

# Session 7: Variance and Operating Consistency

## Prepare to Teach



### Session Overview

Session 7 introduces the students to the concept of variation and how some variation can be controlled through operating consistency. The importance that documentation plays in maintaining operating consistency is covered.



### Class Preparation Checklist

1. Purchase and bring to class at least 100 o-rings (all the same size and color, if possible).
2. Purchase and bring to class colored tape that will stick to the floor of your classroom.
3. Procure examples of the four different levels of ISO documentation (Quality Manual, Operating Procedure, Work Instruction and Quality Record) from a local process plant
4. Arrange for flipchart easel, flipchart paper, and markers OR whiteboard and markers.
5. Arrange for overhead projector and overheads, if used.
6. Bring texts or other materials to be used in this course.



### Objectives

#### Performance Objective

1. Demonstrate how to follow procedures and policies in order to ensure operating consistency, reduce variability in the process, reduce waste, and prevent safety incidents.

#### Learning Objectives

1. Define variation.
2. List variables that affect processes.
3. Summarize the various causes of variation.
4. Differentiate between common cause and special cause variation.
5. Discuss the concept of operating consistency.

6. Outline the Standardize/Do/Check/Act (SDCA) process for process standardization.
7. Explain the importance of documentation in maintaining operating consistency (i.e., Why is documentation necessary: ISO 9000, customer requirements, best management practices, PSM compliance, etc.).
8. List the different levels of documentation found in the process industry today:
  - Policies
  - General Procedures
  - Specific Procedures (or Job Instructions)
  - Forms
9. Describe different types of procedures, procedure formats and information found in procedures.
10. Describe different types of policies, policy formats and information found in policies.
11. Discuss the process technician's role in following and maintaining procedures and policies.
12. Describe the concept of "best practices".
13. Illustrate how the information found within a policy relates to how business is conducted.
14. Explain how the information found within a procedure relates to the functioning of the process.
15. Explain the concept of "document control".
16. Discuss the various document retention systems found within industry.
17. Discuss the consequences of not following policies and procedures; i.e., product inconsistencies, threats to safety, health and environment.
18. Demonstrate a willingness to take directions.
19. Demonstrate attention to detail.
20. Display an appreciation for tasks that need to be completed in sequential order.
21. Demonstrate motivation to perform steps as stated in procedures.
22. Recognize the value of policies and procedures.
23. Display acceptance of personal choice constraints due to document control requirements.

24. Recognize importance of keeping process documentation “evergreen”.
25. Recognize when instructions given by others are in conflict with approved policies and procedures and challenge the issue.

## Agenda

Activity	Estimated Time
1. Agenda	10
2. Performance and Learning Objectives	10
3. Variance/Variation/Variability	30
<b>BREAK</b>	10
4. Variance in Everyday Activities	15
5. Variance in Process Industry Activities	15
6. Ring Toss Activity	30
<b>BREAK</b>	10
7. Operating Consistency	10
8. The Value of Documentation	30
9. Summary and Wrap-Up	10

### Begin Lesson

#### 1. Agenda

Time: 10 minutes

**DISPLAY**

SLIDE #1

*OR*

**Write slide contents  
on the flipchart  
or whiteboard.**

**Agenda:** Using the transparency, whiteboard, or flipchart, list the topics that you intend to cover in today's class.

## 2. Performance and Learning Objectives

Time: 10 minutes

**DISPLAY**  
SLIDES #2 - 6

*OR*

**Write slide contents  
on the flipchart  
or whiteboard.**

Discuss the lesson's objectives with the learners in order to provide them with clear-cut guidelines for what is to be learned during the instructional session.

## 3. Variance/Variation/Variability

Time: 30 minutes

**Definition:** One of the major causes of product or service quality problems is variation.

**Variability (or variance or variation)** is the net result of the many factors which constantly affect any process.

Variation can be traced to the variables that affect processes. These variables include:

**DISPLAY**  
SLIDE #7

*OR*

**Write slide contents  
on the flipchart  
or whiteboard.**

- **Man**
- **Methods**
- **Machines**
- **Materials**
- **Environment**

? *Can you think of some examples of these variables in the process industry?*

- **Man:** The process technician
- **Methods:** The procedures for running the equipment
- **Machines:** The pumps, distillation columns and reactors used in the plant
- **Materials:** The raw materials used to manufacture products
- **Environment:** The plant within which the unit and processes are contained

Variability is:

**DISPLAY**  
SLIDE #8

*OR*

**Write slide contents  
on the flipchart  
or whiteboard.**

- **Always present**
- **Inevitable**
- **Can be measured**

Variation can be classified in two ways:

- Common-cause variation or
- Special-cause variation.

**Common-cause variation** can be explained as:

**DISPLAY**  
SLIDE #9

*OR*

**Write slide contents  
on the flipchart  
or whiteboard.**

- The fluctuations in measured values that are predictable within limits (controlled)
- Attributable to the many interacting causes of a system
- In general, variation not worth investigating
- Considered **normal variation**.

**Special-cause variation** can be explained as:

**DISPLAY**  
SLIDE #10

*OR*

**Write slide contents  
on the flipchart  
or whiteboard.**

- Uncontrolled variation that is not predictable within limits (uncontrolled)
- Attributable to one or more assignable causes that may be discovered and removed
- In general, the kind of variation worth investigating (indicated by points that fall beyond control limits)
- Considered **abnormal variation**.

Ask the students to list the common causes of variance and the special causes of variance for the following processes:

**#1**

Process: Driving to work

Common causes of variance: Traffic, speed traveled, distance to work

Special causes of variance: Flat tire, traffic accident

**#2**

Process: Hitting a home run

Common causes of variance: Skill of the batter, skill of the pitcher, speed of the pitch

Special causes of variance: Poor weather conditions, defective baseball or bat



**Break 10 minutes**

## **4. Variance in Everyday Activities**

**Time: 15 minutes**

Ask the students to break into groups and come up with two or three of their own examples of processes and the common-cause and special-cause variation associated with each. Then ask each group to describe their first process and ask the remaining students to list the common-cause and special-cause variation. Provide guidance as they progress through this activity, correcting mistakes as they go. Continue until each group has shared each of the processes they came up with.

## **5. Variance in Process Industry Activities**

**Time: 15 minutes**

Let's go back to our process industry example. Given each of the process variables we listed (see below), what would be some common-cause and special cause variance associated with each variable?

- **Man: The process technician**
- **Methods: The procedures for running the equipment**
- **Machines: The pumps, distillation columns and reactors used in the plant**
- **Materials: The raw materials used to manufacture products**
- **Environment: The plant within which the unit and processes are contained**

## 6. Ring Toss Activity

**Time: 30 minutes**

**Objective:** The objective of this activity is to help the students understand the concept of normal (common cause) and abnormal (special cause) variation.

1. Have all the students form a circle approximately 6 feet in diameter.
2. Give everyone an equal share of the o-rings you have brought with you today.
3. Place a dot of sticky tape on the floor in the center of the circle of students.
4. Tell the students that their job is to throw their o-rings and hit the dot, without moving from their assigned place in the circle.
5. Give them a signal to begin pitching their o-rings.
6. Throw a few o-rings yourself without trying to hit the dot.
7. Once everyone has pitched all of their o-rings, ask the following questions:

? *Who threw this o-ring that is right on top of the dot? (Point at the o-ring on top of the dot.)*

- **Several people will raise their hands.**

? *Who threw this o-ring over here just left (or right) of the dot? (Point at the o-ring just to the left or right of the dot.)*

- **No one will want to raise his or her hand.**

? *Why do you think this o-ring (to the right or left) hit here versus on top of the dot?*

- **Students will try to answer this question, providing various "legitimate" answers.**

**The Point:** You can't make up excuses to explain this type of variation because it is normal . . . special cause. This type of variation is inherent in the process of pitching o-rings.



**Break 10 minutes**

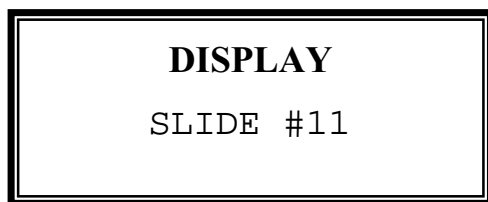
## 7. Operating Consistency

Time: 10 minutes

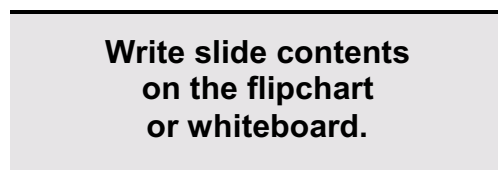
**Definition:** Operating Consistency refers to performing job activities according to standard operating procedure . . . doing the same thing the same way every time.

Operating Consistency is one way to control variance that may be added into the process by “man” or “methods”.

In order to achieve operating consistency, companies must standardize their processes. Companies interested in stabilizing and standardizing their processes should follow the SDCA (Standardize-Do-Check-Act) Cycle:



*OR*



Everytime an error occurs, ask:

- Does a standard exist?
- Did we follow the standard?
- Is the standard adequate?

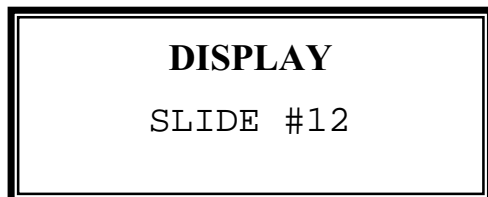
Once a company has established standards, insures the standards are adequate and insures that employees follow the standards, then a company can say that their processes are standardized and stable.

## 8. The Value of Documentation

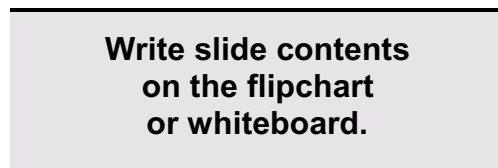
Time: 30 minutes

**Why is documentation important?** Documentation provides a means for capturing the standards needed for operating consistency.

As you may recall from your Session 1 homework assignment, ISO registered companies have four levels of documentation to insure operating consistency:



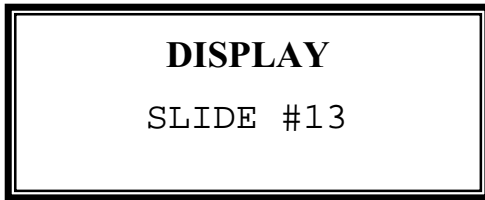
*OR*



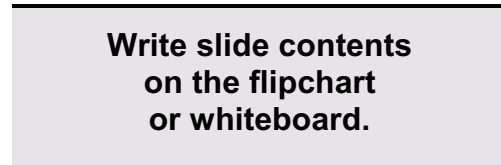
- **Quality Manual**
- **Operating Procedures**
- **Work Instructions**
- **Quality Records**

Distribute the examples of the various levels of documentation you have brought with you today. Give students an opportunity to look through each type of document.

**Types of Procedures and Policies:** Explain that in an ISO registered facility, the new employee will encounter all types of procedures and policies:



**OR**

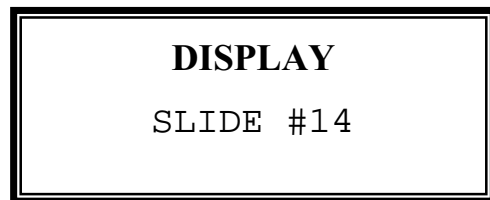


- **Administrative**
- **Operating**
- **Safety, health and environment**
- **Etc.**

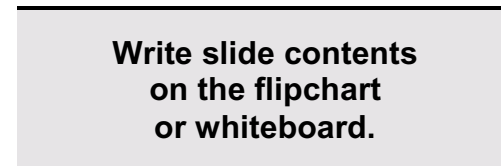
*Discuss examples of each type of procedures listed above.*

**Difference Between The Two:** The main difference between a policy and a procedures is that a policy conveys administrative or managerial guidelines and a procedure conveys step-by-step instructions.

**Procedure and Policy Formats:** Explain that these procedures and policies may look different from plant to plant. But the same basic contents will be present:



**OR**



- **Title**
- **Author**
- **Date Written**
- **Approval Signatures**
- **Management of Change Log**
- **Purpose**
- **Responsibility**
- **Scope**
- **Main Content of the Policy or Procedure**

**Retention:** Explain that new employees may find documentation in electronic form in Lotus Notes or as an HTML file accessed via the company Intranet or server, OR in paper form filed in a Policies and Procedures Manual in their unit.

**Document Control:** Explain that if policies and procedures are NOT kept up-to-date and revised whenever there is an equipment change, process change, etc. (emphasize management of change here), then operating consistency cannot be insured.

## **9. Summary and Wrap-Up**

**Time: 10 minutes**

1. Encourage additional questions over course content and exercises.
2. Review homework assignment.