COPES-VULCAN

SPX VALVES & CONTROLS™

GUIDANCE NOTES FOR

VARIABLE ANNULUS TYPE

DESUPERHEATER

(VAD)

(FORM GN-09)

SPX Valves & Controls • 9843 Martin Ave. • P.O. Box 577 • Lake City, Pennsylvania 16423 USA
Telephone: (814) 774-1500 • Fax: (814) 774-1681
Web Site: www.spxvalves.com • E-mail: info@spxvalves.com

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SUBJECT: INSTALLATION OF VARIABLE ANNULUS TYPE DESUPERHEATER (VAD)

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1. INTRODUCTION

The Copes-Vulcan VAD is a contact type desuperheater that utilizes a variable water annulus in order to provide a fine spray pattern of coolant that can easily be absorbed by the vapor that is being desuperheated as it passes through a venturi created by the insertion of the spray head in the vapor main.

The unit incorporates a spray head that is concentrically mounted within a short section of standard schedule seamless steel pipe. The pipe acts as the desuperheaters outer body and pressure boundary that is installed in the vapor header and becomes an integral part of it. The unit is provided with a coolant branch to which is connected the coolant supply to the desuperheater.

The variable Annulus desuperheater is fully described in the Copes-Vulcan product Specification No. PS 51 which should be referred to for information on the performance of the unit. This document focuses on the installation of the unit and the following guidelines for the correct installation of a VAD into a piping system are offered in order to ensure correct performance and to avoid operational problems in the future.

The recommendations given are based on past experience and good piping and operational practices, and if followed should result in trouble-free commissioning and operation.

The VAD is a maintenance free desuperheater that has been designed to basically fit, commission and forget. Modifying this unit in any way or substituting non-factory or inferior parts could drastically impair the performance of the unit and will render void any warranty issued by Copes-Vulcan

The design of the unit does not lend itself to on site maintenance in the event of failure of the unit it should be completely replaced.

The operation of the unit is dependent upon a satisfactory supply of coolant the quantity of which will be regulated by a coolant control valve which should have a rangeability in excess of the desuperheater.

Poor installation can result in undesirable forces being set up that may impair the performance of the desuperheater.

2. PRIOR TO DELIVERY

A. Shortly after your order is entered you will receive a copy of the certified Copes-Vulcan specification data sheet (See Sample Appendix 1) detailing the operating conditions for which the equipment is being designed, along with drawings illustrating the equipment that Copes-Vulcan is proposing to supply. This information should be studied carefully to ensure that the interpretation of your requirements is correct. Any discrepancies should be brought to Copes-Vulcan's attention immediately.

B. These recommendations and the drawings submitted with the specification data sheet should be forwarded to the person(s) responsible for locating the desuperheater and designing the associated pipework in order that a satisfactory installation is achieved. Following the recommendations contained in these notes will assist in this objective.

3. ON RECEIPT

A. Physical Check

On receipt, the desuperheater should be checked against the packing list to ensure that the supply is correct, that the unit is in a complete state and that no damage has been sustained in transit.

B. Provisions for Proper Storage

If it intended to store the desuperheater for any period of time before installation the following steps should be taken:

1. When desiccant bags are used as part of the packing procedure, to minimize moisture build up, a tag will be attached to an outside surface stating the number of bags, their location and the trade name of the desiccant. The desiccant bags should be replaced every three months.

2. Unpainted metal surfaces may be protected from rust by applying a rust preventative compound such as CRC 3-36 or equivalent. Where needed, this type of treatment should be applied annually. When a rust preventative compound is not permissible or cannot be used, the equipment must be enclosed in a vapor proof envelope, that should be evacuated of all air, and sealed.

3. If the consignment includes a pneumatic or motor operated coolant control valve the installation guidance notes for that item should be consulted for any precautions needed with that equipment.

C. Inspections While in Storage

1. Visually examine the exterior surfaces of the equipment on a semi-annual basis; visually examine accessible interior surfaces of the equipment on an annual basis.

   Disassembly of the equipment is not required, and should not be undertaken at any time. Removal of the shipping caps will enable a satisfactory inspection to be carried out, and if the long term storage of the equipments has resulted in deterioration, the unit should be returned to Copes-Vulcan for refurbishment.

2. Water, oil, grease or other foreign material should be removed from the equipment, and the source of these contaminants should be located and action taken to ensure no further re-occurrence.

3. Equipment stored with desiccants are to be inspected to assure the desiccant material is being replaced and is properly located and secured in the equipment.

4. Inspect all equipment covers and temporary shipping caps and plugs to ensure that these items are firmly attached and are performing their function to keep foreign matter out of the desuperheater.

D. Long Term Storage Assurance

Consideration should be given to engaging the services of a Copes-Vulcan service engineer to inspect the equipment if the storage period exceeds one year or it is suspected that the storage conditions may not have been entirely satisfactory. This can be tied in with a visit to review the installation or to advise on commissioning.

Alternatively, if there is any concern about the condition of the equipment as a result of long term storage, consideration should be given to returning the equipment to Copes-Vulcan for a thorough examination and refurbishment if found necessary.

4. LOCATION

The VAD can be installed in either a horizontal or vertical run of piping.

If the unit is to be installed in a vertical run of pipe then a steam trap should be installed at the lowest point of the system to remove any condensate or excess coolant that could collect at that point.

In all cases the unit must be installed with the spray head facing downstream with the vapor flow.

In selecting the location for the VAD, consideration should be given to the need for routine examination. This will normally be achieved by removing the unit from the line, so adequate access should be allowed for this purpose, along with provision for suitable lifting gear if considered necessary.

Attention should be given to the effect of flow disturbances created by the incoming piping configuration on the performance of the desuperheater. Ideally the pipe should be straight and of uniform diameter with no expanders, tees, elbows or valves for the recommended “x” distance shown in Figure 1 of this guidance note.

Downstream of the desuperheater a reasonable length of straight piping is required in order to prevent separation of the coolant particles from the vapor by centrifugal action as the mixture travels around a bend. This is also necessary to avoid coolant impingement on the pipe wall. Copes-Vulcan gives a recommended distance ("z" in Figure 1) to the temperature sensing device and approximately 50% of this distance should be straight. (See dimension "y" on Figure 1)

5. COOLANT ENTRY

Coolant entry into the VAD is through the coolant entry connection which should be located below the vapor main if the installation allows. This will facilitate maintaining a supply of coolant up to the unit when the unit is out of service, or is operating at very light loads. This will help to minimize the risk of thermal shock, and will speed up response when the desuperheater is brought back into service.

The coolant control valve should be located below the desuperheater for the same reason.

Reference to the specification sheet for the desuperheater will show the method of connection required. (Flanged or Welded)

6. HEADER SIZE AND PIPELINE VELOCITY

The desuperheater size will have been established by Copes-Vulcan using specific rules for good desuperheating. It is up to the system designer to establish the main header size, taking into account the system pressure drop and good piping practice regarding the header velocity.

Any spray type desuperheater relies upon the velocity in the vapor main keeping the coolant particles in suspension long enough for them to be absorbed by the vapor. If this does not happen then the particles fall out of suspension and collect at the bottom of the main where they are carried along, possibly missing the temperature sensor entirely. Copes-Vulcan will recommend a minimum velocity, and this velocity should exist for at least 6 feet (2 meters) downstream of the desuperheater. If the existing pipe is too large to achieve this minimum velocity, a reduced section of pipe should be installed or a venturi liner fitted to increase the velocity local to the desuperheater.

The required minimum velocity is a function of many variables, and Copes-Vulcan make their recommendation on the basis of good engineering practice and past experience

If the header size is different to the desuperheater size, or if a reduced section of pipe is being fitted, care should be taken that a smooth transition occurs between the header and the desuperheater without too sudden an expansion or contraction. A 15º max. inclusive angle is recommended.

7. LOCATION OF TEMPERATURE SENSING ELEMENT

The location of the temperature sensing element is critical to successful operation of the desuperheater. The distance is determined by Copes-Vulcan taking into account the residual superheat in the vapor, the differential between the outgoing vapor temperature and that of the coolant. The minimum recommended distance for a particular size is shown as dimension "Z" in Figure 1 any deviation from this dimension for a particular application will be indicated on the desuperheater specification Data Sheet. If it is necessary to deviate from this recommendation in order to clear an obstruction or a bend, the distance should be lengthened .

8. COOLANT SUPPLY

For any desuperheating application, where the coolant is to be mixed with the vapor, it is important that a high grade of coolant be used. It has to be recognized that any impurities in the coolant will be left behind when the coolant is evaporated and can result in build up of solids in the vapor main or worse still is the risk of chemical attack when diluted chemicals become 100% concentrates when the coolant is evaporated.

The ideal coolant is condensate or liquids with no more than 11 ppm of dissolved solids. It is important that the coolant is de-aerated otherwise there is a risk of the oxygen in the coolant being released during the evaporation stage which can give rise to oxygen corrosion, particularly in carbon steel piping.

The VAD contains close fitting components and controlled tolerance passageways that can be affected by the ingress of foreign matter. The coolant should therefore contain no foreign particles. If there is any doubt about this it is recommended that a 30x30 mesh strainer be installed upstream of the coolant inlet. A 30x30 mesh contains 900 holes per square inch which will not allow particles larger than 0.025" to pass.

9. THERMAL LINERS

The fitting of thermal liners is not necessary with the VAD because of the shrouding of the coolant by the vapor as it enters the vapor stream.

10. STEAM TRAP

It is recommended that a stream trap be placed between the desuperheater and the temperature sensing point at least 2/3rds of the distance downstream. This will ensure that any unabsorbed coolant that has dropped out of suspension is removed from the vapor flow before it reaches the sensing point.

11. INSTALLATION

The protective discs that are fitted to each connection on the desuperheater for protection during shipping should be left in place until just before installation occurs.

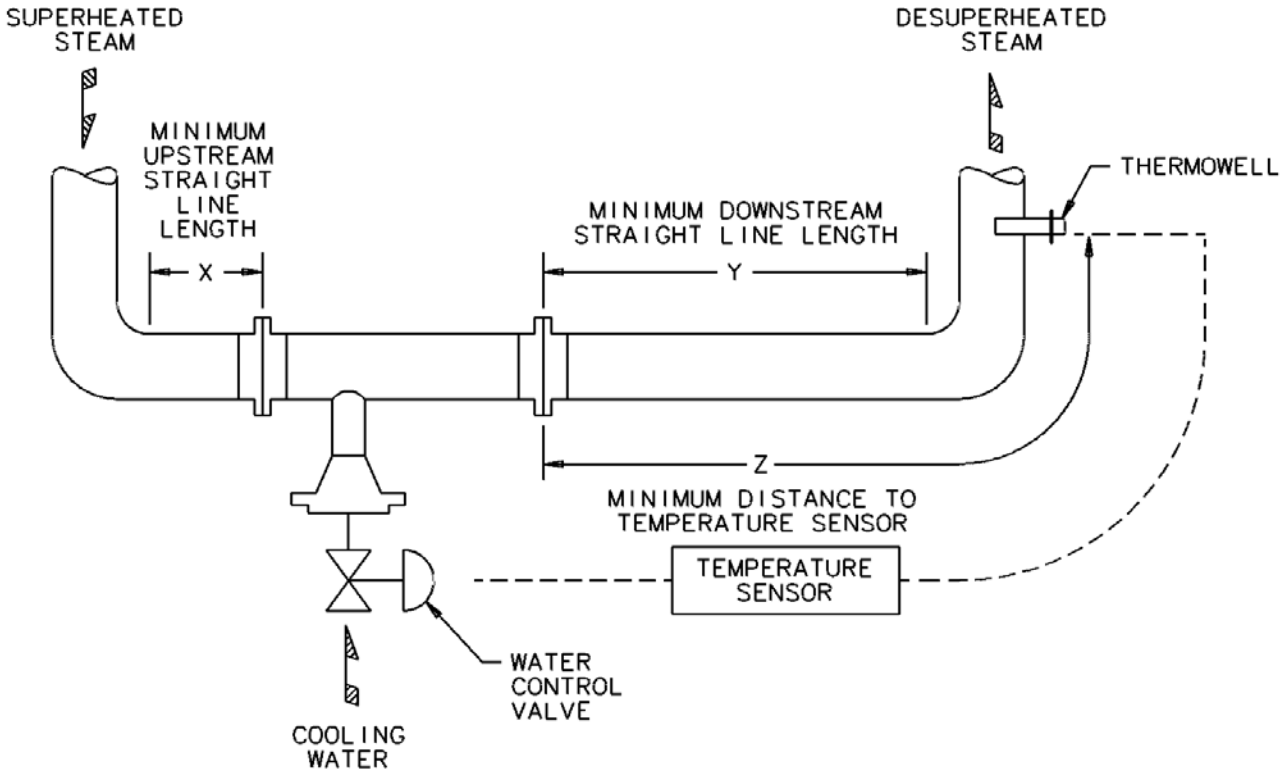
When installing the desuperheater good piping practice should be employed. Care should be taken that all flanges are square to each other to ensure that no pipe strain is imparted to the desuperheater unit and that this will not result in distortion when the unit comes up to temperature.

Ensure that the unit is installed with the spray head facing downstream with the vapor flow.

Before finally connecting the coolant piping make sure that this has been thoroughly cleaned and is free of any foreign matter.

It is recommended that the desuperheater is not installed until after the vapor lines have been flushed and chemically cleaned to avoid any damage to the nozzle head.

FIGURE 1



TYPICAL INSTALLATION

		UNIT SIZE													
		1.00	1.25	1.50	2.00	2.50	3	4	5	6	8	10	12	14	16
X	M Inch	0.2 8	0.2 8	0.2 8	0.3 12	0.4 16	0.4 16	0.5 20	0.7 28	0.8 32	1.0 39	1.2 47	1.5 59	1.8 71	2.0 78
Y	M Inch	3 118	3 118	3 118	3 118	3 118	4 158	4 158	4 158	4 158	5 197	5 197	5 197	5 197	5 197
Z	M inch	6 236	6 236	6 236	6 236	6 236	8 315	8 315	8 315	8 315	10 394	10 394	10 394	10 394	10 394

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APPENDIX 1

TYPICAL TECHNICAL DATA SHEET

COPES-VULCAN TECHNICAL DATA SHEET
VAD DESUPERHEATER

Customer Name	XXXXXXXXX	CV Inquiry	91-78086-16
Customer Inquiry		CV Job	9716-49658
Customer PO		CV Job Ref	
Ultimate User	Eunice Project	CV Serial #	
Tag	SP-712	Item	8
Application	LP Steam to E-851 (Gas Processing)	Quantity	10

Cond	Inlet						Outlet				Conditions @ Water Valve Inlet			
	Flow	Press	Temp	Enth	Vel	Sp Vol	Flow	Press	Temp	Enth	Flow	Press	Temp	Enth
	lb/hr	psig	deg F	btu/lbm	ft/min	ft3/lbm	lb/hr	psig	deg F	btu/lbm	lb/hr	psig	deg F	btu/lbm
1	4674	60	500	1282	11422	7.527	5131	57.9	325	1192	457	150	303	272.9
2	1674	55	400	1232	3896	7.168	1745	54.7	325	1193	71.1	150	298	267.7
3	5117	65	550	1306	12358	7.438	5760	62.5	325	1191	643	150	303	272.9
4														
5														

Design Pressure: 100 psig
Design Temperature: 600 deg F
Pipe Size and Schedule: 3" Sch 40

Cond	Coolant Press Reqd @ VAD	Water Valve
	psig	Prelim Cv
1	67.3	0.1
2	60.4	0
3	73.2	0.1
4		
5		

Description: 3" VAD
Pressure Class: ANSI 150
Body Material: ASTM A-106 GrB
Inlet Connection: 3" Flanged ANSI 150 Serrated RF
Outlet Connection: 3" Flanged ANSI 150 Serrated RF
Coolant Connection: .5" Flanged ANSI 150 Serrated RF
Maximum Steam Pressure Drop: 2.46 psi
Required Capacity: 5,117 lb/hr
Maximum Available Capacity (1/3 Sonic @ Annulus): 6244 lb/hr
Minimum Distance Required to Temp Sensor: 26 ft (8.0 m)
Length of Straight Upstream Pipe: 1.3 ft (.4 m)
Length of Straight Downstream Pipe: 13.2 ft (4.0 m)

Selection Mode: Manual

Comments:

Initials	Rev	Description	Date
JRS	0	INITIAL	Sep-21-1998

Program Rev Level: 4.2 (4.2.19)