



## Holdup Management at Y-12

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# Overview

- Introduction
- Holdup Monitoring
  - What holdup monitoring is/isn't
  - What we want to accomplish
  - How we accomplish it
    - Where/what to measure
    - Qualitative vs. Quantitative
  - How we improve the process
- Closing Remarks

# Introduction to Holdup Management

## Prevention

- Engineering controls
- Clean-up procedures
- Filter change outs

## Monitoring

- Identify accumulation points
- Periodic qualitative measurements
- Data trending
- Investigate and quantify accumulation changes

## Remediation

- Clean out/Change out
- Modify limits

# Why do we need to quantify holdup at Y-12?

**Holdup** - The residual amounts of Special Nuclear Material (SNM) [ $^{235}\text{U}$ ] remaining in process equipment (ducts, filters, glove boxes, tanks, pipes, etc.) after the run-out of processed material.

- **Nuclear Materials Control & Accountability – DOE Order 470.4-6**
  - “inventories must be based on measured values, including measurements or technically justifiable estimates of holdup”
    - Semi-annual (and sometimes quarterly) quantitative holdup inventory required
    - Timely confirmation of nuclear materials to support safeguards and material security
      - Receipt Confirmations
      - Material/Container Anomaly investigations
    - Uranium Holdup Survey Program (UHSP) – qualitative holdup monitoring
    - Accountability of SNM contained within contaminated waste items identified for discard out of the MAAs.
      - Old process equipment removal
      - Contaminated waste removal
      - Waste Management’s DOT regulations
- **Nuclear Criticality Safety – DOE Order 420.1C, Chapter III, Section 3.e.**
  - “facilities that conduct operations using fissionable material in a form that could inadvertently accumulate in significant quantities must include a program and procedures for detecting and characterizing accumulations.”
    - Nuclear Criticality Safety - IAPP (Inadvertent Accumulation Protection Program)
    - Nuclear Criticality Safety - CSEs/CSRs w/ Holdup Requirements and Zone Limits

## Uranium Holdup Surveillance Program (UHSP)

- The UHSP surveys provide a means to **monitor** uranium holdup deposits in processing equipment (high efficiency particulate air [HEPA] filters, bag houses, ductwork, stacks, exhaust fans, etc.) and to **manage** the accumulation levels.
- It is designed as a two-tiered approach to monitoring for uranium holdup. Extensive **qualitative** gamma monitoring surveys are conducted first. If a reading at any location is outside its defined alarm values, then options to address suspected buildup are available, including **quantification** of the accumulated uranium for NCS and/or NMC&A evaluation.

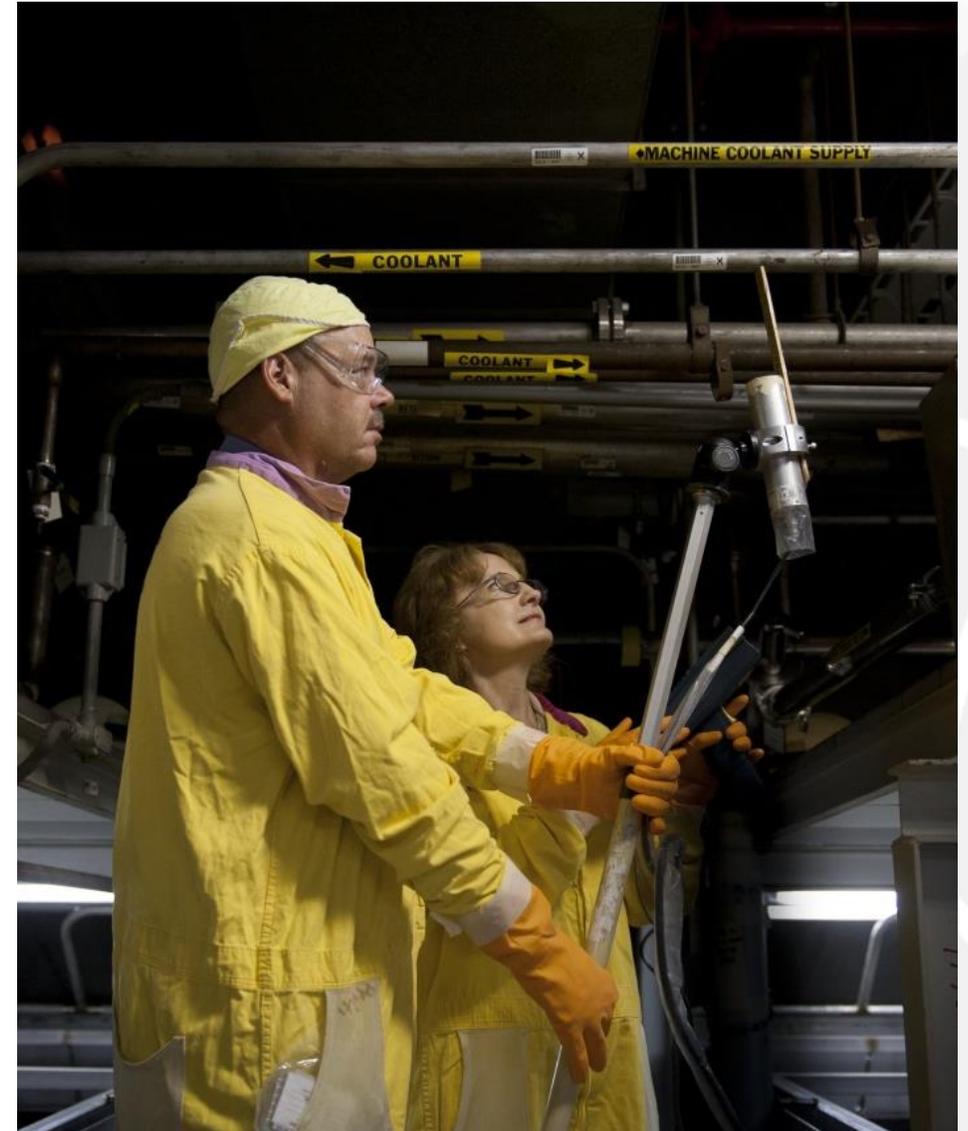
# UHSP Scope

## Extent

- Over 1,500 measurement points
- Several production facilities
- Over 5,000 measurements annually

## Goals

- **Sufficient measurement coverage to ensure accumulation points are identified**
  - Informed selection of measurement points
- **Simple, fast measurements that can be performed by operations**
  - Sodium Iodide for short acquisitions
- **Action limits that indicate anomalous readings**
  - High/low count rate alarm thresholds
- **Re-measurement capability with NDA personnel to confirm high/low measurement**
  - Resolve high/low points if measurement is invalid
- **Quantification if an accumulation is detected**
  - Full GGH measurement and analysis
  - Report results to NCS/NMCA for remediation



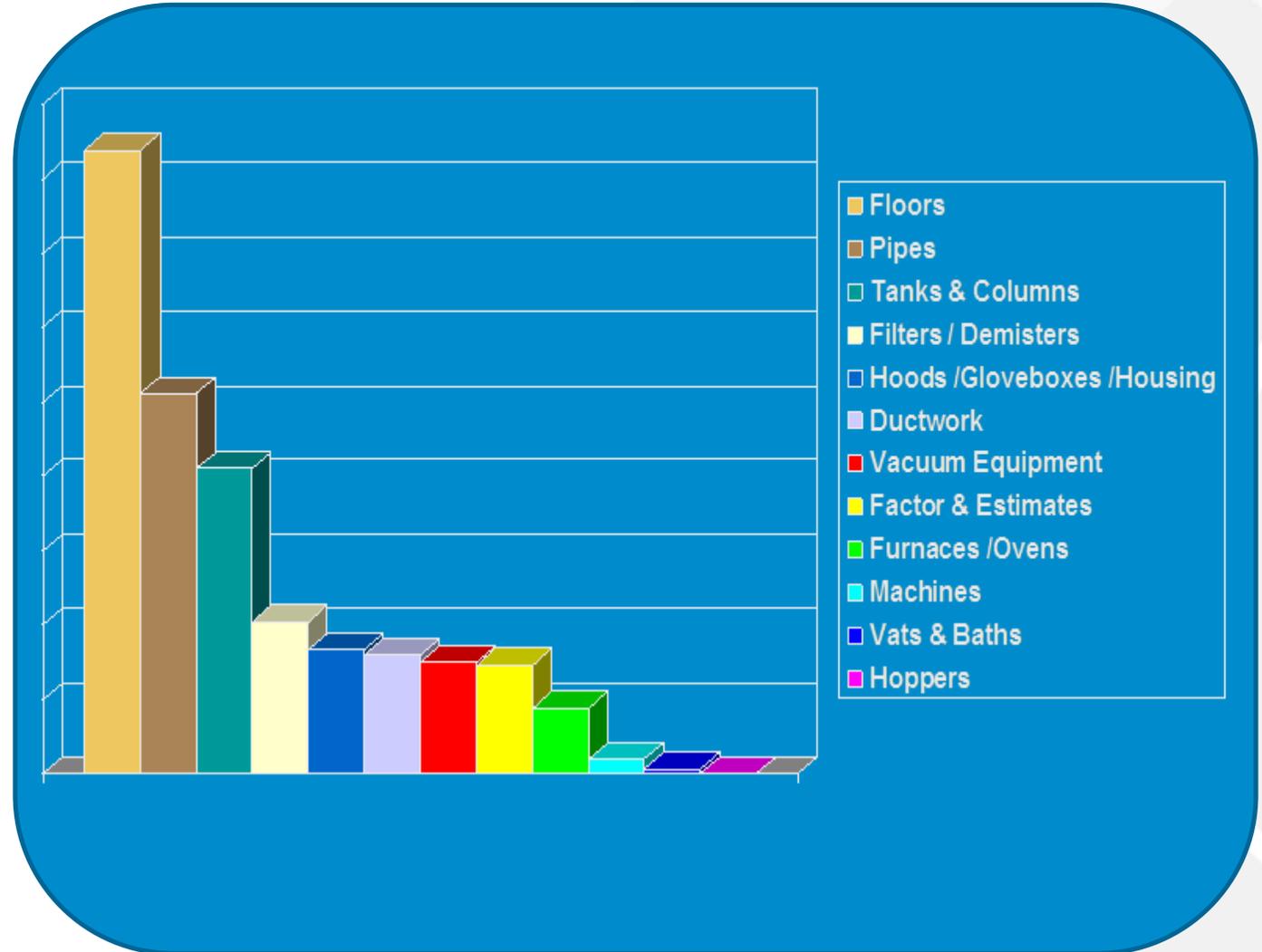
# Where's the Holdup?

## Expected/Designed Accumulation Points

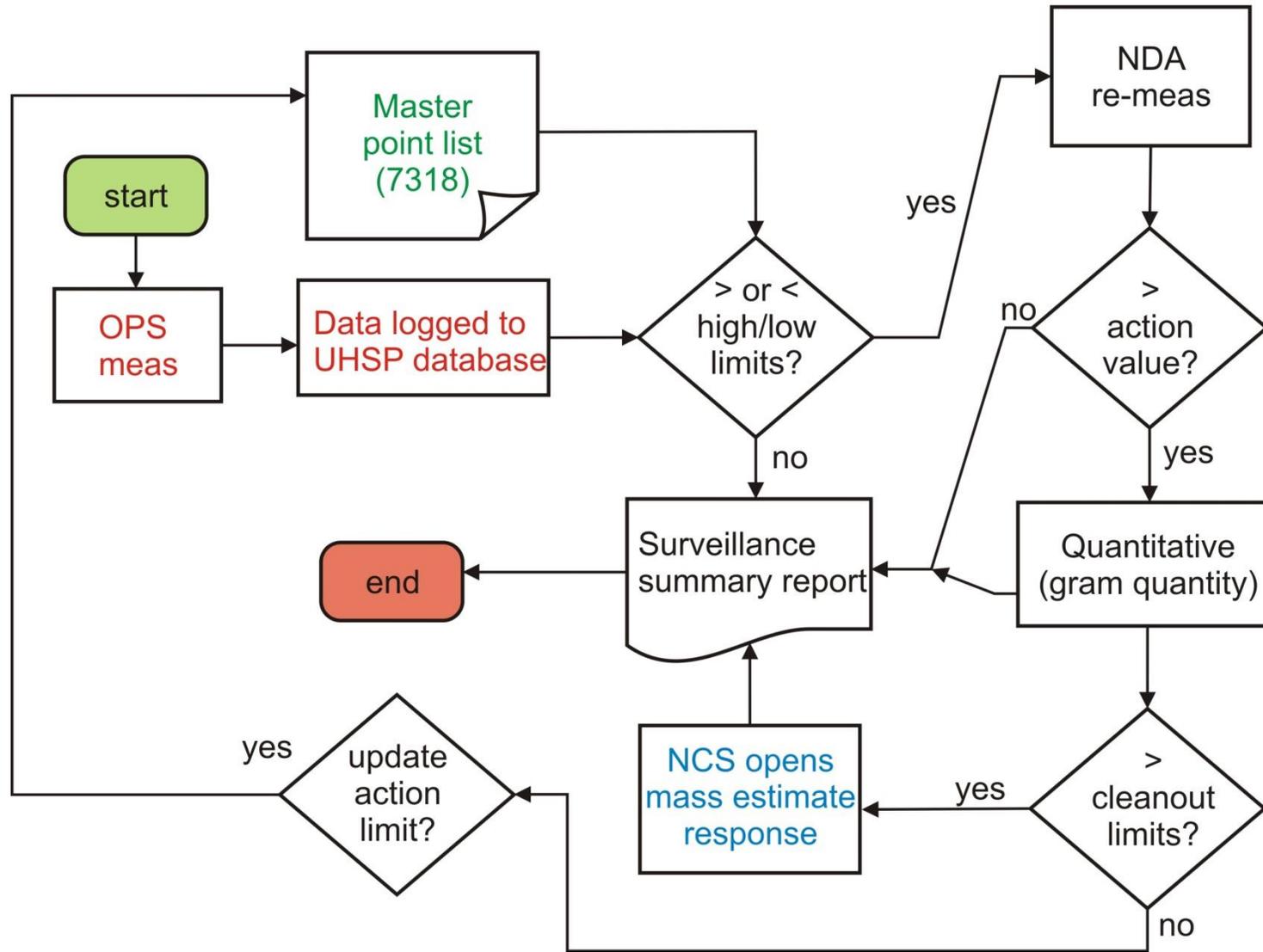
- These locations are well-defined and can typically be cleaned/replaced to remove excess accumulations.
- **Examples**
  - Tanks
  - Filters/Demisters
  - Process Equipment

## Inadvertent Accumulation Points

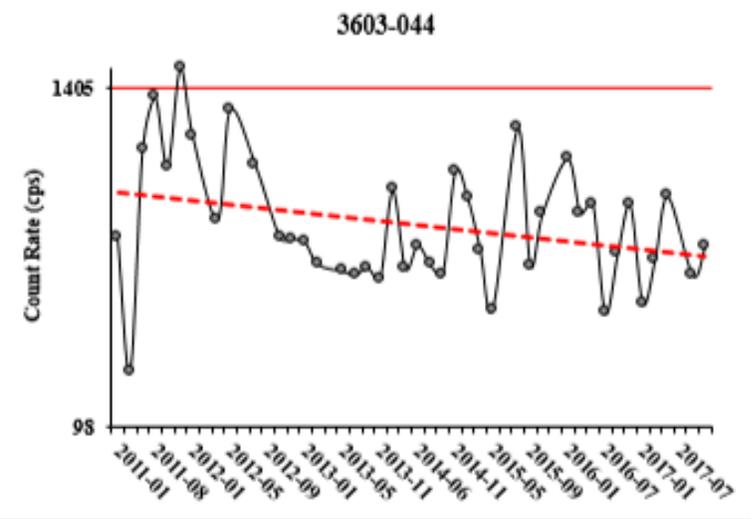
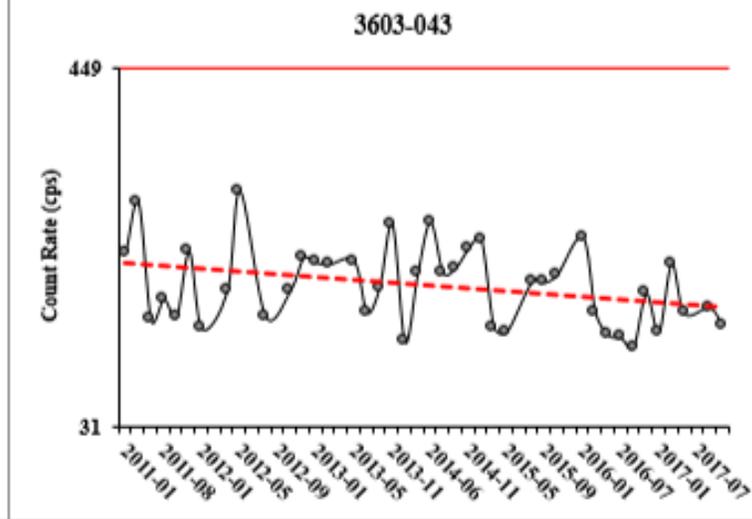
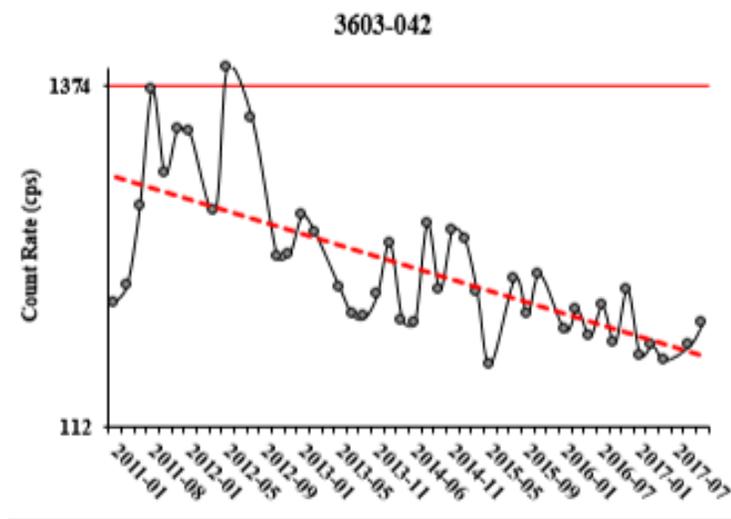
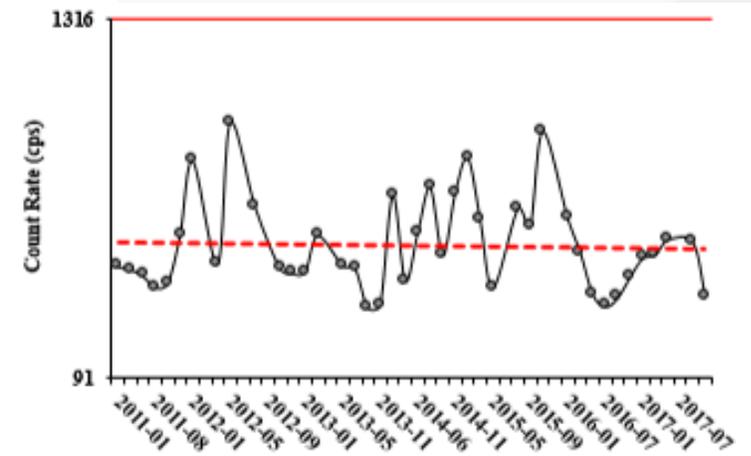
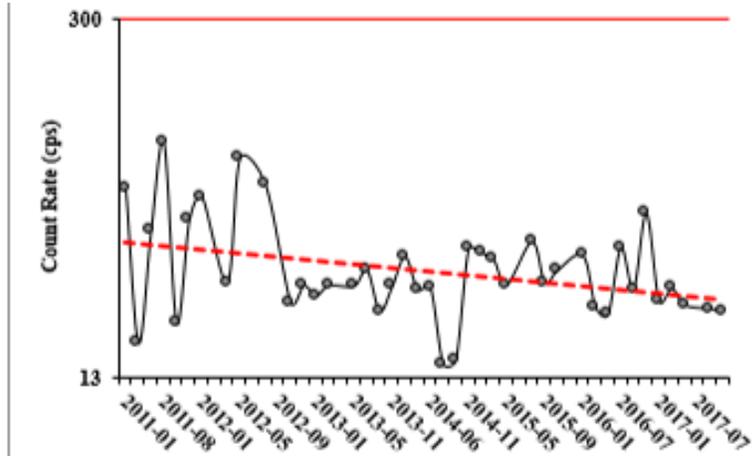
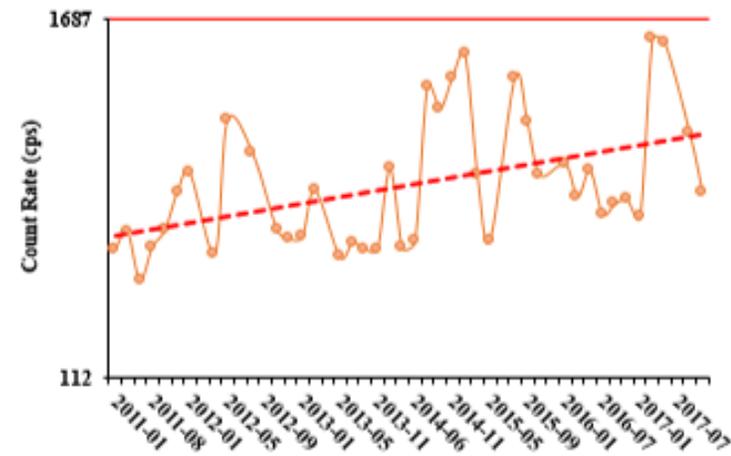
- These locations are typically large and cumbersome to measure entirely.
- Identifying elbows, expansions, low points, and other high probability accumulation areas is important.
- **Examples**
  - Ductwork
  - Pipes
  - Floors



# UHSP DATA FLOW

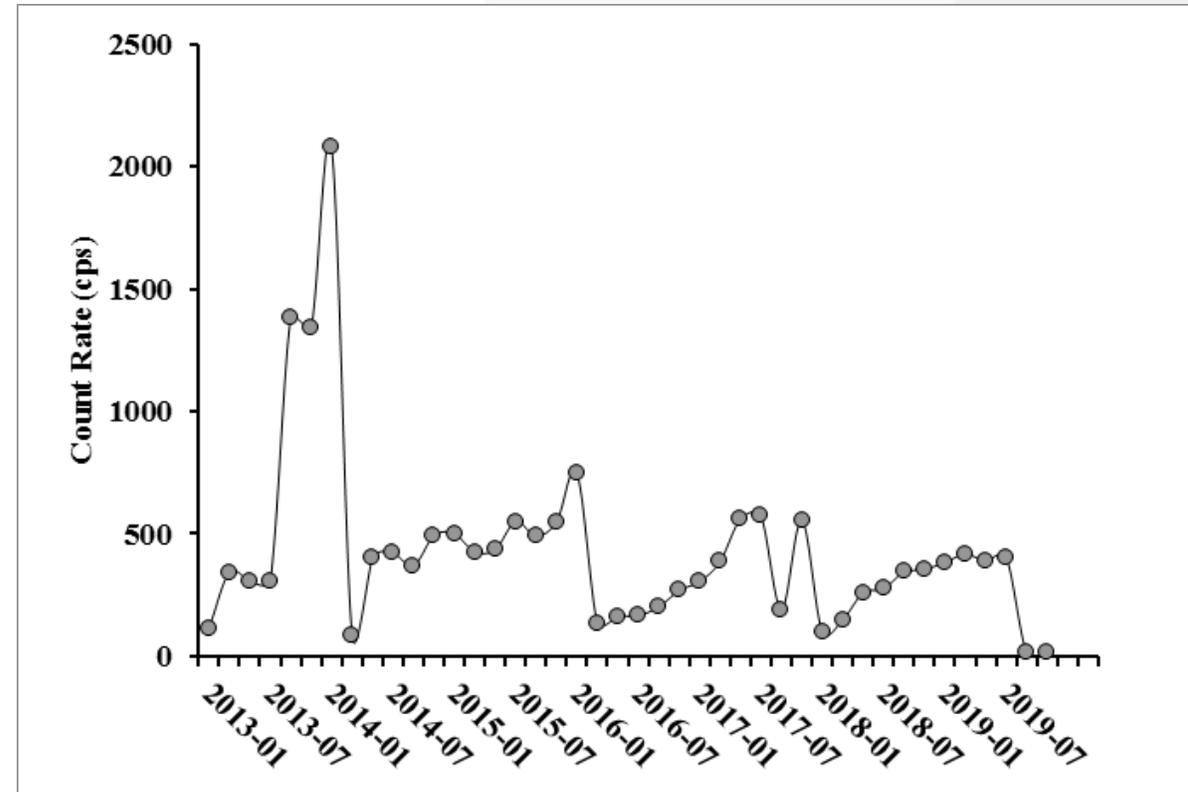


# Action Limits and Data Trending

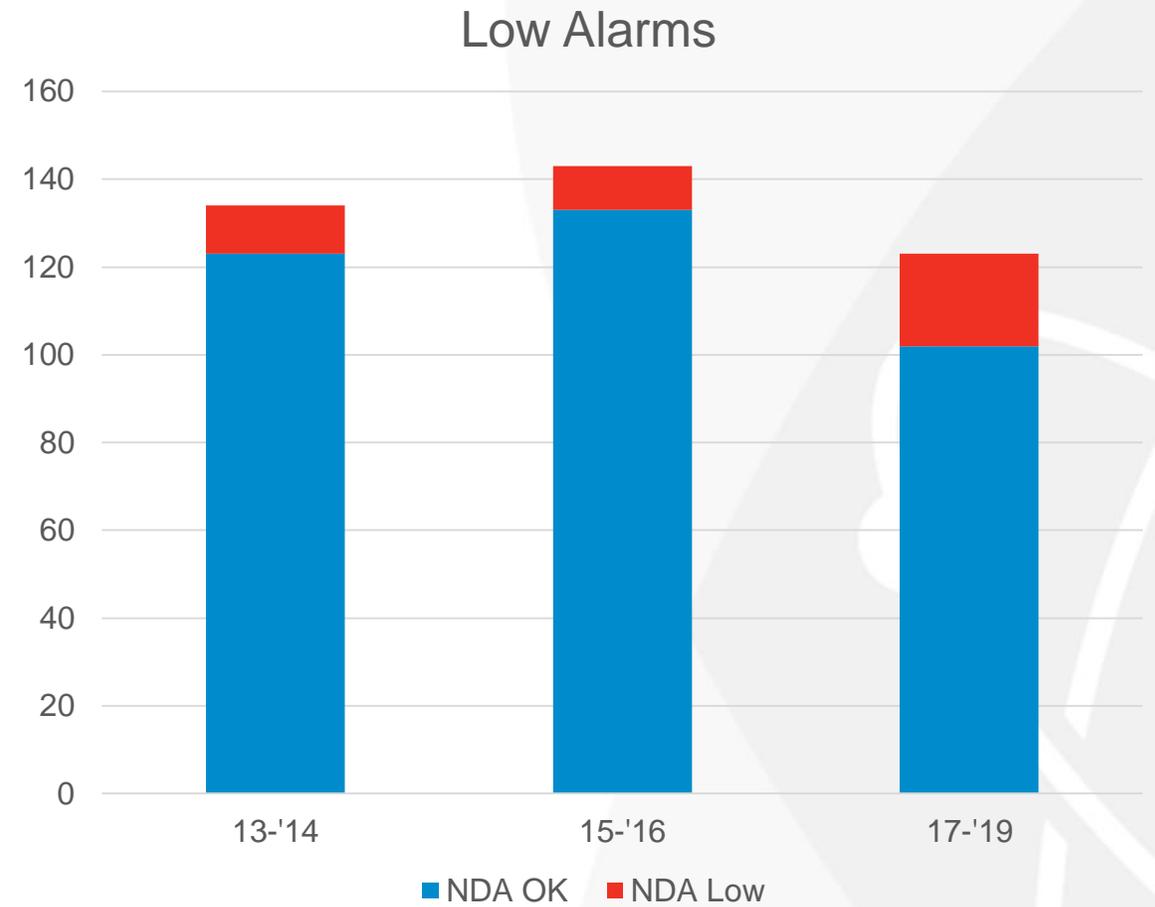
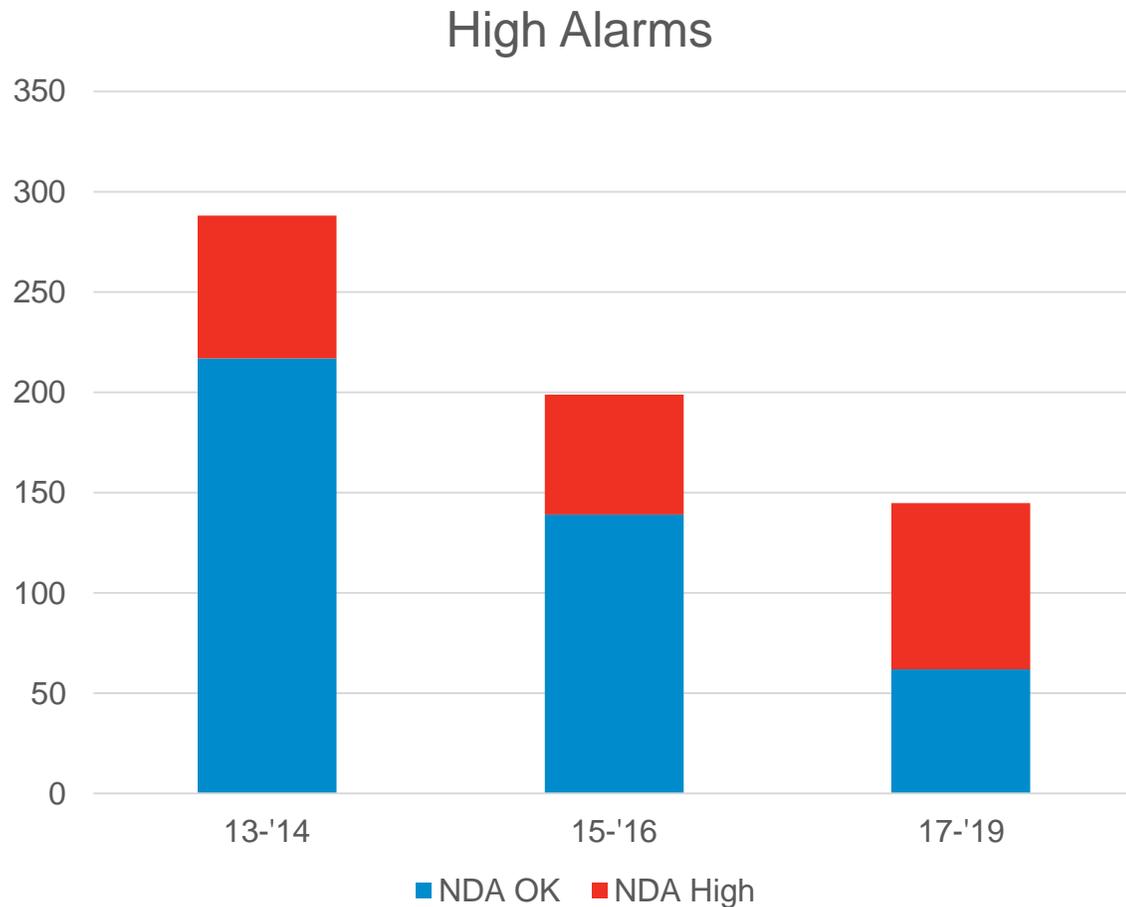


# Data Trending-Filters

Monitoring filters can help dictate change out requirements as a complement to regular change out routines.



# The importance of NDA re-measurement w/Nal Detectors



NDA personnel perform quick confirmatory measurements to ensure the count rate is outside of the action limits. This can greatly reduce the number of quantitative measurements required.

# UHSP Improvement Project

Building	Points	Annual Measurements
9212	1,423	6,720
9215	833	2,647
Other	284	675
<b>Total</b>	<b>2,540</b>	<b>10,042</b>

Using both qualitative and quantitative data, existing action limits and measurement frequencies were modified and non-accumulation points were removed to reduce the annual workload on the program.

These changes helped reduce nuisance alarms and focus energy on true accumulation areas.

**Changes to points must be approved by their governing organization (NCS/NMC&A).**

Over 5,000 qualitative UHSP measurements are currently made each year, down ~45% from years past.



Building	Points	Annual Measurements
9212	1,025	4,067
9215	540	1,024
Other	260	555
<b>Total</b>	<b>1,825</b>	<b>5,646</b>

## Summary

- Holdup management starts with implementing engineering and administrative controls to prevent and minimize accumulations.
- A holdup monitoring system like the UHSP can be used to monitor accumulations that arise or could potentially arise to satisfy NCS and NMC&A requirements.
  - **Note: Holdup monitoring cannot detect rapid accumulations that arise faster than the periodic measurements frequency. While it is often a simple solution, it isn't always the best solution.**
- Using a simple qualitative scan to observe data trends significantly reduces the amount of work required to provide effective holdup monitoring.
  - Quantitative measurements require more sophisticated equipment and analysis than qualitative measurements.
- **Selecting measurement points and their action limits is the most intensive part of developing a holdup monitoring system.**
  - Action limits can typically be selected based on a current reading at the measurement location ( $\mu \pm 3\sigma$ ).
- **Modifying your qualitative measurement frequency and action limits based on qualitative/quantitative data trends and customer feedback is necessary to improve the efficiency of the holdup monitoring system.**

# Questions?

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