessary for us to think about the order and purpose of standardization. Why is standardization necessary? What should I standardize? We will examine these questions and investigate what we should set in terms of standardization.

As we noted earlier, there are many areas in which we can foresee benefits from standardization.

For these items we want to standardize, we need to first understand the difference between something called work standards, standardized work, and job instruction.

Show Slide 2 - 4 “Documents In Manufacturing”

Explain to the audience the difference between the categories of forms in TPS.

- Work Standards (Documents that form a basis for the process)
- Standardized Work (Documents that are a tool for C.I. / Kaizen and contain 3 specific elements: Takt Time, SWIP, & Job Sequence)
- Job Instruction (Documents that are used for training.)
- Work Study (Documents for detailed work study & improvement)

KEY POINT: Go slow at this point and confirm audience comprehension. This distinction between work standards, standardized work, and Job Instruction is critical yet easily confused.

To help you better understand the difference I would next like to explain in more detail the difference between work standards and standardized work, the various types of forms of work standards, their necessity, and purpose.

III. Work Standards

Definition of Work Standards

Work standards detail the most suitable methods that we have under current conditions for operating conditions, work methods, control methods, and other essential item. In sum total they form the basis for the manufacturing process. Consequently, work standards are among the most important company documents that apply to production and manufacturing activities.

There are many types of work standards in manufacturing companies. Here are some of the more typical ones.

Show Slide 2 - 5 “List Of Work Standards*”

*If possible prepare some examples of work standards in advance.

Examples could include:

Quality control plans, quality check sheets, tooling drawings, maintenance instructions, inspection procedures, work instructions and procedures, condition sheets & parameters, job instruction sheets, job procedure sheets, trouble shooting instructions, tool change instructions, defect handling instructions, etc.

Subjects For Work Standards

The subject of work standards are all documents related to production activities. However there are three main areas of work standards. Let's look again in more detail at the three main types

1) Process Conditions

This would include processing conditions for production such as equipment, material, fixtures, fluids, cutting conditions, etc. For each part that we process the above items need to be decided.

The work standard forms used here include operation drawings, process drawings, and machine drawings.

2) Control Standards

Often depending upon the process there are variables that need to be controlled such as quality standards, measurement standards, hydraulic & pneumatic standards, current, and voltage. These standards are very important and need to be controlled carefully as they directly affect quality.

The most typical forms in this area of work standards include quality control plans, quality check sheets, maintenance operations and checking procedures.

3) Operation Standards

Work standards in this area include all the steps, conditions, and parameters for operators to follow in conducting work. In assembly operations in particular these types of documents are extremely important and among the most vital to standardize.

Examples of work standards in this category include operation instruction sheets, job procedure sheets, safety instruction sheets, etc.

Various Categories Of Work Standards

There are many types of work standards, if you study them carefully they tend to fall into the following categories.

- Equipment & Tool Maintenance Related
- Inspection & Measurement Related
- Operation Methods Related
- Production Engineering or Control Condition Related
- Process or Machine Related
- Conveyance Related
- Safety Related
- Trouble Shooting Related
- Rules & Regulations Related
- Other

Detailed Conditions & Information On Work Standards

Production environments and operational characteristics vary. Basically however, the following items need to be investigated and incorporated in work standards.

Show Slide 2 - 6 “Filling Out Work Standards” and illustrate where the following items are entered.

1. Process name, operation name.
2. Operation procedure. (The sequence to accomplish the objective of the task).
3. Key point of the operation. (Key point at each step of the procedure).
4. Operation conditions. (Equipment, tools, fixtures, gages, cutting conditions, molding parameters, etc.).
5. Material Used, sketch where part or material used.
6. Required quality standard.
7. Job area layout.
8. Other related standards, management diagrams, associated times, numbering, remarks, etc.

Usage Of Work Standards

Work Standards are generally used to document the following purposes.

1. A basis for the equipment and process.
2. A basis for team leaders to conduct training.
3. A basis for the operator to conduct work.
4. A tool for managers to supervise work.
5. Helps in the creation of standardized work.

Implementation Of Work Standards

The important thing about work standards are that they must be followed to produce a quality product, within the planned cost, safely, and consistently. Additionally these work standards must be adhered to by all employees, and parties related to manufacturing. It is also important to train people to understand the contents of the standards and to follow them with supervision. Work standards are also one of the most basic inputs to standardized work. It is important for us to fully understand their importance.

IV. Examples of Work Standards

Quality Check Sheets

Quality Check Sheets are documents that describe who, what, where, and how of process control. Quality Check Sheets are based off of a Control Plan which is the agreement we have with the customer for manufacturing a product. Quality check sheets are among the most important work standards in manufacturing as they indicate the key quality items to be controlled at the process.

Show Slide 2 - 7 “Quality Check Sheet” – Prepare in advance.

Operation Drawings

This is a document used in Toyota that is based upon the final product drawing and shows operation by operation the position being processed, degree of precision, etc. This drawing is used by the manufacturer of production equipment, production engineering department, prototype engineering department, and the manufacturing departments during the start of production.

Show Slide 2 - 8 “Operation Drawing” – Prepare in advance.

Tooling Layout Drawing (used often in machining)

This document used in Toyota summarizes the tools (drills, taps, holders, etc.) used in machining operations, dimensions, and cutting conditions (revolutions, speed, feed, coolant, and cycle). These drawings are made operation by operation so that the tooling conditions for each process can be easily determined.

These drawings need also be stored in a data base for future tooling engineering study.

Show Slide 2 - 9 “Tooling Layout Drawing” – Prepare in advance.

Process Condition Sheets

Process condition sheets are documents which are set to ensure optimal conditions based upon equipment usage, quality standards, cost, amount, and safety considerations. For example the conditions that must be maintained on an induction hardening machine, an injection molding press, or a paint process are good examples of this type of process standard.

Show Slide 2 - 10 “Process Condition Sheets” – Prepare in advance

Operation Instruction Sheets

Operation instructions are generic documents used to set the operation procedure for conducting the most efficient, safe, and reliable way for doing a job. These operation instruction sheets list all the detailed information in order to complete a job (quality, safety, ease). Based upon the instructions listed quality standards, machined parts, inspection methods, and other important items are listed.

These operation instruction sheets are used to capture a wide range of instructions such as equipment usage, operation methods, tool and jig handling, manual assembly, trouble shooting, safety, and quality.

Show Slide 2 - 11 “Operation Instruction Sheets” and highlight key points.

Job Procedure Sheets

Job procedure sheets are simple documents that are mainly used in manual assembly area that do not use automated equipment. For the most part these procedure sheets are the same as operation instruction sheets. The analytic element of these sheets is basically the same as the operation instruction sheets as well. Namely, this means that each movement associated with the task is documented. For example, in an assembly area, the procedure for assembling each part, any related key points, and quality standards would be indicated.

Show Slide 2 - 12 “Job Procedure Sheets” and highlight the key points.

V. Elements Of The Operation

1. Describing work elements

When analyzing the contents of operation instruction sheets, procedure sheets, or job instruction sheets it is very important to understand the unit or degree to which we break the job down into. In other words at what level do we analyze tasks or elements of a job.

Carefully proceed while you explain the concept of elemental operation analysis

In conducting job research and analyzing the elemental aspects of a job debate often occurs. At what level of detail do you describe the job? First is necessary to understand what makes up the most basic element of a job. If we are able to understand this most basic element level of a describing a job then the process of creating work standards will become much easier.

2. Elements Of The Operation

Work elements are those which are used to describe a job such as manufacturing, service, or repair at a very basic level. For example the statements

“Set part in machine”

is a descriptive statement that could apply to various operations as an element of that job. By combining a series of elements we are able to complete a whole job. For example “Pick up raw material”, “Cut with saw”, “File edges” & “Measure dimensions” are a series of elements that combine to make up a job.

In this way you can see that elements are divisions or steps in completing a task or a process. These type of divisions not only relate to most assembly operations but also to set up, die exchange, tools, machine usage, adjustment, material preparation, etc. Any job can be broken down into a series of elements that make up the procedure.

3. Criteria for describing work elements

In order to distinguish what makes up the elements of a job we need to have some type of judgment criteria to help us correctly identify the appropriate ones.

Show Slide 2 - 13 “Basic Thinking Behind Work Elements”

Here is a sample set of judgment criteria for determining the basic elements of a given job. The following points should help serve as a sort of guideline in deciding to what level a job needs to be divided up into.

- An element is a fixed amount of work
- An element is something that you can teach
- When completed describing an element you should feel a sense of satisfaction that you completed a part of a job.

Ex. You are now able to trim the edges
You are now able to cut the material

- You can not complete a job by just completing one element of an operation. You must combine several elements in order to complete a meaningful task.
- When you combine several elements they form a series of actions that are mutual, without gap, or redundancy and allow you to make or repair something.
- The length of an element is one that is appropriate for instructional purposes.
- Elements of an operation can stand alone, however they can also be further broken down into more detailed steps.

Elements are used to describe the steps to operate a machine, assemble a part, change a tool for example. They function to make the subject of instruction clear and easy to understand. For this reason they often take the form of verb / object.

Discuss this concept until it is clear what constitutes a work element.

In the slide exhibit general details are broken down into more minute details for a hypothetical task. As you go to the right the elements are broken down to the level of motions. Writing any type of instruction sheet depends upon the audience and the situation. The more experience the worker the less details is needed. The more you are looking for ways to improve the process the more detailed the description might be. In general for most work standards or instructions the middle area of “work elements” can be used for adequate instruction.

VI. Creating Operation Instruction Sheets

Instructions and procedure for creating operation instruction sheets

The most frequently used form of work standard is the operation instruction sheet. Here I'd like to talk in more detail on how to create operation instruction sheets. Operation instruction sheet format depends upon the type of production you are involved with as well as the specific characteristics of the operation in question. What I will explain here is the most basic type of operation instruction sheet.

Distribute a blank operation instruction sheet to the participants.

Show Slide 2 - 14 “Example of an operation instruction sheet”

- Follow the steps for filling out the operation instruction sheet and explain.
 - Ask questions while confirming the participants degree of understanding.
- 1) Operation Name: Enter the name of the machine, tool, operation, or subject of the task you are standardizing.
 - 2) Number: Enter the number of the step that you are writing.
 - 3) Work Elements: The procedure should be the steps or sequence that describe the human motion required to conduct a job. The steps should be described in the form of verb / object.

For Example: “Fasten nut” “Set material on the fixture”

- 4) Key points: In the key points column should be special remarks related to quality, safety, ease of operation, etc.
 - Quality: Is there any point that must be done to ensure quality in the step? i.e. is there a make or break point?
 - Safety: Include key information that will help prevent injury or accident.
 - Ease: Include key information that will make the job easier like special knowledge or knack's.
- 5) Sketch: Draw any information such as a part sketch, diagram, quality standard, dimensions, etc. that will serve as a visual aid to the user.
- 6) Other: Write down your name, and the date so that it will be clear who and when the document was created.

2) Practice creating operation instruction sheets

In order to improve your skill I'd like to practice creating some operation instructions sheets.

You will need to prepare a short demonstration in advance. It should consist of about five to eight steps in length. Conduct practice as required. Usually a short demonstration using paper, hole punch, stapler, paper clips or whatever tools available is sufficient. Hand out blank operation instruction sheets to the class.

Example

- Explain the contents of the operation you will demonstrate
- Explain how to fill out the sheet, key points, sketch, etc.
- Demonstrate the operation (Pick up paper, fold paper, punch hole, staple, and store, etc.)
- Have audience write down the work elements, key points, etc.
- Present the result of the operation instruction
- Explain the example created

Note To Instructor: There is no one right answer but make sure that the examples created are uniform and consistent. For example if one person has 3 work elements and the rest of the class 8 work elements then there is confusion on what is a "work element". Discuss the different answers and contrast the differences and likely implications.

3) Creation and maintenance of operation instruction sheets

Operation instruction sheets are usually kept by the Team Leader stored in a safe place. When necessary someone closer to the job can maintain the sheets.

The purpose of operation instruction sheets is to provide information to the person responsible for doing a certain job. Quite often they are displayed visually in the work site.

Questions: Ask the class if they have any questions about operation instruction sheets. Check to see if they understand the difference from standardized work.

Urge the class to create operation instructions for their areas if applicable. Recognize that these sheets are important for maintaining quality, cost, safety, ease of operation, and for doing continuous improvement.

VII. Standardized Work

Definition of Standardized Work

We will continue now with a brief description of what is “standardized work” in TPS. Standardized Work is a document centered around *human motion* that combines the elements of a job into the most effective sequence without waste to achieve the most efficient level of production.

Show Slide 2 - 15 “Standardized Work Overview”

There are three pre-conditions that must be met for true standardized work to function properly. 1) the work must be cyclical and repetitive, 2) the quality of the process must be high and quality of incoming parts must be high, 3) there must be low levels of equipment downtime. If these three conditions are not in place then either pure standardized work is not applicable or you need to work on improving the process and layout so that pure standardized work can apply.

True standardized work is also very distinct from work standards in that it includes three critical elements; takt time, standard work in process, and job sequence which we will cover in session 3. These concepts are unique to TPS and apply repetitive jobs in departments such as final assembly and some man machine combination sub assembly areas.

There are also three different forms that must be filled out to create the optimal standardized work pattern for a process. The forms are 1) the process capacity sheet, 2) the standardized work combination table, and 3) the standardized work chart.

Standardized Work when properly applied and used can effectively combine people, product, and process to improve quality, cost, safety, ease of operations, etc. Furthermore, it forms part of the base for Just-In-Time production by preventing over-production by relying upon takt time. Also, Standardized Work becomes an important base line for comparison in continuous improvement efforts.

Characteristics Of Standardized Work

There are several characteristics of standardized work that deserve special mention. I will now try and summarize some of the more important ones.

The purpose of standardized work is to enhance production of “the right part, at the right time, in the right amount” or in other words the Just In Time portion of the Toyota Production System.

Another way of putting this is to that we want to “make quality parts at the lowest possible cost, and deliver them to the customer on a timely basis”.

In session 1 we discussed standardized work as a method for helping to achieve the four goals of the Toyota Production System. Standardized work is created under the direction of Team Leaders in production areas. The actual contents can be written by other experienced personnel but needs to be reviewed and signed off by the Team Leader. The responsibility for managing standardized work and making sure it up to date is that of the Team Leader and Manufacturing Manager.

It is important to remember that work standards and standardized work are different but both can be used to generate large benefits in our respective work areas. Using these types of standards will help us stabilize workability, work time, and work in process to affect delivery, cost, and quality.

Types Of Standardized Work Forms

The most widely used types of Standardized Work forms are as follows:

Process Capacity Sheets
Standardized Work Combination Tables
Standardized Work Charts.

In Session 3 we will cover each of these items in greater detail. Here I will merely explain them in brief overview fashion without a lot of detail. Tomorrow I will give you actual examples and practice problems in creating them.

Brief Explanation Of Standardized Work Forms

1) Process Capacity Sheet

This sheet displays machine capacity and production capability when manufacturing parts through various production processes. On a Process Capacity Sheet, manual work time, machine automatic time and tool exchange time are written down to determine the capacity of each machine or piece of equipment.

1. Identifies the production / process capacity.
2. Clarifies the bottleneck process in terms of machine capacity.
3. Becomes a basis for creating Standardized Work Combination Tables.

2) Standardized Work Combination Table

This sheet combines human movement and machine movement to clarify the range or area that can be covered within takt time.

1. Determines the area that one person can cover.
2. Determines work sequence.
3. Identifies the wait time or gaps within the line.

3) Standardized Work Charts

For each production team member standardized work illustrates the job area, confirms the three elements of standardized work (takt time, SWIP, & job sequence) and illustrates some points regarding safety, and quality. This form is displayed at each production work area. However is not merely for the purpose of educating or training the team member.

Standardized work charts are in fact to be posted in or near the work area preferably at the start of the line. Using this form the Team Leader or Managers can see how the line is operating with respect to the standard. When looking at standardized work we should be looking to see “is there anything wrong?” as if we were searching for a problem.

The primary functions of Standardized Work Charts are as follows.

1. Serves as a tool for discovering problems / opportunities for continuous improvement.
2. Serves as a tool for visual control regarding the three elements of standardized work, as well as quality and safety issues.
3. Serves as a form of operator instruction for repetitive tasks

VIII. Job Instruction

Brief Description Of Job Instruction

Now we will transition into a brief description of Job Instruction. Up to this point we have covered Work Standards, and briefly introduced Standardized Work. I will next briefly describe Job Instruction, and how it differs from Work Standards, and Standardized Work.

Job Instruction (JI) is a method of teaching jobs that focuses on how to accurately, safely, and conscientiously teach a job that will lead to mastery of that job in the shortest period of time. The basic JI method was developed in the U.S. over 50 years ago. In its simplest form it represent a step by step process for trainers to follow when instructing. The four basic steps are - Prepare, Present, Try Out, & Follow up. Each step has certain patterns that need to be followed in more detail. The Job basic Instruction method is quite old and established, yet it remains one of the most effective ways of training people in manufacturing.

When instructing a job various forms can be used depending upon the seniority and experience of the trainee. Experienced workers may be able to learn a job by just receiving instruction off a Standardized Work Chart. New or temporary employees however, need a more basic breakdown of the job. The form we use in these instances is the Job Breakdown Sheet.

Job Breakdown Sheet

The Job Breakdown Sheet is a tool used by team leaders and trainers to accurately instruct the safest, high quality way to do the job in an orderly sequence. This Job Breakdown Sheet is a document that arranges the job effectively for the team member so that they can quickly grasp the details of the job content. Job Breakdown Sheet includes the major steps for the job and the key points with each step, as well as the reason for each key point.

Show Slide 2 - 16 “Example Of Job Breakdown Sheet” and explain.

The job breakdown sheet was developed to organize work in the most efficient way for instruction. With this sheet you can easily conduct training to fit the level and experience of the trainee by adjusting the level or degree of content so that instruction is accurate and complete.

With proper job breakdown, the following effects can be expected.

1. Enables instruction of the necessary job, in a short period of time.
2. Enables smoother job instruction.
3. Enables teaching of a sequence.

4. Enables instruction with key points.
5. Can assist in the creation of work standards / standardized work.

Operation Instruction Sheets

We don't always have to use a Job Breakdown Sheet when instructing. When you don't have time to prepare a Job Breakdown sheet other forms can be used. For example, earlier we created an Operation Instruction Sheet. Operation instruction sheets are the most typical form of work standards seen in manufacturing.

Operation instruction sheets include instructions related to equipment, machinery, tools, gages, etc. Consequently they can frequently be used in training team members. Remember that similar to the structure of a Job Breakdown Sheet, Operation Instruction Sheets include the main elements of the job, and also key points. The important part of Job Instruction is the methodology taught in the JI course of prepare, present, try out, and follow up. When the basic teaching pattern on JI is understood, other forms can be used.

Summary Of Standardized Work

In session 3 we have covered the various types of work standards forms that are used to drive standardization in order to produce a high quality product on a stable basis.

It is necessary for Team Leader to understand the situation of their area and create necessary work standards and standardized works as the situation dictates.

Normally work standards must first be created in order for standardized work to be accurately created. We must determine our priorities and decide which areas of our plants need standardization. In TPS job instruction sheets and work standards are created first before standardized work charts.

IX. Closing The Meeting

The most basic building block of any efficient manufacturing company is standardization with the workplace.

Without any standardization there can be no continuous improvement in terms of quality, cost, safety etc. over the long term.

The advancement of standardization enhances the long term viability of the company. Today we learned that there are two chief area of standardization; work standards and standardized work.

Show Slide 2 - 17 “Summary of Main Points In Session 2”

Both types of standards can help make it easier to smoothly manage our respective areas on a daily basis.

Today we mainly focused on the topic of work standards. Work standards are necessary for the creation of standardized work. In other words they are thus important building blocks for the two main pillars of the Toyota Production System; Just in Time & In Station Process Control. For this reason we have spent the last few hours enhancing our knowledge of work standards.

I would like all of you to think carefully about what types of standards you work areas may need.

We need to communicate the skills and knowledge that reside in us and our team members to other people in our work sites. If we do not share the respective skills and knowledge that we have it is difficult to expect the company to continue to grow and develop.

Thank you today for your participation.

Please remember to be on time to the next training session.