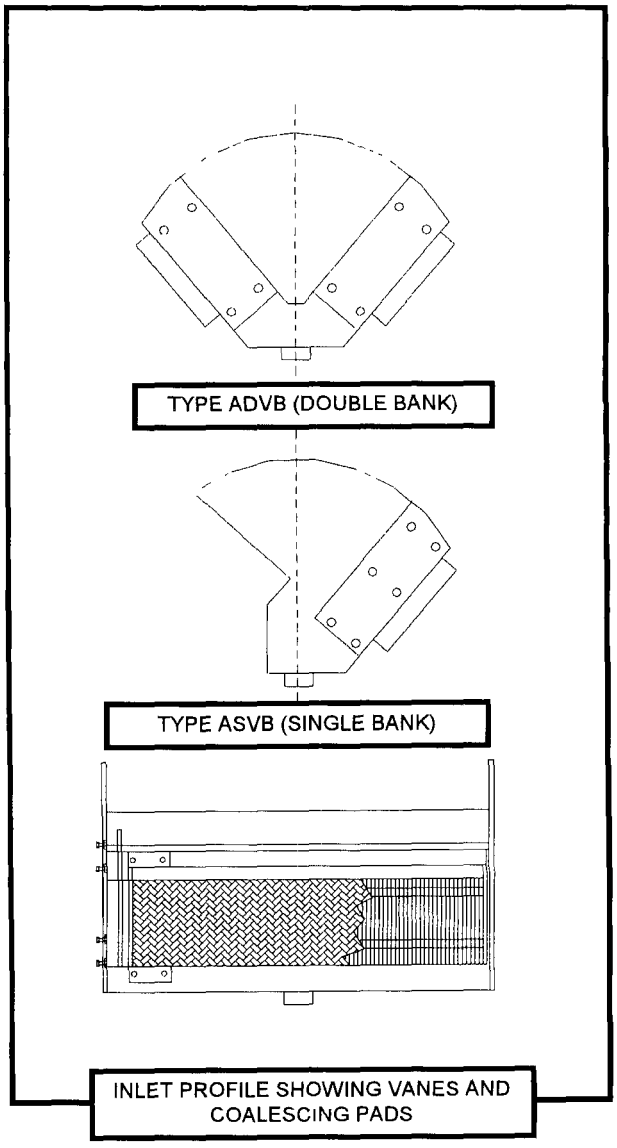
ANDERSON™

A Division Of The Clark•Reliance Corporation

AVB Series Steam Drum Vane Bank Purifiers

Section	A100
Bulletin	A100 90
Date	3/1/98
Supersedes	NEW

- Extremely Efficient Mechanical Separation of Entrained Liquids and Mists from Saturated Steam.
- 100% Removal of Liquid Particles 8.0 Microns and Larger. Guaranteed TDS performance.
- Low Pressure Drop.
- Superior Design.
- Rugged Construction/Long Life.
- Custom Designed per Application.
- Low Profile Construction
- Compact, economical innovation to replace existing bulky and expensive drum internal designs



Design Advantages.

The Anderson AVB Vane Bank Purifier has several advantages over other forms of internal separators for steam purification.

- The AVB can be sized for any percentage (100%-150% typical) over the maximum design flow rate.
- The AVB maintains full efficiency down to 0% of max design or operating flow.
- Anderson Vane Banks have a low pressure drops (3-4" w.c.), allowing for operation closer to the steam disengaging surface
- Anderson Pocket Vanes provide a more laminar flow with lower turbulence due to advanced flow profile design
- The AVB is easy to install, significantly reducing labor requirements as compared to multi-piece knockout cans and mesh designs.
- Anderson Vane Banks are smaller in size compared to other designs in similar applications This results in a smaller, more efficient and economical vessel design.
- Optional removable vanes allow for long life and easy maintenance

Typical Applications

Anderson Vane Bank Steam Purifiers are designed specifically for steam disengaging drums for power generation and process industries where clean dry steam is required. Typical applications include:

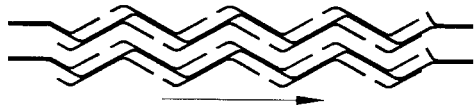
- Waste Heat Recovery Steam Drums
- Watertube Boilers (Sub-critical Drum-Type)
- Industrial Watertube Boilers (Package Type)
- Fire Tube Boilers
- Flash Steam Generators

- Protection of Steam Turbines from blade deposits, pitting, and surface fouling due to carryover from steam drum.
- Protection of Steam Turbines from corrosion cracking from concentrated dissolved impurities and chemicals.
- Protection of Trip and Throttle valves in Steam Turbine Control Systems from Freeze-up and Wear.
- Prevention of Solid Accumulations on Superheater Tube Surfaces.
- Increases Thermal Energy Transfer to Process Equipment Coils and Surfaces.

Principal of Operation

The success of the Anderson Separation Vane is rooted in simple physics principles of centrifugal force, impingement and gravity. The condensate laden steam entering the vane bank separator is a mixture of low density steam and high density water. As this mixture passes through the vane bundle, it is forced to change directions several times. The low density steam can easily negotiate this tortuous path, but because of momentum, the high density liquid is unable to change direction without impinging upon the vane wall.

At each change in direction, a centrifugal force is imparted on the steam/liquid mixture, which throws the water particles against the wetted vane walls. These water droplets coalesce into larger particles, absorb other droplets striking the vane, convert to sheet flow and travel towards the vane pockets Once the liquid enters the vane pockets, they are isolated from the steam flow, and drain by gravity back into the boiler drum.



Direction of Flow

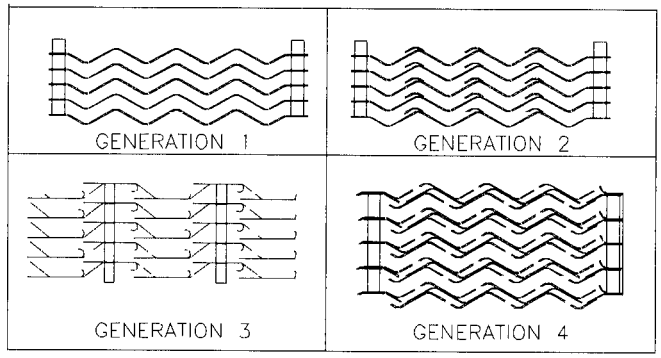
Efficiency

Anderson Vane Bank Separators will remove 100% of all liquid particles 8.0 microns and larger when operating between 0 and 110% design flowrate. When operating at the design flowrate, a separation efficiency of 100% of 5 0 microns and larger is achieved.

Separation efficiency decreases on droplets of decreasing size. In order to separate these smaller droplets, the vane bundle must be preceded by an inlet coalescer. The coalescer will increase the size of incoming liquid droplets so that they can be removed by the separation vanes. The Separation efficiency can be improved to 100% of 3 0 microns by the addition of this inlet mesh pad coalescer secured to modular support brackets mounted on the vane bundle face.

Vane Technology

All Anderson Vane Bundles use Current Generation 4 vane technology. This latest development in vane design is what allows a smaller, more efficient unit to perform at higher flowrates without a decrease in performance. The vane generations shown below detail the relative level of complexity and technology inherent in each design found in industry today.



Generation 1: This is the most basic of "Chevron" or "Hookless" style vanes designed decades ago. This design is still used by Anderson as an inlet separator coalescer to increase the efficiency of particle size removal in other separators. An exposed area 300% larger than Generation 4 is required to slow velocities down to acceptable limits of this basic design, with lower efficiencies of 99% of 10-20 microns typical.

Generation 2: This is the first innovation on the Chevron Design. The addition to hooks on the vane face increases the water removal capacity and allows for a smaller area for equivalent flows. The required area of this style is approximately 175% more than the Generation 4 design.

Generation 3 This style has high capacities of water removal and a corresponding higher pressure drop across the element due to the tortuous path and number of hooks utilized. The pressure drop across this vane design is higher than the Generation 1 or Generation 2 as a tradeoff for higher efficiencies.

Performance

Anderson AVB Type Vane Bank Steam Purifiers provide clean, dry steam under the most demanding applications. The resultant steam from the Steam Drum can be sampled and expected TDS quality can be expressed as found in the below table.

DRUM PRESSURE (PSIG)	ABMA REC. BFW LIMITS TDS (PPM)	MAX TDS AVB TYPE (PPM)	MAX TDS AVB-M TYPE (COALESCER) (PPM)
0-300	3500	1.75	0.35
301-450	3000	1.50	0.30
451-600	2500	1.25	0.25
601-750	1000	0.50	0.10
751-900	750	0.375	0.08
901-1000	625	0.31	0.06
1001-1800	100	0.05	0.01
1801-2350	50	0.03	0.005

BOILER FEEDWATER TDS LIMITS COURTESY OF BOILER WATER LIMITS AND ACHIEVABLE STEAM PURITY FOR WATERTUBE BOILERS, ABMA C.1995, TABLE 1

Standard Configuration and Options

The Anderson AVB Vane Bank Steam Purifier Series are custom designed per each application. The operating pressure, flow rate, diameter of the drum, liquid levels, number and size of the outlets, and other design parameters determine the final configuration for each drum. There are, however, some general design criteria that the engineer may want to specify, depending on the desired level of value add to the end user of the drum.

Construction: The basic construction is all carbon steel boxing and vanes, fully welded together ready for installation and seal welding into the drum. This is the most economical type available. Anderson engineers can supply the unit match marked and tack welded ready for field construction through a manway of user specified diameter, so the drum fabricators can proceed with production unhindered. This method is also preferred for drum re-habilitation of existing equipment. The vane bundle, (less the mesh coalescer options) can undergo PWHT within the drum.

Materials: Standard construction of the boxing and vanes is carbon steel The material for either component can be upgraded to stainless steel upon request to minimize corrosion effects. The vane material is often upgraded to 316L SS due to the corrosive effects of the steam and to prevent plugging and fouling of the vanes when high boiler feed water TDS values are expected. This upgrade prolongs the high efficiency of the unit and reduces maintenance requirements.

Vanes Standard AVB construction utilizes fixed (non-removable) vanes in a sealed boxing design. Many customers specify removable vanes to allow for inspection, replacement, or cleaning deposit removal via passivation during the yearly inspection and shut-down cycles The Vane Bank with the removable vane option is designed with vane access doors to allow for easy removal of the vanes. This option provides the greatest flexibility for drum designs and is a preferred configuration for many maintenance engineers in the power and process industries.

Mesh Coalescers: The mesh coalescer option is specified to obtain the maximum steam quality possible The mesh pads are mounted into frames that bolt onto the vane face. This design avoids the use of in order to provide maximum durability and ease of maintenance. The 304 SS mesh pads require periodic maintenance and replacement, making the frame modules our most appreciated standard design innovation

Application Data Sheet

Due to the complexity and number of options available on this type of purifier, factory engineering is required. These applications, depending on the quantity and information required, can usually be sized within 48 hours. The blank form below is provided for ease of reproduction for each application required. Please fill in all information requested so the Anderson Engineering department can quickly process the information accurately.

FAX TO: 440-238-8828 **ATTN:** ANDERSON APPLICATION ENGINEERING

Company _____ Date _____

Address _____ Ref _____

Contact _____ Phone _____ Fax _____

Steam Data: (circle one) SATURATED / SUPERHEATED Operating Temperature _____

Operating Flow _____ Operating Pressure _____

Steam Drum Design Data:

Boiler Feed Water TDS _____

Design Pressure _____ Design Temperature _____ MDMT _____

Corrosion Allowance _____ Material of Construction _____

Steam Outlet (Size/ANSI Class) _____ Number of Outlets _____

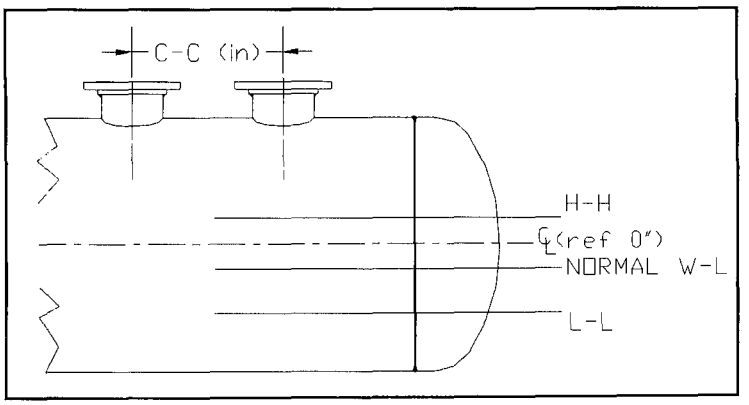
C-C (if more than 1 outlet) _____

Drum Diameter _____

Normal Water Level (inches ABOVE (+) or BELOW (-) CL of Drum) _____

H-H High Water Level (inches above Normal) _____

L-L Low Water Level (inches below Normal) _____



Construction Options (circle one)

Boxing Material (Carbon Steel Std / _____)

Vane Material (Carbon Steel Std / 316 L SS)

Vane Configuration (Fixed Std / Removable)

Boxing Configuration (Fixed Std / Tack Welded- Match Marked)

304 SS Mesh Pad Coalescer (YES / NO)

Type (Single Bank / Double Bank / No Preference)

Manway ID (for installation through) _____

Performance Data:

Required TDS in Outlet Steam (Max) _____

Desired Efficiency 100 % of 8 / 3 Microns Max Allowable Pressure Drop _____

ANDERSON™ SEPARATOR COMPANY

A Division Of The Clark•Reliance Corporation

ASME CODE STAMPS U UM R

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