

White Paper

Xtralis Refrigerated Storage Sampling Kit



Introduction

Refrigerated storage facilities present unique challenges to the reliable operation of Aspirated Smoke Detection (ASD) systems. These facilities operating under extremely low temperatures often experience excessive ice build up on their internal structures including the ASD pipe networks.

Ice build-up over time will adversely affect the integrity of the ASD pipe network so much so that it may render the ASD system inoperative in terms of smoke detection leaving the facility unprotected.

This paper describes the Xtralis Refrigerated Storage Sampling Kit which provides reliable means for smoke sampling in refrigerated storage environments in a considerably improved and cost-effective manner with simplified and reduced maintenance regime.



"Icing" on the Pipe

Ice forms when moisture comes into contact and condenses on a cold surface. In the same way, ice evident in refrigerated storage facilities is due to moisture which is introduced into the refrigerated area in various and often uncontrolled ways:

- Infiltration of outside moist air through doorways.
- Even when doorways are closed, outside moist air will infiltrate through small gaps driven by differences in air density between the hot air outside and the cold air inside the refrigerated storage area.
- Moisture evaporating from the stored products.

With ASD systems, ice will form (build-up) around sampling holes or inside pipes forming ice plugs (Figure 1) which over time may create air flow issues and ultimately impede smoke detection.



Ice build-up on ASD sampling holes



Ice build-up inside ASD pipe (ice plug)

Figure 1: Ice Build-up Issues on ASD Pipe Networks

Maintenance required to rectify this problem (i.e. unblocking of sampling holes and/or pipes) can be very time consuming and costly to the facility operators. In addition to using lifting equipment to access ceiling-high pipe networks, this task can only be carried out outside normal operating hours to avoid business disruption whilst much time and effort could sometimes be spent trying to locate ice plugs inside the pipe.

Solution

Xtralis has designed and developed the *Refrigerated Storage Sampling Kit*; a unique solution which addresses the common ice build-up issues experienced on ASD pipe networks for existing and new refrigerated storage facilities.

The Xtralis Refrigerated Storage Sampling Kit (Figure 2) is located above the refrigerated storage area (i.e. ambient temperature) and is inserted into the refrigerated area at grid patterns corresponding to smoke detection locations as per installation codes/standards or in areas experiencing frequent and excessive ice build up (i.e. close to chillers, above doorways).

With its innovative design, the sampling hole (flow restrictor) is transposed upstream at ambient temperature while inside the refrigerated area the inlet funnel pipe is open-ended.

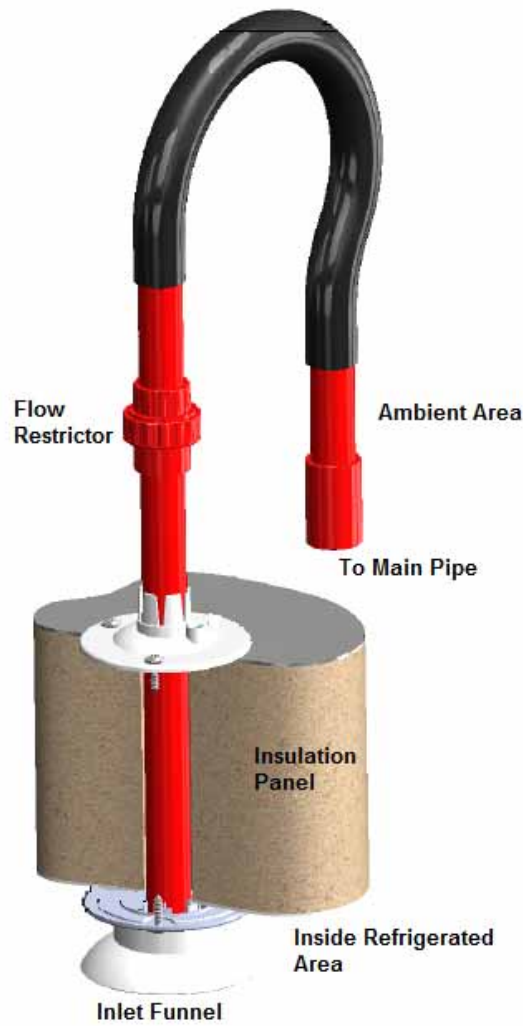


Figure 2 Xtralis Refrigerated Storage Sampling Kit

This arrangement prevents ice build-up on the flow restrictor which would otherwise result in premature blockage if kept inside the refrigerated area. Blockage is significantly delayed across the large cross sectional area of the open-ended inlet funnel inside the refrigerated area hence promoting reliable operation and reduced maintenance frequency.

On the other hand, should ice build-up occur, it will be at the entrance of the inlet funnel which can be easily disassembled for inspection and swift maintenance – and this is all carried out at ambient temperature!

Proof of Concept – Field Trial

A field trial at a refrigerated storage facility in Melbourne (AU) was undertaken to ascertain performance and identify the modes of blockage of the Xtralis Refrigerated Storage Sampling Kit. The Kit was inserted above the doorway area which experienced heavy ice build-up (red square Figure 3) with the main pipe installed above the refrigerated storage facility. The recorded temperatures during the trial were:

- Freezer area: -20 to -25°C (-4 to -13°F)
- Outside area: 0 to 10°C (32 to 50°F)

The performance of the Xtralis Refrigerated Storage Sampling Kit was ascertained under different configurations and operating conditions relative to flow restrictor sizes and flow rates (Table 1).

Table 1 Field Trial – Test Parameters

Kit No.	Flow Restrictor (mm / inch)	Flow rate (L/min)
1	3 / 0.118	5
2	6 / 0.236	5
3	6 / 0.236	10



Figure 3 Field Trial – Sampling Location

At the end of the trial period the flow rate and ice build-up characteristics for each Kit were recorded (Table 2).

Table 2 Field Trial – Test Results

Kit No.	Flow Restrictor (mm / inch)	Flow rate (L/min)	Length of ice build up (mm / inch)
1	3 / 0.118	0	60 / 2.3
2	6 / 0.236	0	60 / 2.3
3	6 / 0.236	9	90 / 3.5

The findings from the field trial prove the concept of the function and performance of the Xtralis Refrigerated Storage Sampling Kit in refrigerated storage environments. In particular, it was noted that:

- Ice build-up on all Kits occurred at the entrance of the open-ended inlet funnel extending up to 90mm (3.5") inside the pipe.
- All flow restrictors were ice free and dry.
- Higher flow rates appeared to delay blockage from ice build-up.
- Ice plugs were easily removed through insertion of a rod inside the pipe.

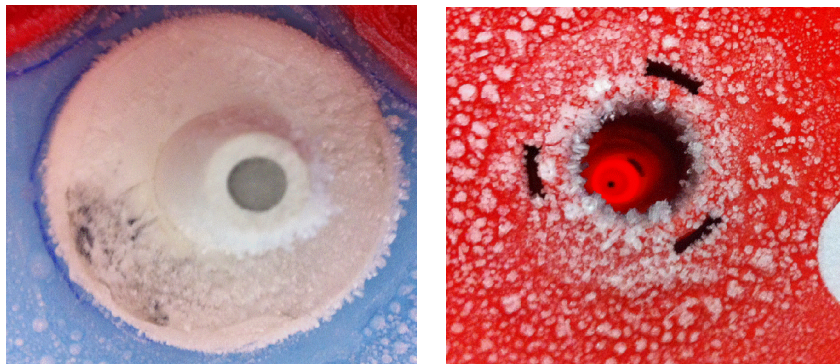
Blockage Rate

An accelerated ice build-up test in laboratory conditions was undertaken to compare the blockage rate between the Xtralis Refrigerated Storage Sampling Kit and a standard sampling point. Both sampling arrangements comprising identical hole size and operational flow rate, as outlined in Table 3, were placed in a -20°C (-4°F) environment and exposed to identical moisture content.

Table 3 Accelerated Ice Build-up Test – Test Parameters

Sampling Arrangement	Hole Size (mm / inch)	Flow rate (L/min)
Xtralis Refrigerated Storage Sampling Kit	6 / 0.236 (flow restrictor)	5
Standard Point	6 / 0.236	5

After 8 hours of accelerated ice build-up, the standard sampling point had completely blocked from ice whereas the Xtralis Refrigerated Storage Sampling Kit inlet funnel was unblocked and maintaining the original flow rate (Figure 4).

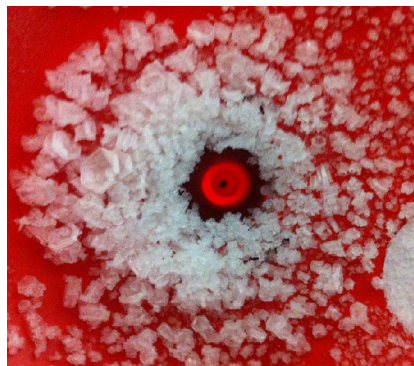


Standard Point (hole completely blocked from ice)

Xtralis Refrigerated Storage Sampling Kit – Inlet Funnel

Figure 4 Accelerated Ice Build-up Test – 8 hours Exposure

Following 100 hours of accelerated ice build-up, the Xtralis Refrigerated Storage Sampling Kit inlet funnel was partially blocked from ice resulting in a 15% reduction in the original flow rate (Figure 5). Ice build-up occurred at the entrance of the inlet funnel with the flow restrictor being ice free and dry. Even under this condition, the Xtralis Refrigerated Storage Sampling Kit is able to maintain operational function in terms of transportation of smoke.



Xtralis Refrigerated Storage Sampling Kit – Inlet Funnel

Figure 5 Accelerated Ice Build-up Test – 100 hours Exposure

The accelerated ice build-up test results show that the blockage rate of the Xtralis Refrigerated Storage Sampling Kit is significantly reduced (at least x12 times) compared to a standard sampling point.

Conclusions

The Xtralis Refrigerated Storage Sampling Kit provides a standardised and robust method for reliable smoke sampling in refrigerated storage facilities. It ensures reliable and hassle-free ASD operation by offering the following key benefits:

- Added flexibility through suitability for facilities with and without roof cavities.
- Reduces installation cost due to eliminating the need for heat tracing.
- Reduces maintenance frequency, effort and cost due to:
 - Reduced icing blockage.
 - Eliminating the need for costly access equipment hire.
 - Minimising the need for “Back Flush” systems.
- Enables fire contractors to work under ambient conditions at all times since the ASD pipe is inspected and maintained outside the refrigerated storage environment.
- Provides all round cost savings and improved aesthetics.

About Us

Xtralis is a leading global provider of powerful, early warning fire detection and security solutions that prevent disasters by giving users time to respond before life, critical infrastructure or business continuity is compromised.

We protect more than 40,000 customer sites in 100 countries, including billions in assets belonging to the world's top governments and businesses.

Our solutions include VESDA[®] by Xtralis – very early warning fire detection, ICAM[®] by Xtralis – flexible fire and environmental monitoring, ADPRO[®] by Xtralis – outdoor and enterprise security, and ASIM[®] by Xtralis – traffic detection.

Visit us at www.xtralis.com to learn more.

www.xtralis.com

UK and Europe +44 1442 242 330 D-A-CH +49 431 23284 1 The Americas +1 781 740 2223

Middle East +962 6 588 5622 Asia +86 21 5240 0077 Australia and New Zealand +61 3 9936 7000

The contents of this document are provided on an "as is" basis. No representation or warranty (either express or implied) is made as to the completeness, accuracy or reliability of the contents of this document. The manufacturer reserves the right to change designs or specifications without obligation and without further notice. Except as otherwise provided, all warranties, express or implied, including without limitation any implied warranties of merchantability and fitness for a particular purpose are expressly excluded.

Xtralis, Xtralis logo, The Sooner You Know, VESDA, ICAM, ECO, OSID, HeiTel, ADPRO, IntrusionTrace, and LoiterTrace are trademarks and/or registered trademarks of Xtralis and/or its subsidiaries in the United States and/or other countries. Other brand names mentioned herein are for identification purposes only and may be trademarks of their respective holder(s). Your use of this document does not constitute or create a licence or any other right to use the name and/or trademark and/or label.

This document is subject to copyright owned by Xtralis AG ("Xtralis"). You agree not to copy, communicate to the public, adapt, distribute, transfer, sell, modify or publish any contents of this document without the express prior written consent of Xtralis.

Doc. 25855_00

