PENNWALT

High-G Tubular Bowl SUPER CENTRIFUGE

Super Centrifuge

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How the Super Centrifuge operates

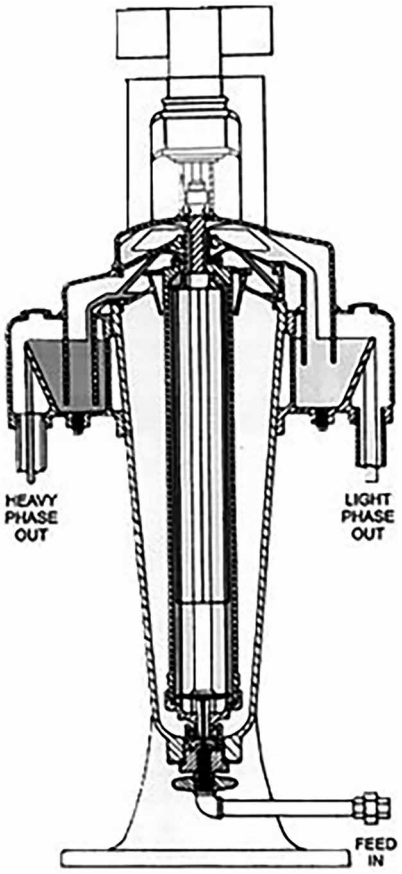
This sectional view of a Super-Centrifuge shows the application of centrifugal force to a mixture of two immiscible liquids containing some suspended solids.

The mixture continuously enters the Super-Centrifuge through an inlet feed nozzle at the base of the machine, into the hollow cylindrical rotor. Rotors have been designed and engineered to rotate at upto 17000 r.p.m. (max.) and generate centrifugal force of upto 20000 times the force of gravity (max.).

This force separates the two liquids according to their specific gravities into concentric cylindrical layers, and the solids are deposited inside the rotating bowl against the rotor wall. Such a rotor, which is designed to separate two immiscible liquids and to remove the suspended solids simultaneously is known as a “separator”.

The separated liquids are continuously displaced upwards by the incoming mixture and continuously discharged through their respective outlet ports at the top of the rotor. The layer of accumulated solids that builds up on the inner diameter of the rotor wall is cleaned out batchwise for which the super-centrifuge is shut down when it is filled up to the rotating bowl’s limiting solids holding capacity and the rotating bowl is removed for cleaning.

There are, however, many applications where only the removal of suspended solids from a single liquid is required. Super centrifuges for such applications are called “Clarifiers” and are often provided with only one set of discharge ports. Mylar Liners are optionally supplied and can be placed on the inner diameter of the bowl for ease of removal of insoluble solids deposited on the inner diameter of the bowl



General applications

The fields of application of the Super-Centrifuge are almost unlimited. The number of processes which involve a liquid/liquid, liquid/liquid/solid, or liquid/solid separational steps are too numerous to be described here. A few of the better known ones are mentioned briefly below:

General applications here include:

Clarification of

- Dry Cleaner's Spirit
- Animal Fats
- Water Gas Tar
- Fish Oils
- Ball Pen Ink
- Wool Grease
- Printing Ink, etc.
- Clarification of caustic in Rayon Industry (Steep press liquor)
- Caustic Soda solution
- Gums
- Blood fractions

Food Manufacture

- Cider and wine clarification
- Soup clarification
- Fat clarification
- Fruit juice clarification
- Cocoa butter clarification
- Chocolate scrap recovery
- Chewing Gum
- Cherry Syrup

Bio-Diesel Production

- Diesel/Water Separation
- Diesel/Glycerine Separation
- Diesel/Alkaline water-Methanol-Glycerine Separation

Super Centrifuge for Pharmaceutical & Bio-Technology Applications

Many hazards with industrial bio-processing with real or perceived risks such as highly pathogenic bacteria, viruses, etc. need to be processed using Model AS-16 and AS-26 high-G Tubular Bowl Super Centrifuges which are built with Sanitary Design Features for separation of Biological material, and are featured for Biotechnology application requiring BL-1-LS containment of biohazards. The super centrifuges can be also featured for BL-2-LS containment of biohazards, if necessary.

To ensure safe processing, a risk assessment, corresponding bio-hazard containment and bio-safety issues must be examined by bio-process engineers of the end-use customer. The super centrifuges are featured and designed with the relevant appropriate bio-hazard containment for Sterilisation-in-Place which should be validated by the end-user's bio-process engineers and operators.

The applications in the Pharmaceutical & Bio-Technology Industries are as follows:

- High Value Pharmaceutical Products Recovery with BL-1-LS Containment Level such as during Separation of E-Coli Whole Cells & E-Coli Lysed Cells in conformance with cGMP Standards.
- Vaccine membrane fragment classification.
- Vaccine Conjugated Protein Separation.
- Fractionation of Human Blood Plasma Into Its Protein Fractions Viz: Fibrinogen, Gamma Globulin, Immunoglobulin, Thrombin, Albumin on the basis of Dr. Cohn's Procedure Variations.
- Virus Particles Separation (0.06µ)
- Harvesting Biomass
- Mammalian Cell Debris Separation
- Clarifying Process Liquids
- Cryoprecipitate Separation
- Animal Blood Processing
- Yeast Cell Debris
- Stroma (cell wall fragment)
- rDNA Injectables
- Protein precipitate (PEG/NH4SO4) Separation
- Bio-remediation processes
- Interlukin IV
- Polishing of Solutions containing fines

SKID MOUNTED AS 26 VBNF CLARIFIER CENTRIFUGE
This configuration is also available in Model AS16 VBNF

Features of Supercentrifuge for Bio-Pharma Applications:

- Jacketted Barrel of Sanitary/Hygienic Design for cooling purpose.
- Complies with cGMP standards.
- All stainless steel wetted parts are electro-polished to Ra < 0.5 microns.
- Inbuilt centripetal pump is provided for foam and aerosol control.
- Variable speed Drive achieves operations between 7500 x G to 17000 x G or 20000 x G depending upon the model of Super Centrifuges.
- Sterlization-in-place (SIP) feature is provided with special vaportite covers designed to accept clean saturated steam at 1.0 barG and 121°C, and would be/should be provided with a safety Rupture Disc, in the bowl drain outlet pipe-work.
- Clean-in-Place (CIP) feature is provided.
- A dedicated Control Panel is provided with status indicating illuminators, ON-OFF Push Buttons, and Auto-Manual Sequence Control of CIP and SIP operations.
- The Barrel, Pedestal and Drive plate can also be optionally made of stainless steel, based on application specific customer requirements.
- Rotating Barrel option on Model AS-26 is available

Super Centrifuge for Human Blood Plasma Fractionation

Both the Model AS16 Super-centrifuge and Model AS26 Super-centrifuge are available with electro-polished Vaportite / Vapourseal covers which are ideally suited for fractionation of Blood Plasma based on variations of Cohn's Process wherein the slightest contamination means the loss of a complete batch. Furthermore, the three piece frame comprising the pedestal, barrel and swivel head is painted in white to a pharmaceutical finish. Furthermore, all the stainless steel process contact parts such as the rotating bowl in Stainless Steel or equivalent material, the stainless steel covers and certain stainless steel drag components are polished to high sanitary standards to ensure functionally satisfactory performance.

In addition, the barrel is preferably jacketted for cooling media circulation and the pulley assembly is fitted with grease packed bearings to ensure a clean, reliable and effective performance. Flame Proof Electrical Drive Motor and Flame Proof Start-Stop Push Button station can be provided for safety during operation. Features can also be provided for Inert (N2) Gas purging wherever required for safety.

General specifications

Model	Laboratory Super Centrifuge	AS12	AS16	AS26
Bowl Speed, rpm Operational/max	23000 / 25500	15000 / 17000	15000 / 17000	115000 / 17000
Centrifugal Force Operational/max	13150 G / 16200 G	13200 G / 17000 G	13200 G / 17000 G	156000 G / 20000 G
Total Bowl Capacity Liters	0.3	3.1	6	9
Bowl Dirt Capacity Liters	0.2	2	3.5	5.25
Bowl Weight Kg (Empty)	1.38	11	17	25
Motor, KW	0.19	1.1	2.2	3.7

Note: The laboratory Supercentrifuge has been further developed with a Turbine drive for rotation upto a maximum speed of 38000 rpm.

Compliances

1. Pennwalt Ltd manufactures CE-compliant High-G Tubular Bowl Super centrifuge Models AS-26, AS-16, and AS-12 adequately covering the requirements under the provisions of:
   - EC-Machinery Directive (98/37/EC)
   - EC-Low voltage Directive (2006/95/EC)
   - EC-Electromagnetic compatibility Directive (2004/108/EE)

2. Pennwalt Ltd. Has been approved by Llyod's Register Quality Assurance to the ISO 9001:2008 Quality Management System Standard.

Pennwalt Ltd. is a fast growing business conglomerate with a strong presence in the Indian and International market. With a determination to move up the value chain in process, products and performance, Pennwalt has always been acknowledged for its excellence.

Our Chairman, Mr. S.D.Kashyap joined Sharples Process Engineers (P) Ltd., thereafter known as Pennwalt India Ltd, as a Production Engineer in the year 1960. Thereafter within a short span of 8-years, Mr. S.D.Kashyap took over as the Managing Director of Pennwalt India Ltd. In the year 1968. The company was turned public limited in the year 1970.

Pennwalt Ltd., was incorporated in India in 1959 with the share-holding of the erstwhile Sharples Corporation, USA and thereafter entered into technical collaboration with the erstwhile Sharples-stokes Division of Pennwalt Corporation, USA for manuacture of world class Separations Equipment to the highest standards of international perfectionism.

Thus Pennwalt Ltd. has a strong technological base and wide-ranging expertise in the manu-facture, installation, commissioning, applications engineering and supply of solid-liquid, liquid-liquid, and particle size separations equipment tailored precisely to match customer-specific requirements on a worldwide basis.

Distributed by:

EMDACO BVBA
Kerkstraat 9
9250 Waasmunster - BELGIUM
Tel. +32 (0)52 34 35 33
Fax +32 (0)52 34 35 44
info@emdaco.be
www.emdaco.be

www.pennwalt.com
Please check for your local contact