

LABTEX™

The UK's Laboratory Equipment Experts

Pope Scientific Nutsche Filter Dryers

Pope Nutsche Filter-Dryers are known and used world-wide for critical high purity separations of liquids and solids. Products include pharmaceuticals, bio-materials, electronics grade materials, fine speciality chemicals, and many others.

Pope Nutsches are designed for this separation, a critical operation because it is often the final step in an entire manufacturing process, prior to packaging.

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Pope Scientific Nutsche Filter Dryers

In most applications, the solids are the product, often being highly pure crystals from reaction and precipitation, suspended in a solvent slurry. After liquid from the slurry passes through the filter, the solids may be further dried and then harvested.

In other less common applications, the filtered liquid discharge is the valued product, with the solids being removed and remaining in the Nutsche filter. Pope's designs accommodate both operations.

These units provide capabilities for solids filtering, washing, reslurrying and drying in a single vessel, reducing process time and personnel and environmental exposure. Pressure capability facilitates filtering rate and vacuum capability allows control of filter cake drying rate which can be additionally aided by heat and cake agitation.

Bench Top Nutsche Filter Dryers

Pope's smaller lab scale Nutsche units provide chemists and researchers with a very powerful tool for testing, piloting and small scale processing. They are also ideal for pilot work in simulation of larger production scale Nutsche filters and are a logical leap forward from common Buchner funnel apparatus.

Features include

- Pressurisation and/or vacuum draining for faster filtering
- Vessel vacuum and heating capability for efficient drying of filter cake
- Built-in spray heads for filter cake washing
- Complete material containment for increased safety and purity plus gas blanketing capability
- Optional mixers or cake agitators for greater drying efficiency of filter cake



Standard Benchtop Nutsches are available in 6" diameter, with choice of 3, 4 or 5 litre volumes.

ASME stamped, (other certifications available), and fitted with useful components including valves, sight glasses, pressure relief, spray assembly and pressure/vacuum gauge, the user can select optional jacketing or electric heating and choices of either motorized mixer or up/down cake agitator in manual or motorized versions.

Custom Benchtop Nutsches are also offered in sizes as small as 3" diameter, volumes as small as 0.2 litres. Larger Benchtop Nutsche Filters are also available, although these 8" and larger diameter units are more commonly designed as floor standing pilot systems due to weight considerations.



Pilot Plant and Custom Manufactured Nutsche Filter Dryers

Larger Nutsches are available in volumes up to 1000 litres. 55 gallon, 24" with non-removable top head, jacket, 800 mixer.

“Standard” type units are offered providing similar features as the Pope Benchtop series, but in addition, several design choices plus a very broad range of unique customization are available. 316L stainless steel construction is standard with other alloys, coatings and special finishes available.

ASME certification is standard, CE/PED and others also available. Customer’s applications, process requirements and preferences are many and varied. Labtex, backed by Pope’s Nutsche applications specialists are on hand to assist clients with specification and design of optimized equipment. The starting point for this is our Nutsche Application Questionnaire.

Sizing of units depends on the total slurry volume, the quantity of expected filter cake to be collected and other issues; Pope’s Cake Depth – Volume Chart is utilized in this determination.



30 Litre Nutsche



100 Litre Nutsche



170 Litre SS 3 Piece Nutsche Filter



170 Litre SS 3 Piece Nutsche Filter With Lift



250 Litre Nutsche Top Angle



250 Litre Nutsche With Lift

Technical Information

Vessel flanges

Sanitary clamp type flanges can be utilized up to 12" diameter vessels. The lower flange is a special variation which allows for holding and sealing a variety of filter screens and fabrics.

Upper removable lids and flanges are available also. Beyond 12" diameters, heavy duty flanges and C-clamps are utilized.

Geometry

The most basic vessel geometry is a single lower flange only. With this design, the entire body is raised up, or the bottom end is lowered from the body to harvest the filter cake. Another option is to also have a removable top head. This provides the user with two means of access and harvesting, removing either the top or the bottom head, or both. Some users prefer to have an additional flange for vessel break-apart a short distance or midway up from the bottom filter flange. This provides for containing of the filter cake when the upper section of the vessel is removed, and convenient cake harvesting without spillage.

There are other variations including "removable basket" design. See photos for examples.

Support

Nutsche vessels normally come with legs with locking castors. Depending on geometry, (see above) the number and location of legs may vary.

With vessels larger than 8" diameter, the vessel sections can become heavy and inconvenient for manual movement and lifts are typically provided for safe raising/lowering and movement across rooms. Variations can include self-contained lifts, platforms, and specialized frame for manual or automated rotation of vessel. See photos for examples.

Agitation

In many cases, though not all, some means of agitation is required or preferred. Pope's Series 700, 800 or 900 mixers are offered for conventional type stirring of slurry before or during filtration or after reslurrying. Raising/Lowering cake churning and smoothing agitators are also offered. These provide greater efficiency in braking up clumps and shortening drying time.

Heating

Vessel jacket heating is offered to help in drying the filter cake. Heated dry air or nitrogen can also be admitted at a fixed rate. These, in conjunction with vacuum and cake agitators optimize drying efficiency. Electric heaters are available as an alternative to liquid jackets.

Filters

Multi layers stainless steel filter screens are available from 1 to 200 micron pore size. 50 micron filter are "standard", covering a wide range of applications. In addition, polypropylene cloth and other special type membrane filters can be used. Pope's designs provide customers with a choice and the option of changing from one type to another without any further nutsche unit modification.

Other Features

Many options are offered including sight glasses, valving, pressure and temperature indication/control, other sensors, sampling ports, spray head, and side discharge harvesting ports.

Special skid mounted systems combining liquid and vacuum pumps, reactors, control systems and other turnkey features are also available.

Nutsche filter-dryer cake depth in inches per volume and vessel diameter

Cake Volume				Vessel Diameter, Inches											
Litres	Gallons	cu ft	cu in	2	3	4	6	8	9	10	12	14	18	24	30
0.01	0.00	0.000	0.6	0.19	0.09	0.05	0.02	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00
0.1	0.03	0.004	6.1	1.94	0.86	0.49	0.22	0.12	0.10	0.08	0.05	0.04	0.02	0.01	0.01
0.5	0.13	0.018	30.5	9.71	4.32	2.43	1.08	0.61	0.48	0.39	0.27	0.20	0.12	0.07	0.04
1	0.26	0.035	61.0	19.42	8.63	4.86	2.16	1.21	0.96	0.78	0.54	0.40	0.24	0.13	0.09
2	0.53	0.071	122.0	38.84	17.26	9.71	4.32	2.43	1.92	1.55	1.08	0.79	0.48	0.27	0.17
3	0.79	0.106	183.1	58.26	25.89	14.57	6.47	3.64	2.88	2.33	1.62	1.19	0.72	0.40	0.26
4	1.06	0.141	244.1	77.68	34.53	19.42	8.63	4.86	3.84	3.11	2.16	1.59	0.96	0.54	0.35
6	1.59	0.212	366.1	116.52	51.79	29.13	12.95	7.28	5.75	4.66	3.24	2.38	1.44	0.81	0.52
8	2.11	0.282	488.2	155.37	69.05	38.84	17.26	9.71	7.67	6.21	4.32	3.17	1.92	1.08	0.69
10	2.64	0.353	610.2	194.21	86.31	48.55	21.58	12.14	9.59	7.77	5.39	3.96	2.40	1.35	0.86
12	3.17	0.424	732.2	233.05	103.58	58.26	25.89	14.57	11.51	9.32	6.47	4.76	2.88	1.62	1.04
15	3.96	0.530	915.3	291.31	129.47	72.83	32.37	18.21	14.39	11.65	8.09	5.95	3.60	2.02	1.29
20	5.28	0.706	1220.4	388.42	172.63	97.10	43.16	24.28	19.18	15.54	10.79	7.93	4.80	2.70	1.73
25	6.61	0.883	1525.5	485.52	215.79	121.38	53.95	30.34	23.98	19.42	13.49	9.91	5.99	3.37	2.19
30	7.93	1.059	1830.6	582.62	258.94	145.66	64.74	36.41	28.77	23.30	16.18	11.89	7.19	4.05	2.59
35	9.25	1.236	2135.7	679.73	302.10	169.93	75.53	42.48	33.57	27.19	18.88	13.87	8.39	4.72	3.02
40	10.57	1.412	2440.8	776.83	345.26	194.21	86.31	48.55	38.36	31.07	21.58	15.85	9.59	5.39	3.45

Filter Area	in ²	3.1	7.1	12.6	28.3	50.3	63.6	78.6	113.1	154.0	254.5	452.4	707.0
	ft ²	0.02	0.05	0.09	0.20	0.35	0.44	0.55	0.79	1.07	1.77	3.14	4.91
	cm ²	20.3	45.6	81.1	182.4	324.3	410.5	506.8	729.8	993.3	1641.9	2919.0	4561.0
	m ²	0.002	0.005	0.008	0.018	0.032	0.041	0.051	0.073	0.099	0.164	0.292	0.456



Application Questionnaire

APPLICATIONS QUESTIONNAIRE FOR POPE NUTSCHE FILTER-DRYER

Date:	
First Name:	Last Name:
Position:	Company:
Address:	
	Postcode:
Phone:	Email:
Website:	

INTENDED USE (CHECK ALL THAT APPLY)

<input type="checkbox"/>	Collect solids/crystals as product	<input type="checkbox"/>	Re-slurry and mix
<input type="checkbox"/>	Collect filtered liquid as product	<input type="checkbox"/>	React
<input type="checkbox"/>	Dry filter cake a little bit	<input type="checkbox"/>	Heat with vessel jacket
<input type="checkbox"/>	Dry filter cake to maximum dryness	<input type="checkbox"/>	Cool with vessel jacket
<input type="checkbox"/>	Wash filter cake	<input type="checkbox"/>	Utilize vacuum for liquid removal and drying
<input type="checkbox"/>	Mix/Stir (see Mixing section, below)	<input type="checkbox"/>	Utilize pressure for liquid removal
<input type="checkbox"/>	Model a larger production nutsche	<input type="checkbox"/>	Other

Batch Quantities:

Typical volume range of slurry to be processed per operation:

Minimum: _____ Maximum: _____ Check One: _____ Gallons: _____ Litres: _____

Ok to add portions of slurry batch after partial liquid removal? Yes: _____ No: _____

Expected weight range of resulting filter cake:

Minimum: _____ Maximum: _____ Check One: _____ Lbs: _____ KG: _____

Expected weight range of resulting filter cake:

Minimum: _____ Maximum: _____ Check One: _____ Gallons: _____ Litres: _____

(Note: If only approximate weight/weight% of solids/slurry is known, try to determine or estimate filter cake density to obtain approximate volume.)

Materials:

Materials of construction requested/accepted:

Metals:

_____ 304-L S.S _____ 316-L S.S _____ Hastelloy _____ Don't Know
_____ Other (Please Specify)

Elastomers:

_____ Viton (Pope default for o-rings) _____ Telfon envelope (Pope default for gaskets)
_____ EPDM _____ Kalrez _____ Other (Please Specify)
_____ Don't Know

Filter Discs:

_____ Polypropylene _____ 316 S.S _____ Other (Please Specify)
_____ Don't Know



Materials, (Continued):

Materials to be processed:

(Note: Pope Scientific Inc takes clients confidentiality very seriously in all cases, but if a confidentiality agreement is required, please send your company's version for us to review or request a copy of Pope's version. The purpose of below is for Pope to better understand the nature of processing and verification/selection of materials of construction for proper design and quoting equipment. If a client chooses to not reveal details of specific molecular structures, attempt should be made at minimum elastomers such as acids, bases and strong solvents, etc).

Description/Listing of materials to be processed, including solvents: _____

Pore size of filter media required:

(Available from 0.1 to 200 micron. Pope default is 40 micron. Other sizes may be quoted as substitution or spares.)

_____ Microns, installed filter _____ Microns, spare filters _____ Quantity

Operating Range:

_____ Pressure psi maximum

(All Pope Nutsches are ASME rated to full vacuum, with pressure rating typically 50 psig as default.)

____/____ Temperature °C (min/max)

(Default ASME temperature range: - 20 to 150)



Vessel Type and Filter Cake Harvesting:

Pope Nutsches are available in different styles. Select from the list below (please consult Pope directly for more details).

- _____ Bottom filter flange only.
- _____ Bottom filter flange plus upper head removal flange.
- _____ Extra flange in the middle of shell (contains cake during scooping for harvesting).
- _____ "Basket" style filter cake can be lifted out of nutsche intact within metal holding basket.
- _____ Side discharge through special side port. (Requires cake solids type agitator, see below, consult Pope regarding containment type and related details).

Body Flange Type: Flanges indicated above can be sanitary "tri-clamp" type for economical design in diameters up to 12". Heavy duty flanges with multiple removable C-Clamps also available. Please select below.

- _____ Tri-Clamp style (12" diameter maximum).
- _____ Heavy flange style.
- _____ Not sure.

Internal Finish:

(White pickle passivated mill finish inside and outside is standard.)

- _____ Electropolished inside and outside, (with or without mechanical grit finish.)
- _____ 180 grit.
- _____ 240 grit.
- _____ 320 grit.
- _____ Other, and/or optional external finish, please specify.
- _____ None.

Support:

- _____ Legs without wheels _____ Legs with wheels.
- _____ Special (rotating support stand, etc) Please specify.

Lifts: Where appropriate. Pope will include in a quotation, a lifting device for removal of bottom and/or upper heads.

- _____ Please include lift _____ Don't include lift _____ Not sure



Functions and Accessories:

- _____ Pressure and/or vacuum gauge, mechanical dial type (Pope default).
- _____ Pressure relief valve (Pope default).
- _____ Pressure relief rupture disc.
- _____ Pressure transmitter with digital display.
- _____ Temperature gauge, mechanical dial type.
- _____ Temperature sensor, (thermocouple, RTD, etc).
- _____ Temperature transmitter with digital display.
- _____ Include vales for bottom drain, pressure/vacuum, vent (Pope default).
- _____ Include extra vales for (describe) _____
- _____ Spray head for filter cake washing and/or CIP procedure.
- _____ Top mounted, removable sightglass/slurry addition port (Pope default).
- _____ Light (typically mounted in additional small sightglass).
- _____ Others, please describe. _____
- _____ Special control, please describe _____
- _____ Include heating and/or cooling systems (please describe) _____
- _____ Side port for manual cake sampling only.
- _____ Mixer/agitator (see below.)

Mixing and Agitating:

Pope offers two main types of mixers: 1) Conventional type of stirring prior to filtering, for washing and reslurrying etc. where liquid is still present. 2) Cake agitators with up/down movement and full diameter digging/smoothing blades. (These type of mixers/agitators cannot be mounted and used simultaneously.)

- _____ Conventional liquid stirrer with variable speed electric motor and controller. 0-500 RPM, offset mounting for optimal mixing and solids suspension without baffles. (Pope will provide design appropriate for size and duty). Specify special requirements/alternatives if any: _____
- _____ Cake solids agitator with variable speed electric motor and speed controller. 0-50 RPM, center mounting, full diameter angled blade impeller for digging and churning cake solids in one direction, smoothing cake in opposite direction. Manual raising/lowering action. If side discharge solids harvesting is requested in conjunction with cake solids agitator, please describe special requirements if any: _____
- _____ Cake solid agitator with manual rotation and manual raising/lowering action. (Benchtop Nutsche series only).
- _____ None.

Please include any other pertinent information: _____



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