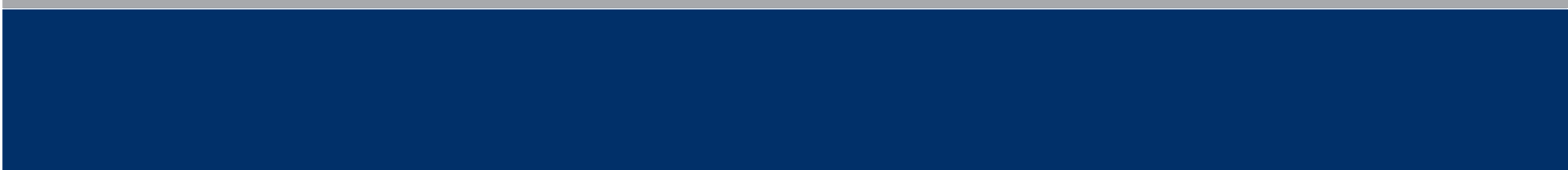




**Dounreay Site
Restoration Ltd**



Engineering review of stack sampling

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Design Authority team leader

Dounreay Site Restoration Limited (DSRL)

13th November 2008

Engineering Review of stack sampling

DSRL stack sampling systems

Engineering Review:

- background & issues
- methodology
- key findings & recommendations

What action has DSRL taken?

DSRL stack sampling systems

DSRL must keep accurate records of radioactive gaseous discharges (Radioactive Substances Act (RSA))

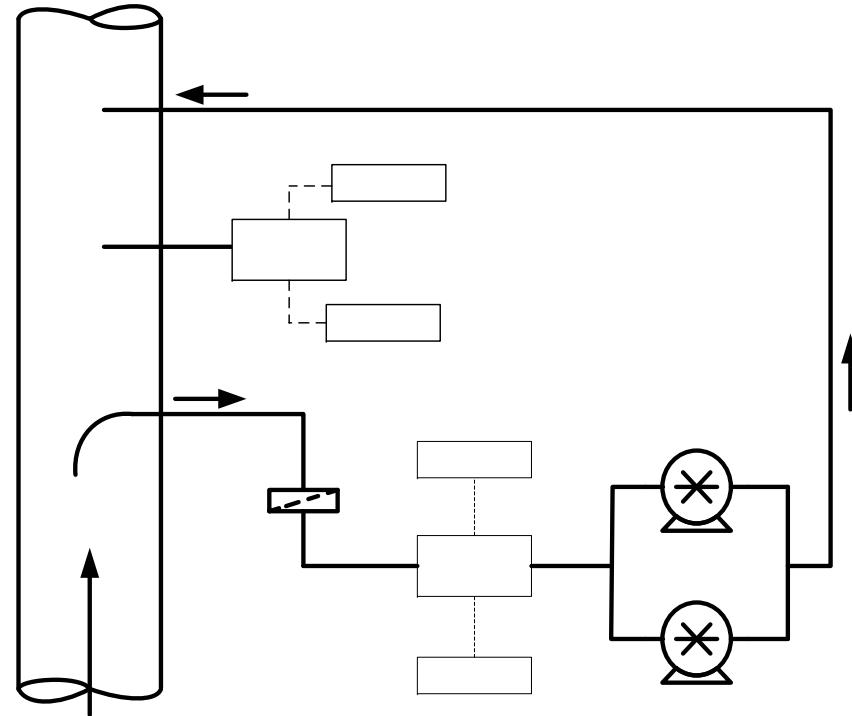
32 Particulate samplers and 11 Tritium samplers

Majority installed 2003-2006 supplied by Roxspur Ltd



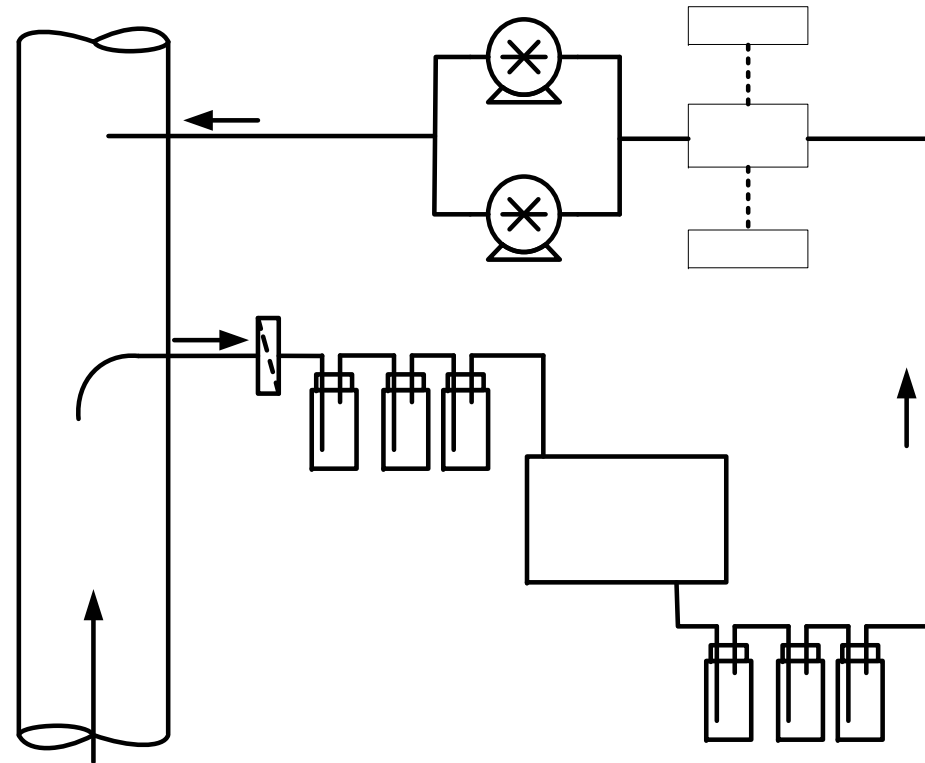
DSRL stack sampling systems - Particulate

- Duty-standby pumps
- Alarms:
 - low stack flow
 - low/high sample flow
- Isokinetic sampling (+/- 30%)
- Flow totalisers (stack & sample)



DSRL stack sampling systems - Tritium

- Duty-standby pumps
- Bubbler bottle sets pre- and post-furnace
- Low/high sample flow alarm
- Flow Totaliser



DSRL stack sampling systems



DSRL stack sampling systems



DSRL stack sampling systems

- Standardised across site (2003)
 - Original specification developed by UKAEA Dounreay
 - Detail design & supply by Roxspur Ltd
 - Characterisation of sampling during commissioning
 - Maximum downtime 9 hours per year

- Survey of stack sampling (2006)
 - Physical survey & drawing updates to record location and configuration
 - Review of sampling configurations against standards (AECOP 1072 and TGN M11)

Engineering Review - Background & Issues

- Numerous operational faults in 2½ years (2003-2006)
 - Usually no loss of sampling, but a cause for concern
- Regular pump failures
- Incorrect setup leading to erroneous data
- Investigation of individual faults identified systemic issues
- Scottish Environmental Protection Agency (SEPA) inspection giving rise to actions

Engineering Review - Methodology

- Consideration of whole engineering cycle
 - Design through to handover, operation & maintenance
 - Retrieved all project files from archives

- Review of Modifications
 - Changes during implementation
 - Ventilation plant and operational changes

- Investigation of common failures
 - Unusual occurrence reporting (UNOR)

Engineering Review - Key findings

- Sampling systems are generally compliant with codes and standards

- Management and control issues
 - Slow identification of changes and trends
 - No clear maintenance policy
 - Systems are a “black box”
 - Effects of plant modifications not recognised

Engineering Review - Key findings

- Pump trips/failures most likely event
 - Rarely result in loss of sampling
 - Pump failure is to be expected
- Most likely cause of loss of sampling
 - Power supply failure
 - Control system failure
- Most likely cause of incorrect sampling
 - Incorrect setup of equipment
 - Failure to manage changes/trends
- Tritium systems liable to water transfer

What have we done? Improvements Programme

- Modifications
 - Pump replacement (alternative models)
 - Additional cabinet grilles to allow heat loss
 - More robust tritium pumps and bottle sets

- Maintenance
 - Revised Planned Maintenance Instructions
 - Appropriate testing of all functions
 - Specialist training for instrument technicians

What have we done? Tests & Investigations

- Checks on Sampling setup
 - Flow survey
 - Adjustments to achieve isokinetic sampling
- Power supply faults
 - System testing
 - Auto-restart timers (Power dips/spikes)
- Tritium water transport
 - Bottle changing method and fixtures
 - Catalyst tube checks and replacement

What have we done? Tritium sets



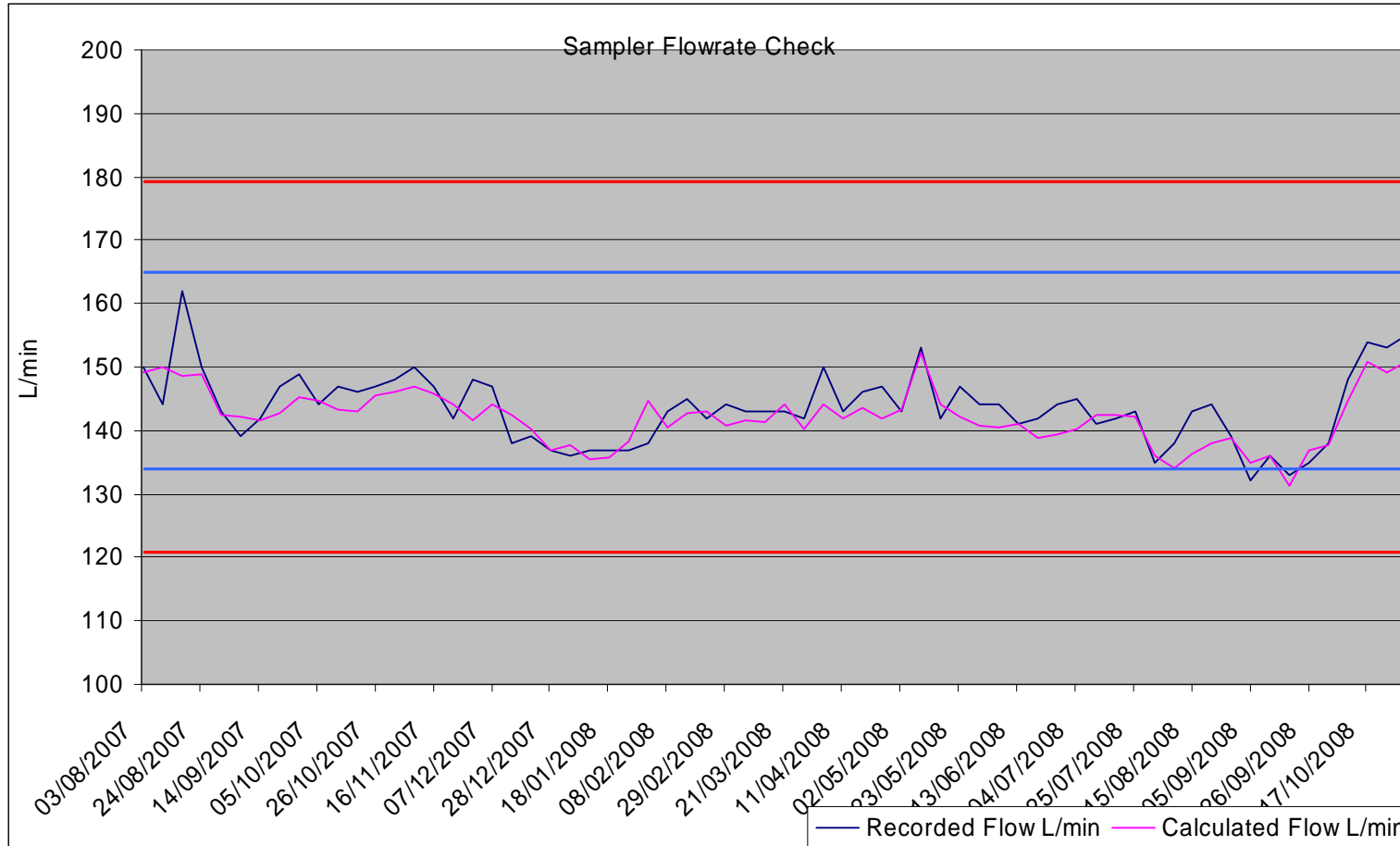
What have we done? Management & Operations

- Review of gaseous discharge data
 - Improved data presentation (graphical for trending)
 - Scrutiny of the data with Action & Alarm levels

- Presentations to plant management and operators
 - Sampling requirements (e.g. isokinetic)
 - Review of data
 - Maintenance & modifications



What have we done? Management & Operations



What have we done? Intelligent customer

- Single point of contact for advice “Stack Man”
- Design Authority
 - Sampling systems to be considered during ventilation modifications (including operational changes)
 - Clear understanding of functionality, system and components
- Dialogue with Suppliers
 - Information exchange meeting with Roxspur Ltd
 - Conversations with component suppliers
- Dialogue with Regulator
 - Action plans following inspections
 - Informal discussions

Summary

- Management and control
 - Presentation and scrutiny of gaseous discharge data
 - Plant ownership & awareness of sampling issues
 - Design Authority (understanding & control of modifications)

- Support infrastructure affects reliability
 - Power supply characteristics
 - Setup and Maintenance

- Most problems are already known
 - Suppliers
 - Operators

