



Toyota Motor Manufacturing Kentucky, Inc.

Practical Problem Solving Intranet system at Toyota Motor Manufacturing Kentucky

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SMAC 2001

Topics covered

- ✦ Knowledge at Toyota
- ✦ TPS as a knowledge sharing system
- ✦ Practical Problem Solving within TPS
- ✦ Preserve Toyota's unique knowledge processes
- ✦ Partnered with PHRED
- ✦ PPS Intranet system
- ✦ System Architecture



Knowledge at Toyota

- ✦ The basic unit of knowledge is a question answered
- ✦ The basic unit of learning is a question

Toyota Production System as a knowledge sharing system

- ★ TPS is a Thinking Production System
- ★ Knowledge creation, conservation & sharing is embedded in the very systems used to build cars
- ★ TPS is a living and constantly evolving system based on:
 - ★ Standardized work processes provide common frames of reference
 - ★ Standardized question / reasoning processes provide basic units of knowledge transfer
 - ★ Sensei provide coaching, expertise and guide reflection

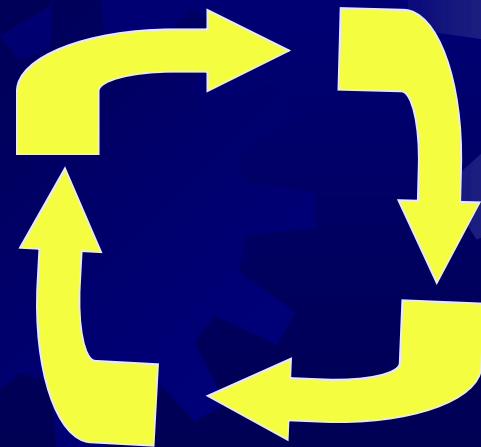
TPS Questioning / Reasoning processes

★ TPS Questioning / Reasoning process embedded in include:

- A3 reports
- Shikumi Diagrams
- Practical Problem Solving process

★ Tools share a common methodology

- Observe
- Question
- Reason /Act
- Reflect



Praptical Problem Solving

- ★ Knowledge generation and sharing based on Ohno's classic questioning process to elicit & share reasoning
 - WSBH-WAH
 - What is the discrepancy?
- ★ Based on '*Genshi Genbutsu*' / *go and see*

Challenges faced

- ✦ Massive growth
- ✦ Changing employment patterns
- ✦ Dynamic information sharing environment
- ✦ Need to preserve Toyota's unique PPS system

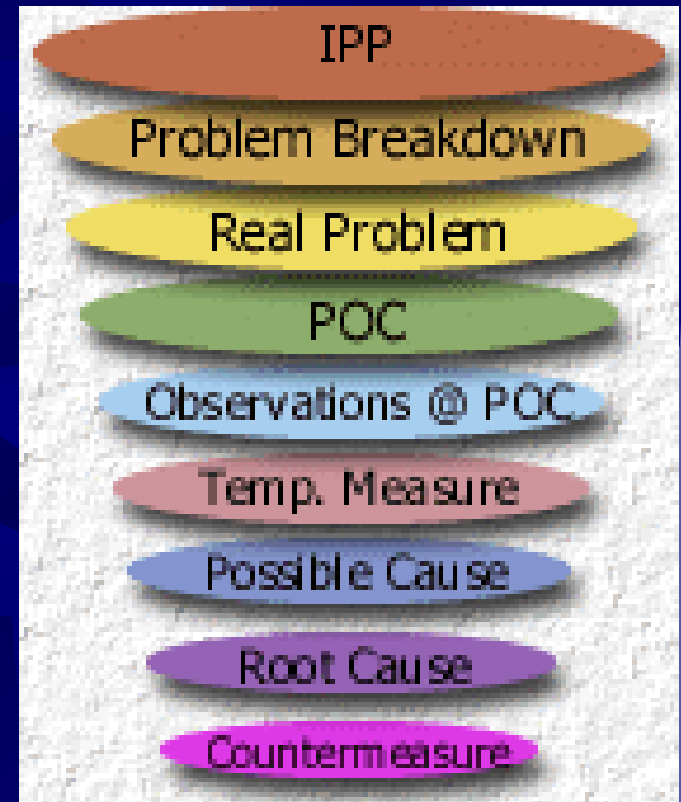


Partnered with PHRED

- ✦ We needed someone who:
 - ✦ Had experience with designing question-based reasoning systems
 - ✦ Understood qualitative as well as quantitative knowledge issues
 - ✦ Could reflect the learning systems inherent in TPS / PPS

PPS Intranet system

- ★ Guides users to address problems through a rigorous reasoning process that progresses over stages to a permanent countermeasure or the identification of an unsolved problem



The PPS Intranet System is composed of:

- ✦ Process
- ✦ Reasoning / Tacit knowledge elicitation
- ✦ Transference of knowledge
- ✦ On line coaching / Just in time training
- ✦ Access to expert problem solvers, coaches and Sensei
- ✦ Knowledge management / Reporting

PPS standardized process

- ✦ Problems are individually defined as miniature projects
- ✦ The problem project is broken down from an initial problem identification and definition to a permanent countermeasure, or the identification of an unsolved problem
- ✦ Temporary fixes are documented and must be either removed or integrated into the permanent countermeasure before the problem can be closed



Practical Problem Solving

PLEASE CHOOSE ONE OF THE FOLLOWING:

Problem Statement: GROMET not seated at final inspection

Initial Problem Perception Id: 4 Open

Problem Breakdown Id:5 Open

The Real Problem Id: 10 Open

Point of Cause Id:11 Open

Observations at the Point of Cause ID:12 Open

Temporary Measure Id:14 Open

Possible Causes Identified Id:17 Open

Direct Cause Id: 22 Open

How direct cause was confirmed/tested id:23 Open

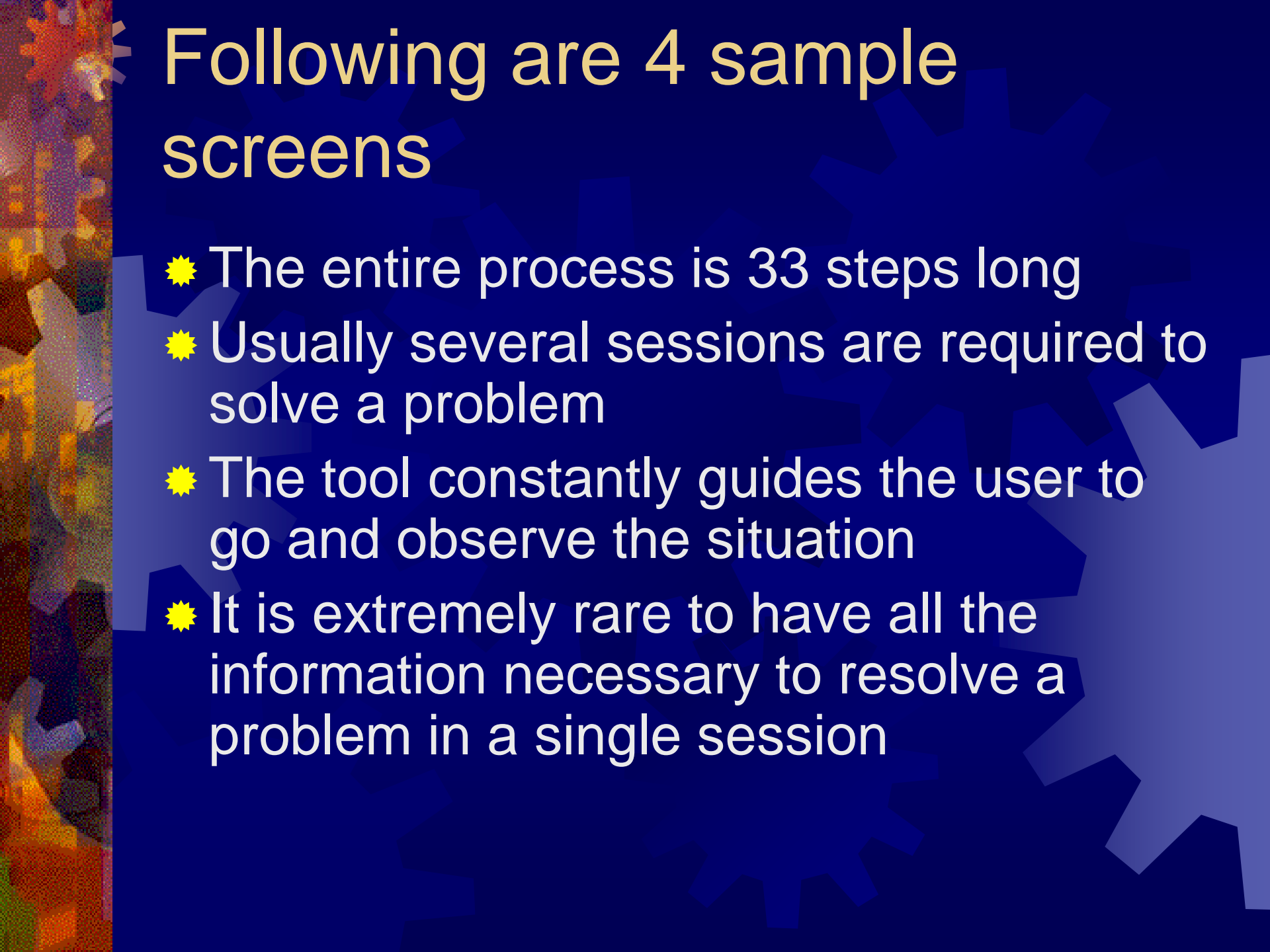
Root Cause Id: 28 Open

CounterMeasure Id: 29 Open

MAIN MENU BROWSE
COACHING PREVIOUS REVIEW NOTES
HELP CLOSE COMMENTS

Reasoning/Tacit knowledge elicitation

- ✦ Users are asked to reflect on and respond to questions in a specific sequence that elicits their reasoning.
- ✦ The user's reasoning is generally an expression of individual tacit knowledge, reflecting their perspective of the situation based on the situation's unique context and the individual's cumulative experience gained on-the-job but not written down for others to access



Following are 4 sample screens

- ✦ The entire process is 33 steps long
- ✦ Usually several sessions are required to solve a problem
- ✦ The tool constantly guides the user to go and observe the situation
- ✦ It is extremely rare to have all the information necessary to resolve a problem in a single session

Initial Problem Perception



Screen ID: 4

Problem Statement

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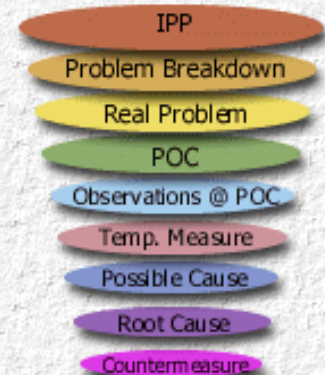


Owner

Teresa Kathleen Hanley

IPP

ED rinse drips on RH rear doors at final inspection



Next/Save

Previous

Reset

Flow Diagram

Main Menu

Help

Coach

Note

Begin by entering your initial problem perception.

ED rinse drips on RH rear doors at final inspection

Select Problem Category

Paint

Select Plant Code

TMM Kentucky

This may change later, because your Initial Problem Perception may not be the Real Problem. In fact, many times it is not.

Later you will more specifically define the problem, so just enter one sentence describing the abnormality here.

Please select a category, to the best of your ability at the moment. You can always change it later.

WSBH vs. WAH - screen 6



Screen ID: 6

WSBH vs. WAH

Toyota Motor Manufacturing Kentucky, Inc.



Owner

Teresa Kathleen Hanley

IPP

ED rinse drips on RH rear doors at final inspection

IPP

Problem Breakdown

Real Problem

POC

Observations @ POC

Temp. Measure

Possible Cause

Root Cause

Countermeasure

Next/Save

Previous

Reset

Flow Diagram

Main Menu

Help

Coach

Note

Describe the event and situation.

What should be happening?

Completed vehicle should be evenly finished and without streaks.

What is actually happening?

Streaks are found on 50% of vehicles.

Can you find a standard to compare it to? It may not be documented. Does one exist? You may need to get agreement to what the standard actually is or what is the commonly accepted best practice.

Describe the characteristics of the occurrence. How do the characteristics compare to the standard? Examples of this are in the coaching.

Root Cause Analysis - screen 24



Screen ID: 24

Why

Toyota Motor Manufacturing Kentucky, Inc.



Owner

Teresa Kathleen Hanley

IPP

ED rinse drips on RH rear doors at final inspection

RP

RH rear door streaks on 50% of vehicles at final paint inspection. Streaks appear to be from ED drips.

Next/Save

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Flow Diagram

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IPP

Problem Breakdown

Real Problem

POC

Observations @ POC

Temp. Measure

Possible Cause

Root Cause

Countermeasure

Describe 'Why' this problem occurred.

Sealer not being applied consistently by sealer robot at rear door hemming process.

Add

Remove Last

Applicator tip partially clogged.

Scheduled replacement of applicator tip not completed at last scheduled date.

Keep adding 'Why's' until you reach root cause.

Root cause is the first abnormal event that sets off the chain of abnormalities.

Each why must be linked to the problem by a chain of cause/effect relationships based on fact.

Countermeasure – screen 30



Screen ID: 30

Countermeasure

Toyota Motor Manufacturing Kentucky, Inc.



Owner

Teresa Kathleen Hanley

IPP

ED rinse drips on RH rear doors at final inspection.

RP

RH rear door streaks on 50% of vehicles at final paint inspection. Streaks appear to be from ED drips.

IPP

Problem Breakdown

Real Problem

POC

Observations @ POC

Temp. Measure

Possible Cause

Root Cause

Countermeasure

Next/Save

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Flow Diagram

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Note

Describe in specific detail your plan to implement the Countermeasure.

	Est Comp	Description	Completed
1	3/31/2000	Add items to checksheets	4/1/2000
2	4/4/2000	confirm all team members aware of need to replace and/or c	
3	5/5/2000	Inform Kathy Hanley of changes	

Insert

A -> Z

Z -> A

Countermeasures need to be tested for effectiveness prior to implementation.

Countermeasures must be permanently established to prevent recurrence.

Make sure all relevant documents are modified as part of your countermeasure plan.

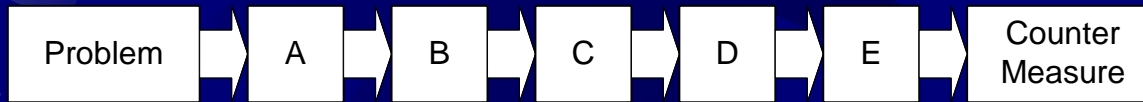
Gain buy in from all responsible for implementation of your countermeasure.

Problem Knowledge Transfer Gap

- ★ Ad Hoc Problem Solving approach



- ★ PPS Intranet-Based approach



- ★ Reasoning becomes apparent which facilitates the transfer of knowledge


Transference of knowledge

- ✦ Questions break the problem and solution down into smaller, well reasoned components which:
 - Makes the logic transparent
 - Establishes a shared mental model
 - Builds a common problem / solution framework
- ✦ There is a deep sharing of reasoning as third parties no longer have to make the “cognitive leap” from problem to solution
- ✦ As people get to understand and benefit from each others experience , active collaborative problem solving communities arise

On line Coaching

- ★ A coaching facility and technical help are on every screen
- ★ Coaching is targeted to the specific step
- ★ Examples from the 'live' PPS course are integrated into it

Coach - Microsoft Internet Explorer



The Initial Problem Perception (IPP) is how the problem presents itself to you. For example, when the Apollo 13 astronauts radioed, "Houston we have a problem." This was their Initial Problem Perception of a giant thump.

As you progress in your problem solving activities, the Real Problem will become apparent. To follow the example, the Real Problem was that there was an explosion in the fuel cells but the astronauts did not know exactly what was wrong at the outset.

Initial Problem Perceptions are often vague, complicated, generalized and you can't get your hands around them.

People often quantify their perceptions with terms such as a lot, too much, all, always, never, none, etc.

They may also describe their problem perception as happening all the time or never.

The IPP may come wrapped in a Countermeasure. For example, my dog says, "I can never get to those donuts, you always put those on the table, you need to put them on the floor where I can reach them." From the dog's perspective they should have open access to donuts. This may not be the Real Problem.

Don't try to Countermeasure the IPP, WAIT until you know the root cause of the Real Problem. If you act on the IPP, you will often cover up the Real Problem instead of countermeasuring the root cause.

Done

I'm Stuck

Access to expert problem solvers, coaches and Sensei

- ★ End users collaborate with acknowledged system experts / Sensei to better develop the problem and the potential solution

I'm Stuck

Expert - Microsoft Internet Explorer

TOYOTA

Screen ID: 4 **Real Coaches** Toyota Motor Manufacturing Kentucky, Inc.

Done

Choose the area where you need help, and then either E-Mail or call the Coach.

Expert Area	Coach	Email Address	Extension
Exterior	Jim White	jimwhite@tmmk.com	2232
Interior	Bob Smith	bobsmith@tmmk.com	1234
PHRED Technical Supp	Laurie Rambaud	laurie@phredsolutions.com	

If you want to have a phone conference with a Coach, please E-Mail your telephone number, and one or more time periods when you will be available to talk to the Coach.

To send an E-Mail to an expert, click the "Send E-Mail" button.

Send E-Mail

Knowledge management / Reporting

- ★ The problem database contains information that enables all personnel to:
 - ★ Identify problems that have already been solved or are being worked on. Users can find closely related problems, enabling collaboration outside of their peer group
 - ★ Identify systemic or “chronic” problems quickly, allowing personnel to focus their attention better on those problems that arise over and over again
 - ★ Determine the status of current problems that the organization is trying to solve
 - ★ Access the wealth of tacit knowledge that went into solving closed problems

Reports available



Screen ID: 41

Reports

Toyota Motor Manufacturing Kentucky, Inc.



Continue

Previous

Main Menu

Help

Select a report type and then click 'Continue'

- PPS 3-PG
- PPS A3
- Summary - All
- Summary - Active
- Summary - Closed
- Temporary Measure - All
- Temporary Measure - Active
- Temporary Measure Status - Removed

Sort By: Category Owner's Department

Categories

Exterior
Functional
Interior
Machine
Man
Material
Method
Paint
Powertrain

Departments

Development
Exterior
Interior
System Development
Travel Services

Select one or more Categories/Departments to report on.
If no Categories/Departments are selected, then all will be used.

Practical Problem Solving

PPS Developer: Teresa Kathleen Hanley, Plant: TMM Kentucky, Problem ID: 1, Date: 2000/03/25

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Initial Problem Perception

ED rinse drips on RH rear doors at final inspection

Possible Causes Identified

1. Hem not sealed at hemming process in Body W
2. Hems missing or insufficient sealer application

Problem Breakdown

Grasp The Situation

Vehicles discovered at final paint inspection with streaks in paint on Rh rear doors. streaks cause flat non-glossy appearance on finished vehicle.

What's Actually Happening

Streaks are found on 50% of vehicles.

What Should Be Happening

Completed vehicle should be evenly finished and without streaks.

Active Possible Cause: Hems missing or insuffici

Direct Cause

Sealer not being applied consistently by sealer rol

How Direct Causes Was Confirmed/Test

Observed sealer robot function at rear door hem

Root Cause

Scheduled replacement of applicator tip not compl
date.

The Real Problem

RH rear door streaks on 50% of vehicles at final paint inspection. Streaks appear to be from ED drips.

Countermeasure/Follow-up

Description

Add replacement of applicator tip to daily start up

Point of Cause

Tracked back from final inspection to after ED rinse. Drips happen on transfer line after ED rinse.

Implementation Plan

Est Comp Date

Observations at Point of Cause



The End

★ Questions?

"Watch for small problems.
They disguise big opportunities."