VESDA® by Xtralis

Chemical Filter for Corrosive Environments

Application Note

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Convention	Description
Bold	Used to denote: emphasis Used for names of menus, menu options, toolbar buttons
Italics	Used to denote: references to other parts of this document or other documents. Used for the result of an action

The following icons conventions are used in this document.

Convention	Description
	Caution: This icon is used to indicate that there is a danger to equipment. The danger could be loss of data, physical damage, or permanent corruption of configuration details.
	Warning: This icon is used to indicate that there is a danger of electric shock. This may lead to death or permanent injury.
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Preface

Xtralis recommends the use of chemical filters when chemical adsorption / absorption is required to remove corrosive gases from the sampled airstream prior entering VESDA units.

This Application Note is intended as a guide for the market to improve the product life, safety and performance of a VESDA system that has been selected for use in a hazardous environment. Though the manufacturer's product warranty may be voided by the use of the detector in such corrosive gaseous environments, it is understood that this commercial risk may be deemed acceptable by the market in some applications. Following the recommendations of this Application Note MAY NOT avoid all risks of the product warranty being voided.

Related Products

Chemical filters can be used with all VESDA detectors except VEA.

Contents

1 Introduction

Corrosive gases have the potential to impact operation and affect the life of VESDA detectors. Corrosion effects include thermal failures, short circuit, metal loss, and are usually accelerated by heat and moisture.

Sources of corrosive gases can be combustion processes, bleaching operations, cleaning compounds, etc. and include acidic gases (H_2S, NOx, Cl_2,), caustic gases (NH_3), oxidizing gases (O_3).

Note!

A VESDA detector protecting a corrosive environmemnt and installed outside the protected area is still vulnerable since corrosive gases will be aspirated to the detector via the pipe network.

To protect VESDA detectors against corrosion, the sampled airstream must be “purified” by passing it through a “bed” of chemical media (beads) before it enters the detector.

For effective removal of corrosive gases from the detector airstream, the correct type and quantity of chemical media specific to the type and concentration of gas(es) of concern must be used. Chemical media manufacturers[1] can assist to identify the type and quantity of chemical media by taking into consideration the VESDA pipe network parameters (airstream flowrate / temperature / humidity).

Note!

- When more than one corrosive gases are present, a combination of chemical media should be used for each target gas.
- Pipe network components must be chemicaly resistant against the target gas.
- When detector is mounted outside the protected area, ensure the exhaust air is returned to the protected area.

[1] For example, Purafil (http://www.purafil.com)

2 Chemical Filter Assembly

Different chemical filter assemblies can be used with VESDA systems provided (i) flow impedance and (ii) smoke transmission properties are quantified and accounted for in the ASPIRE design. For information on this assessment refer to the *Xtralis Open-flow In-Line Components Application Note (No. 18336).*

An example of a chemical filter is shown in Figure 1 assembled from commercially available parts (Table 1) comprising (i) 10” stardard filter housing, (ii) refillable cartridge.

(i) 10” Standard Filter Housing

(ii) Refilable Cartridge for 10” Standard Filter Housing

Figure 1. Chemical Filter Assembly

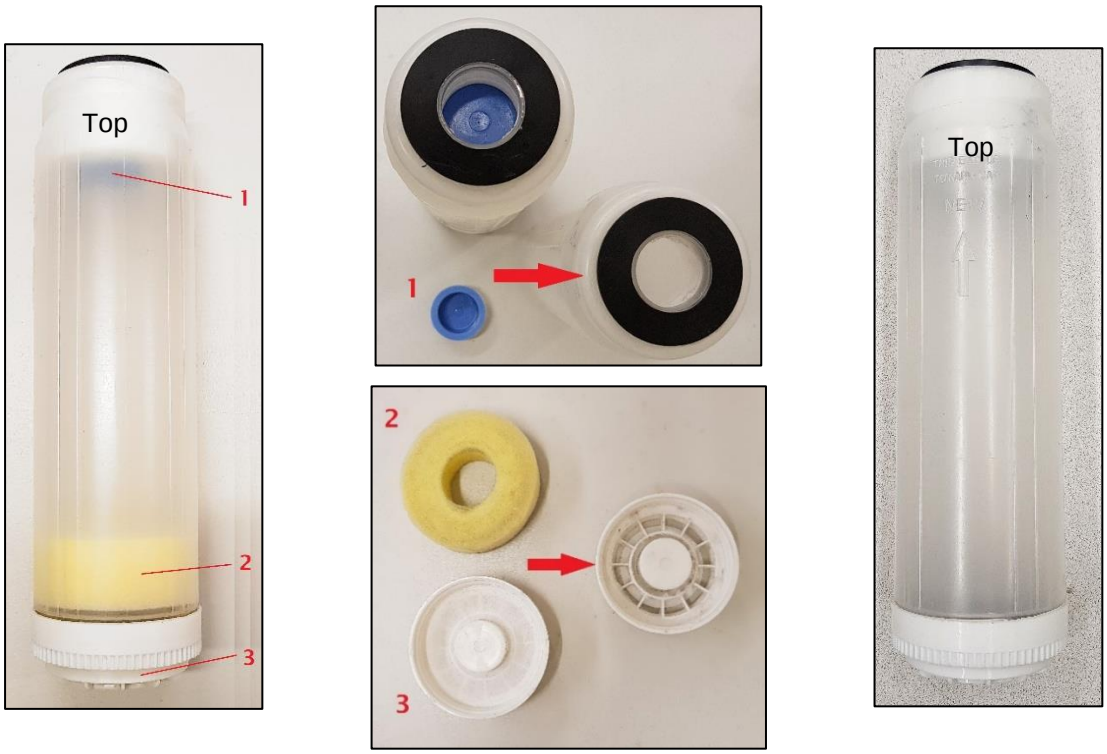
Table 1 Chemical Filter Assembly Parts

Part	**Brand**	**Model**	**Suggested Source**
10“ Standard Filter Housing **¾“ NPT inlet/outlet ports**			
10“ Standard Filter Housing **¾“ BSP inlet/outlet ports**			
Refillable Cartridge for 10“ Standard Filter Housing			

Note!

Select a clear 10“ Standard Filter Housing sump to allow for visual inspection of changing chemical media colour.

The refillable cartridge will require a 3-step modification process to accommodate the chemical media as shown in Figure 2.



Refilable Cartridge (Original State)

Step 1: Remove blue cap (push through)
Step 2: Remove PU foam
Step 3: Remove paper pre-filter

Refilable Cartridge (Modified)

Figure 2. Refilable Cartridge Modification

Once modified, the refillable cartridge is inserted in the 10” filter housing and loaded with chemical media.

Note!

Ensure refilable cartridge is inserted vertically in the filter housing and cap is firmly tighten.

2.1 Chemical Filter Impedance / Smoke Transmission

The inclusion of a chemical filter on the VESDA sampling pipe will affect impedance and smoke transmission which needs to be quantified and accounted for in the ASPIRE design. Detailed information to undertake this assessment is available in the *Xtralis Open-flow In-Line Components Application Note (No. 18336).*

An example of this assessment is shown below for the chemical filter described in the previous section. The assessment applies to activated carbon chemical media (brand: COL-RPA50, beads: Ø3mm / 4mm length, volume: 400ml i.e. half loaded refilable cartridge, supplier: Carbon Activated Corp., AU).

Accounting for impedance in ASPIRE:

1. Obtain chemical filter pressure/flow relationship (Figure 3).

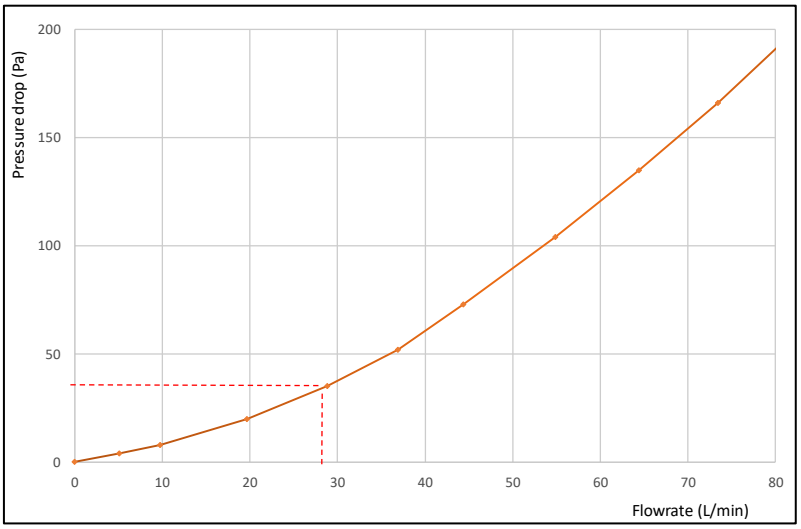
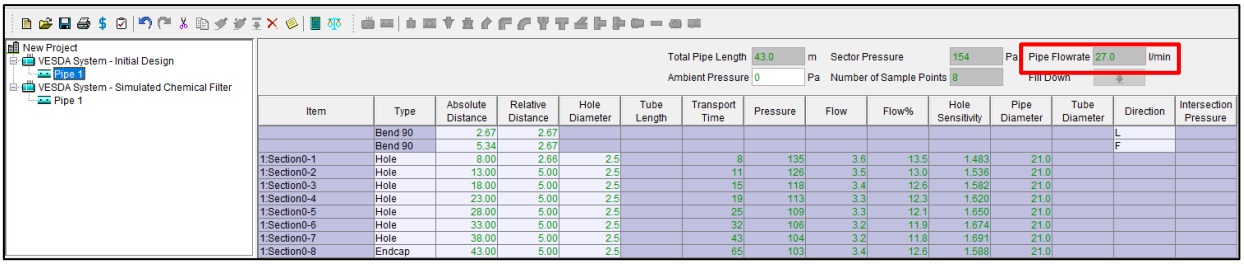


Figure 3. Chemical Filter Impedance Curve

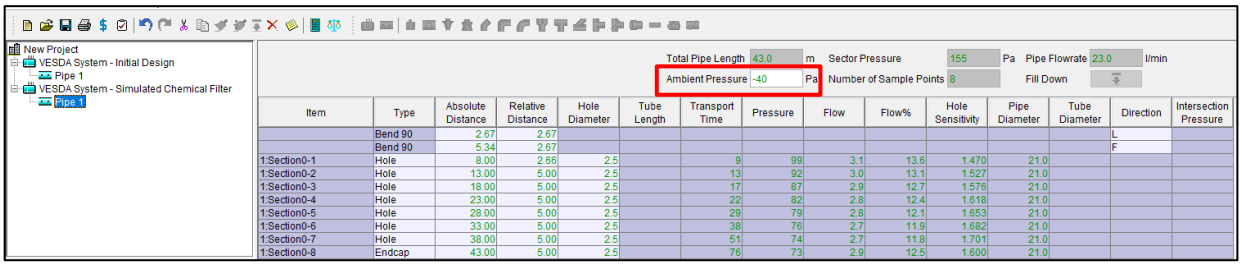
2. Create the initial ASPIRE design (Figure 4). Note the *Pipe Flowrate* for pipe section where chemical filter is intended to be installed i.e. 27.0L/min.



Item	Type	Absolute Distance	Relative Distance	Hole Diameter	Tube Length	Transport Time	Pressure	Flow	Flow%	Hole Sensitivity	Pipe Diameter	Tube Diameter	Direction	Intersection Pressure
	Bend 90	2.67	2.67										L	
	Bend 90	5.34	2.67										F	
1:Section0-1	Hole	8.00	2.66	2.5		8	135	3.6	13.5	1.483	21.0			
1:Section0-2	Hole	13.00	5.00	2.5		11	126	3.5	13.0	1.536	21.0			
1:Section0-3	Hole	18.00	5.00	2.5		15	118	3.4	12.6	1.582	21.0			
1:Section0-4	Hole	23.00	5.00	2.5		19	113	3.3	12.3	1.620	21.0			
1:Section0-5	Hole	28.00	5.00	2.5		25	109	3.3	12.1	1.650	21.0			
1:Section0-6	Hole	33.00	5.00	2.5		32	106	3.2	11.9	1.674	21.0			
1:Section0-7	Hole	38.00	5.00	2.5		43	104	3.2	11.8	1.691	21.0			
1:Section0-8	Endcap	43.00	5.00	2.5		65	103	3.4	12.6	1.588	21.0			

Figure 4. ASPIRE – Initial Design

3. From Figure 3, note the pressure value corresponding to 27.0L/min flowrate, i.e. 40Pa.
4. In the initial ASPIRE design, insert the negative value of this pressure (-40Pa) in *Ambient Pressure* and re-calculate (Figure 5).



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1:Section0-1	Hole	8.00	2.66	2.5		9	99	3.1	13.6	1.470	21.0			
1:Section0-2	Hole	13.00	5.00	2.5		13	92	3.0	13.1	1.527	21.0			
1:Section0-3	Hole	18.00	5.00	2.5		17	87	2.9	12.7	1.576	21.0			
1:Section0-4	Hole	23.00	5.00	2.5		22	82	2.8	12.4	1.618	21.0			
1:Section0-5	Hole	28.00	5.00	2.5		29	79	2.8	12.1	1.653	21.0			
1:Section0-6	Hole	33.00	5.00	2.5		38	76	2.7	11.9	1.682	21.0			
1:Section0-7	Hole	38.00	5.00	2.5		51	74	2.7	11.8	1.701	21.0			
1:Section0-8	Endcap	43.00	5.00	2.5		76	73	2.9	12.5	1.600	21.0			

Figure 5. ASPIRE – Chemical Filter Simulation

5. Check and verify system parameters (i.e. holes pressure/flowrate, smoke transport time, etc.). If any parameter is not met, the VESDA system must be modified i.e. increase fan speed, reduce coverage, upgrade to a detector with stronger fan capacity.

Accounting for smoke transmission loss in ASPIRE:

The chemical filter causes a 20% reduction in the concentration of passing smoke. To compensate for this reduction, a 20% adjustment must be applied to the all detector alarm thresholds. For example, if initial Fire Threshold is 0.2%Obs/m, this will be adjusted to 0.16%Obs/m (0.2%Obs/m – 20%).

Note!

- Where more than one chemical filters are installed on the same pipe, their respective effects will be cumulative.
- The assessment relates to unused and specific chemical beads and does not account for soiling or other types of chemical beads

3 Chemical Filter Installation

- Chemical filter must be installed in a vertical orientation close to the detector
- Each sampling pipe must have a dedicated chemical filter.
- In dusty/dirty environments install a particulate filter upstream the chemical filter. Refer to *Xtralis In-line Filter Application Note (No. 17785).*
- Where gas detection is required, install VESDA ECO upstream the chemical filter. Refer to *Xtralis VESDA ECO System Design Guide (No. 20400).*
- Where water is expeceted inside the pipe install a water trap upstream the chemical filter. Refer to *Xtralis Removal of Water Condensate Application Note (No. 17405).*

4 Chemical Filter Commissioning and Maintenance

After installation of the chemical filter or replacement of chemical media, smoke tests must be conducted to verify system performance (smoke detection, smoke transport time) – refer to *VESDA Commissioning Guide (No. 10195)*. Particulary after installation, smoke tests must be conducted monthly until the next scheduled chemical media replacement for smoke detection verifiction.

The replacement interval for chemical media should follow manufacturer's instructions. Certain chemical media manufacturers[2] offer laboratory analysis that help establish the life cycle of chemical media and determine replacement interval. A visual check for discoloration of the chemical media can also be used as an indicator for replacement (manufacturer instructions should be followed when adopting this approach).

Note!

Monitoring detector airflow should not be used as an indicator of chemical filter loading.

Ensure that chemical filters bear labels stating chemical media installation and replacement date. Record all site maintenance data as per local code and standard requirements.

5 Chemical Media Disposal

While disposed as commercial waste, guidelines set by local regulations must be followed since release of adsorbed chemicals may pose environmental issues.

Consult the manufactuer's Safety Data Sheets (SDS) for handling of unused and spent chemical media.

6 Further Support

Contact an Xtralis office or distributor for further information.

[2] For example, Purafil (http://www.purafil.com)

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