



Technical Service Bulletin

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Guidelines for HYDRAcap[®] System Design.

This Technical Service Bulletin provides information on how to use the Hydranautics' Process Design Guidelines Table. From the table, a designer should be able to estimate the number of HYDRAcap modules, backwash frequencies, flux and cleaning frequencies for a given feed water.

1. Table Limitations

The table is based on Hydranautics field experience with HYDRAcap hollow fiber ultrafiltration modules. It summarizes successful operating parameters for a variety of water sources, pretreatments and processing conditions. The table is created for HYDRAcap60 modules with 0.8 and 1.2 mm fiber ID. Applications that use HYDRAcap40 modules should not use the Process Design Table to design a system.

For assistance with HYDRAcap40 products, please contact Hydranautics Application Technology department.

The table's purpose is to provide a quick estimate for the module quantities, backwash frequency, flux and cleaning frequency. Some water sources, like wastewater and surface water, may vary significantly from site to site, and season to season. It is highly recommended that a pilot study be performed to determine optimum operating parameters for these various applications.

2. How to use the table

To use the Process Design Guidelines Table, feed water source and filtrate flow must be known. From there, the designer can scroll across the row for the given feed water and determine net flux. Net flux is that portion of gross flux that is available for use. The units for flux are gallons/ft²/day or liter/m²/hour. By multiplying net flux by the filtrate flow, or plant capacity, it is possible to determine the number of modules. See the equation below to calculate the number of modules:

$$NM = \frac{PC * k}{AA * NF};$$

where,

NM - number of HYDRAcap modules needed;

PC - plant capacity, [m³/h or gallons/day];

AA - active area on single HYDRAcap module, [m² or ft²];

NF - net flux from table, [liter/m²/hour or gallons/ft²/day];

k - coefficient needed when working with SI dimensions, k = 1000

Hydranautics

401 Jones Rd.

Oceanside, CA 92054

Tel: (760) 901-2500

Fax: (760) 901-2578

Process Design Guidelines for HYDRAcap 60 with 0.8 and 1.2 mm Fibers

Water Type	Turbidity	Gross Flux, l/mh		Gross Flux, gfd		BW minutes		Recovery %		Net Flux, l/mh		Net Flux, gfd		CEB-Cl ₂	CEB-pH	CIP
	NTU	min	max	min	max	min	max	min	max	min	max	min	max	Times/day	Freq-days	Freq-days
City	<0.5	120	145	70.68	85.41	66.8	1000	98.6	99.8	112	139.4	66	82			90
	0.5-1.0	100	120	58.9	70.68	45	120	96	98.6	91.3	113.2	53.7	66.6		7	90
Well	<0.5		120		70.68	60	60		98.5		111.9		65.8	Up to 4 times / day dep on plate counts	0	90
	0.5-1.0		110		64.79	45	45		97.9		92.65		54.5		7	90
	1.0-5.0		100		58.9	30	30		96.5		89.37		52.57		2	90
Surface - pretreated	<0.5	120	144	70.68	84.82	45	90	94.7	99.75	106	130.9	62.6	77	Feed dependent-frequency typically 1-4 times per day; Cl ₂ /H+/OH-	7	60-90
	0.5-1.0	100	120	58.9	70.68	30	60	94	98.5	89.3	111.9	52.5	65.8		4	45-90
	1.0-2.0	90	100	53.01	58.9	30	45	93	97	79.4	91.8	46.7	54		2	30-90
Surface - raw	<0.5	100	120	58.9	70.68	30	60	92	93	85.5	107.8	50.3	63.4		2	30-60
	0.5-1.0	90	100	53.01	58.9	30	45	92	92	76.5	88.21	45	51.89		2	30-60
	1.0-2.0	80	90	47.12	53.01	30	30	90	91	69.7	76.16	41	44.8		2	30-60
	2.0-5.0	70	80	41.23	47.12	20	30	84.7	90	56.1	68.85	33	40.5	1	20-30	
Exemp.*1	5.0-15.0	60	70	35.34	41.23	15	40	74	91	43.7	60.52	25.7	35.6	1	15-30	
Seawater	<2.0	95	110	55.955	64.79	30	45	92	95	83.1	99.38	48.9	58.46	Every backw	0	60
	2.0-5.0	80	95	47.12	55.96	20	30	82	90.2	59.8	79.22	35.2	46.6	Every backw	0	60
	5.0-10.0	60	80	35.34	47.12	15	20	67	82	35.7	59.16	21	34.8	Every backw	0	30
Tertiary w/w	<2.0	65	70	38.285	41.23	20	30	75	85	36.8	56.1	21.6	33	Every backw	0	20-30
Exemp.*1	2.0-5.0	55	65	32.395	38.29	15	20	65	80	31.1	46.8	18.3	27.5	Every backw	0	15-20

Exemption*1 May require LD fiber- for higher turbidities (15 - 100 NTU), LD fibre is recommended, giving higher fluxes if used in crossflow

System Sizing Calculation:

To estimate the no. of modules required for a particular duty, use the following formula

No. of modules = Productivity required, m³/hr, x 1000 / (Net flux, l/mh x membrane area per module)

Example:

Thus a duty of 50 m³/hr, operating with a net flux of 90 l/mh, will require the following no. of HYDRAcap60 modules with standard 0.8 mm fiber;

No. of modules = 50 m³/hr x 1000 / 90 x 46 = 12 modules

- BW** Backwash
- CIP** Clean in place
- CEB** Chemical Enhanced Backwash