TURBOSEP™

- Highly efficient separation of liquid aerosol and foam from fermentation off-gas
- Protects off-gas filters for extended life
- Increases fermenter capacity by up to 30%
- Improves downstream processing efficiency through reduced antifoam consumption
- Continuous operation of the fermenter throughout the foaming process*
- PED and ASME Code Certification available

**When used with differential pressure monitoring and antifoam injection system*

TURBOSEP™ is a static separation device used in industrial fermentation processes to separate liquid aerosols and foam from fermenter off-gas.

This highly efficient mechanical separator has no moving parts and very low pressure drop. Foam, aerosol and entrained liquids that are removed from the off-gas are returned to the fermenter, therefore minimizing product loss and protecting final sterilising filters.

TURBOSEP™ is used to control problems caused by foaming and improve the overall efficiency of the fermentation process. It can be used in any fermentation application where the creation of foam is causing process control problems. This includes:

- Food and feed additives (e.g. lysine, MSG)
- Enzymes (e.g. proteases, carbohydrases)
- Organic chemicals
- Healthcare products

Operation
Fermenter off-gas is directed through static, angled vanes that cause it to spin. The air is directed across a specially designed impinger plate where separation begins. Axial velocities force separated liquid and foam to the outer wall where they coalesce and drain back to the fermenter. The separated gas spirals down exiting TURBOSEP™ via the inside of the central vortex finder.

Design

Each TURBOSEP™ is designed specifically for the application to ensure maximum effectiveness in operation and to overcome critical issues with respect to installation.

Sizing is based upon completion of a questionnaire. The table below gives an indication of the product range based on typical actual gas flows through the fermenter.

Typical Process Flow Rate		TURBOSEP™ Code	Typical Connection Size and Type	Typical Assembled Height (mm)
Al/min	Acfm			
1,000	35	ZVT-1K	1.5¨ Tri-Clamp®	700
2,000	70	ZVT-2K	2¨ Tri-Clamp®	850
3,000	105	ZVT-3K	2.5¨ Tri-Clamp®	1,000
5,000	176	ZVT-5K	3¨ ANSI 150	2,150
10,000	353	ZVT-10K	4¨ ANSI 150	2,150
20,000	706	ZVT-20K	6¨ ANSI 150	2,650
40,000	1,412	ZVT-40K	8¨ ANSI 150	3,150
60,000	2,118	ZVT-60K	10¨ ANSI 150	3,650
90,000	3,178	ZVT-90K	12¨ ANSI 150	5,000
120,000	4,237	ZVT-120K	16¨ ANSI 150	5,150

Other connection types are available. Tri-Clamp® is a trade mark of Alfa Laval, Inc. All Tri-Clamp® connections conform to BS4825 Pt. 3

Technical Data

Materials (wetted surfaces):	304L or 316L Stainless Steel
Gasket Materials:	EPDM
Closure:	Bolted Flange
Design Codes:	EN13445 or ASME VIII Div. 1
Design Pressure:	FV to 3.5 Barg (-14 to 50.8 psig)
Design Temperature:	150°C (302°F)
Minimum Installation Height:	1 meter above fermenter

Standard Surface Finish (ZVT-1k to 3k)

Surface Finish (internal):	Mechanical Polish <0.8µm Ra
Surfaces Finish (external):	Mechanical Polish

Standard Surface Finish (ZVT-5k to ZVT-120k)

Surface Finish (internal):	Pickled and passivated (all accessible welds dressed smooth)
Surfaces Finish (external):	Shot peened

Validated Cleaning via Spray Ball

TURBOSEP™ should be treated as part of the fermenter and therefore be incorporated into the vessel clean in place (CIP) or steam in place (SIP) regime, to remove any separated debris.

Larger TURBOSEP™ units (from ZVT-5K) have spray balls installed with a 360° cleaning pattern. Smaller units can be cleaned by filling the unit with CIP solution and purging with air from the sparger.

Certification

- Manufacturer's test report.
- Declaration of conformity.
- Further documentation is available at an extra cost, to be requested at time of order.

All manufacturing is performed in accordance with local legislation and directives:

- Europe: Pressure Equipment Directive (PED) 2014/68/EU
- USA: ASME certification stamp and national board registration

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