

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.

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.





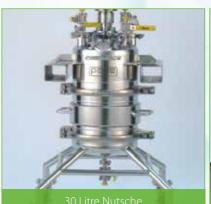
Pilot Plant and Custom Manufactured Nutsche Filter Dryers

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

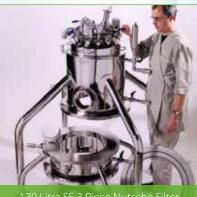
"Standard" type units are offered providing similar features as the Pope Benchtop series, but in addition, several design choices plus a very broad range of unique customization are available. 316L stainless steel construction is standard with other alloys, coatings and special finishes available.

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.













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.

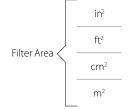
Other Features

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



3.1	7.1	12.6	28.3	50.3	63.6	78.6	113.1	154.0	254.5	452.4	707.0
0.02	0.05	0.09	0.20	0.35	0.44	0.55	0.79	1.07	1.77	3.14	4.91
20.3	45.6	81.1	182.4	324.3	410.5	506.8	729.8	993.3	1641.9	2919.0	4561.0
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 Na	me:	Last Name:					
Position	:	Company:					
Address	:						
		Postcode:	Postcode:				
Phone:		Email:					
Website	::						
INTEN	IDED USE (CHECK ALL THAT AF	PPLY)					
	Collect solids/crystals as product		Re-slurry and mix				
	Collect filtered liquid as product		React				
	Dry filter cake a little bit		Heat with vessel jacket				
	Dry filter cake to maximum dryness		Cool with vessel jacket				
	Wash filter cake		Utilize vacuum for liquid removal and drying				
	Mix/Stir (see Mixing section, below)		Utilize pressure for liquid removal				
	Model a larger production nutsche		Other				

Batch Quantities:

Typical volume r	range of slurry to be pro	cessed per operatior	า:	
Minimum:	Maximum:	Check One:	Gallons:	Litres:
Ok to add partic	ans of slurry batch after	partial liquid ramaya	12 Voc. N	lo.
OK to add portio	ons of slurry batch after	partiai iiquid removai	i: res: i\	10:
Expected weigh	t range of resulting filte	r cake:		
Minimum:	Maximum:	Check One:	Lbs:	KG:
Expected weigh	t range of resulting filte	r cake:		
			Callana	Lituan
Minimum:	IVIAXIMUM:	Check One:	Gallons:	Litres:
, , ,	oroximate weight/weig obtain approximate volu	•	known, try to dete	rmine or estimate filter
cake defisity to t	obtain approximate voit	arrie.)		
Materials:				
Materials of cons	struction requested/acc	rented:		
	struction requested/acc	сріса.		
Metals:	S.S316-	.1	Hastlellov	Don't Know
Other				Don't know
	, , , , , , , , , , , , , , , , , , , ,			
Elastomers:				
	(Pope default for o-ring			pe default for gaskets)
EPDN		ez(Other (Please Speci	fy)
Don't	Know			
Filter Discs:				
	ropylene	316 S.S	Other (Plea	se Specify)
* *	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).

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 spares.)	s 40 micron. Other sizes may b	be quoted as substitution or
Microns, installed filter	Microns, spare filters	Quantity
Operating Range:		
Pressure psi maximum		
(All Pope Nutsches are ASME rated to full vacuur	n, with pressure rating typical	lly 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.

Don't include lift

Not sure

Please include lift

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 slightglass/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 i 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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