Cross-Connection Control

2016 UF TREEO Conference
Cross Connection Survey of
Automotive Manufacturing Plant

Presented by: Steve Fox

A little fun with numbers… Ice Breaker

Steve will try to AMAZE you!!!!

This is how it works…..

1. Write any three digit number without letting Sgt.
Backflow see the number. (Do not use ZERO or
duplicate numbers.)
2. Reverse the order of the number to form a new three
digit number. (Example: 123 reverses to 321)
3. Subtract the smaller number from the larger number.
(Example: 321-123 = 198)
4. How many digits are in the answer?
5. Provide Sgt. Backflow the first or the last number in
the answer and tell if it is the first or last number.
Your answer is:____________________

Basic Objectives

• Review basic terms/concepts
• How to evaluate cross-connections and
  select appropriate control measures
• Discuss process of surveying an automotive
  manufacturing plant for cross connection
  control
Facilitator

Steve Fox
aka: “Sergeant Backflow”

20+ years industry experience

QUICK REVIEW - BASIC CONCEPTS

Cross-Connection

- The actual or potential connection between a drinking (potable) water system and any source or system not intended for potable use.
- Cross connections must be controlled or eliminated to prevent backflow.
- “Backflow preventer” required to control cross-connection and prevent backflow!

Cross-connection, or “link” between drinking and non-potable water

Drinking water system
Non-potable source

Direction of Backflow

Normal Flow
Cross-Connection Example

Uncontrolled Connection with Non-Potable Water

Direction of Backflow

Potable Water Supply

Cross-Connection Control Regulations

Community Water Suppliers

- Community water suppliers responsible for supplying potable water that meets enforceable quality standards.
- Community water suppliers must prevent contamination of system via uncontrolled cross-connections - Cross Connection Control Program.
- CCC Program to include inspections, monitor testing of assemblies, education, containment vs. isolation, etc.

Cross-Connection Control Regulations

Private Water Users

- Private water suppliers (i.e., Auto Company) responsible for managing cross connections and supplying potable water to employees to comply with:
  - State water quality/cross connection requirements
  - Public water system/local ordinance, etc.
  - Plumbing code
  - Occupational Health and Safety Standards (1910.141b)
  - Corporate Health/Safety Standards

Backflow

- The undesired reversal in the direction of flow of water in a potable water piping system.
- An uncontrolled cross-connection may allow for non-potable water or substance to enter the potable water supply under conditions of backflow.
- 2 types of Backflow = Backsiphonage and Backpressure
Cross-Connection Subject to Backsiphonage

Normal Water Flow - Potable Water To Trench Flush System

Waste water may siphon or backflow through hose into potable water supply under backsiphonage condition

Cross-Connection Subject to Backpressure

Chemically treated pressurized cooling water – may backflow into potable water supply

Potable water supply

Backflow Prevention “Device”

- A mechanical device, which is not recognized as performance testable, that prohibits the backflow of non-potable water into potable water supply systems through a cross connection

Backflow Prevention “Assembly”

- A mechanical device, which is performance testable & inline repairable, that prohibits the backflow of non-potable water into potable water supply systems through a cross connection.
Backflow Preventer–Selection Criteria

1. Evaluate Hazard Level of substance that could backflow – High/Health Hazard or Low Hazard/Non-health Hazard?
2. Could backflow occur due to Backpressure, Backsiphonage, or BOTH?
3. Is “Continuous Pressure” resulting from a downstream shutoff/control valve possible (Y/N)?

Critical Concept

Additional Considerations When Selecting Backflow Preventers

- Any device or assembly named “check valve” = can be used for low hazard installations only
- Vacuum breakers cannot be used for backpressure applications
- Must follow appropriate codes and manufacturer specifications prior to selection and installation of backflow preventer

Critical Concept

Containment

- Means of preventing backflow into public water system from consumer’s premises by installing appropriate backflow preventer at the service connection or meter.
- Protects city water supplier ONLY, not plant water.
- Hazard level of plant determines type of backflow preventer required.

Critical Concept

Containment Examples

Backflow Prevention Assemblies
**Isolation**

- Installation of a backflow preventer on plant water supply line to every point of water use, or water fixture, in a building/dwelling. This “isolates” any potentially harmful process water system from plant/building potable water system.
- Hazard level of cross connection determines type of backflow preventer required.

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**Isolation Example – Wash Area**

![Diagram of wash area showing plant potable water supply, backflow preventer, non-potable water, and wash machine fill connection.]

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**Most Common Backflow Preventers**

- Air Gap Method
- Hose Bibb Vacuum Breaker Device
- Atmospheric Vacuum Breaker Device
- Pressure or Spill Resistant Vacuum Breaker Assembly (Testable)
- Reduced Pressure Principle Backflow Prevention Assembly (Testable)
“I need you to write in the report that I do not need a backflow preventer in the city water supply. We don’t think it is necessary and we need more flow!”

(Plant Engineer)

OKAY....Lets take a look...
Service Connection #2

City Water Makeup to Reverse Osmosis Units (Lines 2 and 3)

- Chemicals applied via pump to city water and permeate
- Added to control pH, remove chlorine, control scaling
- Variable frequency drive pumps for RO Units

Service Connection #2

• Reject Water – Diverted/Pumped Directly to Secondary RO Unit
• Permeate or RO Water

Service Connection #2

• Note: City supply line and RO discharge are interconnected via bypass valve.
• RO Product Water
• City Water Makeup to Reverse Osmosis Unit
“Can I just install an air gap at tank in next room?” Why or Why Not?

- Chemicals added – Potential High Hazard
- Potential for backpressure (pumps)
- Reject water from RO unit is not air gapped – reused for additional treatment
- Quick Disconnect – may be used to supplement pressurized process water loop
- ID’d bypass between city water and RO water
- Non-Potable Water Header (under construction)

RECOMMENDATION:
Reinstall RPBP, OR install holding tank upstream of entire system, and Air Gap city water supply

Service Connection 1 for 3…Better than nothing??

RO Water to Holding Tank for Distribution – No Air Gap at Tank
CROSS CONNECTION SURVEY
ISOLATION EVALUATION

Eyewash and Emergency Shower

Check Valve

Follow the Hose.................

Keep Going.................
Hose Supplies Caustic Chemical Feed Pump!

1. High or Low Hazard? High
2. Backsiphonage and/or Backpressure? Both
3. Continuous Pressure? Yes
   Protect Supply with RPBP!

Why Else is This Installation a Concern?

Valved Hose-supplied by eye wash drop
1. High or Low Hazard?
2. Backpressure or Backsiphonage?
3. Continuous Pressure?
   Protect cross connection with a Pressure Vacuum Breaker Assembly, OR Remove Hose and Re-plumb to Alternate Supply!
Process Water Makeup

What is this?

Makeup to Pressurized Tower Water and Treatment System

Potable Water Supply

Process Water Makeup

1. High or Low Hazard? High
2. Backsiphonage and/or Backpressure? Both
3. Continuous Pressure? Yes

Protect Supply with RPBPs!

Labeling…riser from floor below says “Potable Water”…safe to use right?

Around the corner, this is what it goes too………

• Line is labeled “Potable Water” from 1st floor - multiple labels
• Actually a chemical supply line for cleaners to fill mobile cleaning carts
• Potential to install potable water outlet to this line!
Ice Machine

Ice Machine Supply... look closely ....what is this?

?  

More Ice Machine Installs.... good air gap from condenser drain?

Ice Machine supply... 
Lab Faucet Vacuum Breaker installed.
Approved? Why or Why Not?
Car Wash Makeup....approved air gap?

Lab Equipment-Fume Hood Water Supply
Atmospheric Vacuum Breaker Required
- Install Outside Unit

Lab Equipment-Lab Faucet Vacuum Breaker Required

Water Cooling Line-Lab Equipment

3/2/2016
Cutting Machine

1. High or Low Hazard? High
2. Backsiphonage and/or Backpressure? Backsiphonage
3. Continuous Pressure? Yes
   Protect Supply with SVB, PVB, or RPBP!

Potable Water Supply

Water Discharge

Valved Hose Reel....What's Wrong?
1. Hose connection must be 12” below CL of SVB
2. Top of Hose Reel must be 12” below CL of SVB

Electrode Steam Humidifier Supply

Electrode Steam Humidifier Supply

Humidifier Drain – Air Gapped?
Humidifier Supply

1. Must evaluate internal makeup – some units have internal air gap
2. Must evaluate hose connection or supply method (valved hose or direct pipe connection)
3. Multiple units vs. single unit

Potable Water Makeup to Washer System

Approved Air Gap in Supply to Washer
Flood Level Rim

Is a Vented Dual Check Valve Appropriate for a Pressure Washer with Pump?

Pressure Washer Connection/Pump
1. High or Low Hazard? High
2. Continuous Pressure? Yes
3. Type of Backflow? Both
Solution: RPBP

Some examples of correct backflow preventers........
(yes we did find some!)
Washing/Cleaning Equipment Example

- Approved Reduced Pressure Backflow Prevention Assembly
- Chemical Hose
- Water Supply Point

Quick Disconnect – Power Washer/Steam Cleaner Connection

- Approved Reduced Pressure Backflow Prevention Assembly
- Quick Disconnect

Garbage Disposal

- Approved Atmospheric Vacuum Breaker
- No valves downstream of AVB

Makeup to Process Hot Water Supply

- Approved Reduced Pressure Backflow Prevention Assembly
- Process Hot Water/Steam Heat Exchanger
- Chemical Pot Feeder
- Pressurized Process Hot Water Loop

Cross-connection subject to chemical application, under pressure, suggests reduced pressure backflow prevention assembly is required!
Makeup to Process Cooling Water

City Water Makeup – Wash Tank

Water Supply – Air Conditioner Condenser Cooling

Report Out Information

• Inventory of all backflow prevention assemblies, devices and methods
• Itemized list of recommendations based upon survey information – be specific in terms of location, system, etc.
• Service connection assessment
• Internal Program Compliance, Local/State or OSHA Compliance

What do we have, and what do we need to do?
Survey Recommendations/Tips

- **Ask Questions** – How do you use this, or do you still use this? What does this hose supply?, etc.
- **Black Box Evaluation – Cross Connections:**
  1. Where/how does the water go in?
  2. What does the water do when inside?
  3. Does water come out, and where/how?
- **Be an “educator”, not just an “enforcer”**

Survey Recommendations/Tips

- **Don’t Rush** – Take your time, ask questions, attention to detail, be a detective
- **Know your Codes and Reg’s:**
  1. Have Plumbing Code readily available
  2. List of backflow preventer approvals
  3. Local ordinance, state reg’s, etc.
- **Always assume client does not know what your are talking about – education is key**

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Apply your knowledge

1. Is the containment installation approved?
   - Yes or No?

Apply your knowledge

2. Is this an approved installation? Why or Why Not?
Apply your knowledge

The water supply connection for this valved hose should be protected with:

A. Vending Machine Backflow Preventer
B. Nothing
C. Pressure Vacuum Breaker
D. Hose Bibb Vacuum Breaker

Apply your knowledge

The drain line for the vent on the vented dual check valve backflow preventer, and the drain for the potable water supplied ice machine condenser cooling line are properly air gapped.

True or False?

Apply your knowledge

The Fixture Vacuum Breaker in this picture specifies that any detergent aspiration point is greater than 6" below the "critical level" reference mark on the device. The picture shown here represents an unapproved installation.

True or False?

THANK YOU!!!