SciLog® **Intelligent BioProcessing Systems**

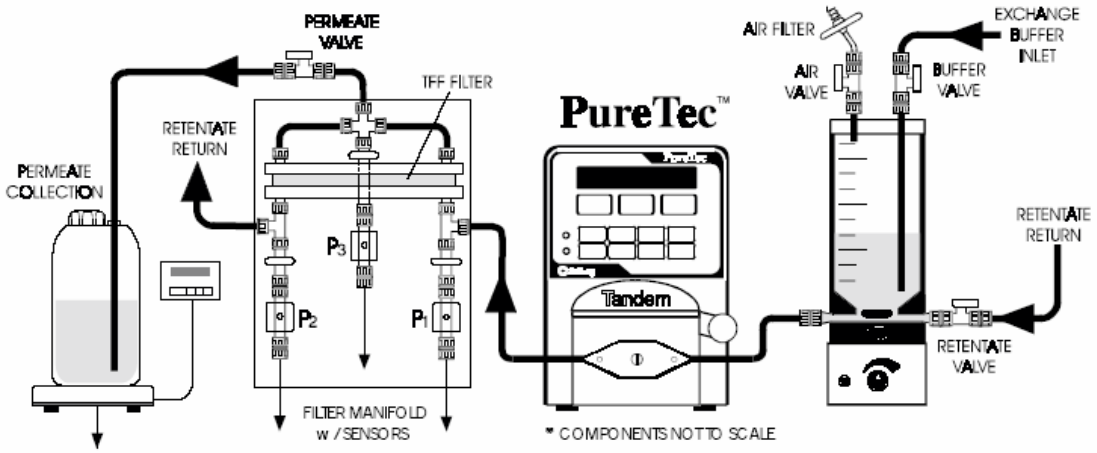
Optimized Permeate Yields in Tangential Flow Filtration (TFF)

The **PureTec APS** is an easy-to-use, high performance system for TFF process development and lab-scale TFF applications involving concentrating and desalting of dilute protein solutions and diafiltration (buffer exchange) with typical starting volumes of 50–1000 ml. The system is designed to accommodate TFF filter cartridges from different manufacturers, e.g. “Pellicon XL 50” (Millipore) and “Minimate” (Pall) and others.

The PureTec design is based on a patented* technology capable of monitoring and controlling trans-membrane pressure (TM) while monitoring / controlling feed rate, permeate collection rate and re-circulation rate. Using disposable pressure sensors, the PureTec simultaneously monitors feed (P1), retentate (P2) and permeate (P3) line pressures, calculates the resulting trans-membrane pressure (TM), and monitors / displays the associated flow rates:

{(P1 + P2)/2} – P3 = TM (Trans-Membrane Pressure)

The PureTec implements TTF applications by **Constant Rate** or by **Constant Pressure:**



In the **Constant Rate Mode**, the user implements a desired pump rate and selects some or all of five, monitored alarm conditions: High Pressure, Low Pressure, Feed Volume, Permeate Weight (requires scale hook-up) and Run Time Alarm. The pump rate can be increased or decreased “on-the-fly” without stopping the pump action. ***In the Constant Rate Mode, increasing the feed rate in a stepwise fashion, and simultaneously monitoring the permeate collection rate, allows the user to readily determine the optimal feed rate with the highest permeate yield.***

In the **Constant Pressure Mode**, the PureTec controls the pump output based on a constant filter pressure (30 psi max.). The user has four pressure options to select from: 1.Constant Trans-Membrane Pressure (TM); 2. Constant Feed Pressure (P1); 3. Constant Retentate Pressure (P2) or 4. Constant Permeate Pressure (P3). The pressure setting can be increased or decreased “on-the-fly” without stopping the pump action. Five alarm conditions are limit. If the alarm limit is exceeded, a “Pump Stop” or “Alert Only” alarm action is monitored: Low Pressure, Low Flow, Feed Volume, Permeate Weight (requires scale hook-up), Run Time Alarm.

Each of the five alarm conditions is based on a user-definable alarm limit. If the alarm limit is exceeded, a “Pump Stop” or “Alert Only” alarm action is implemented, depending on the user-selected alarm option

US Patents: 5,947,689; 6,350,382; 6,607,669; Other Patents Pending *OVER*

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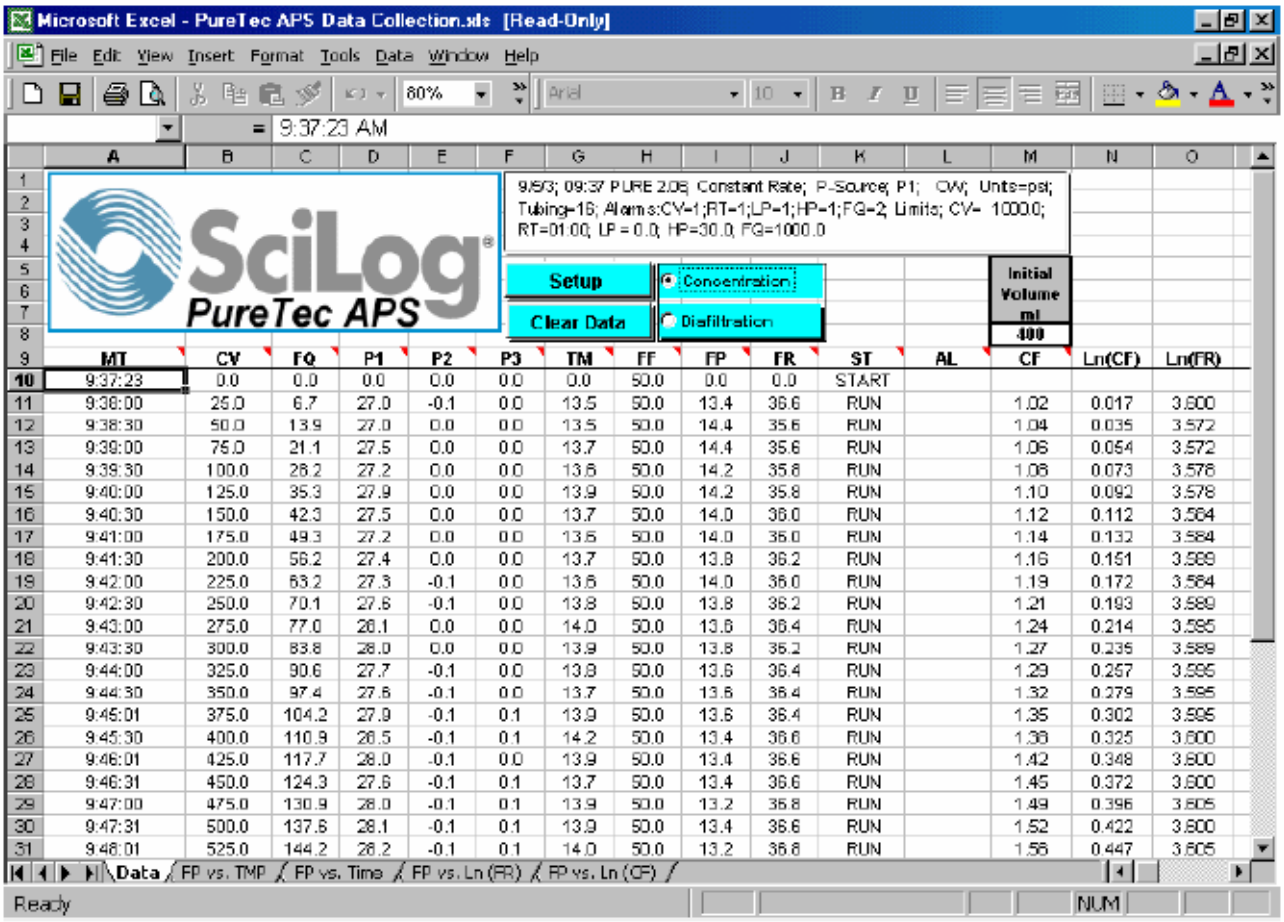
In the Constant Pressure Mode, increasing the trans-membrane pressure (TM) in a step-wise fashion, and simultaneously, monitoring the permeate collection rate, allows the user to determine the optimal TM with the highest permeate yield.

The PureTec displays and prints out eleven (11) filtration-related parameters. The user can scroll though three display options providing an instantaneous overview of the filtration progress and status. All information is printed out in an "Excel-friendly" format. Alternatively, a WinWedge software is used to summarize the filtration data and create graphical representations of the data on your PC as shown below:



MT	CV	FQ	P1	P2	P3	TM	FF	FP	FR	ST	AL	CF	Ln(CF)	Ln(FR)
9:37:23	0.0	0.0	0.0	0.0	0.0	0.0	50.0	0.0	0.0	START				
9:38:00	25.0	6.7	27.0	-0.1	0.0	13.5	50.0	13.4	36.6	RUN		1.02	0.017	3.600
9:38:30	50.0	13.9	27.0	0.0	0.0	13.5	50.0	14.4	35.6	RUN		1.04	0.035	3.572
9:39:00	75.0	21.1	27.5	0.0	0.0	13.7	50.0	14.4	35.6	RUN		1.06	0.054	3.572
9:39:30	100.0	28.2	27.2	0.0	0.0	13.6	50.0	14.2	35.8	RUN		1.08	0.073	3.576
9:40:00	125.0	35.3	27.9	0.0	0.0	13.9	50.0	14.2	35.8	RUN		1.10	0.092	3.578
9:40:30	150.0	42.3	27.5	0.0	0.0	13.7	50.0	14.0	36.0	RUN		1.12	0.112	3.584
9:41:00	175.0	49.3	27.2	0.0	0.0	13.6	50.0	14.0	36.0	RUN		1.14	0.132	3.584
9:41:30	200.0	56.2	27.4	0.0	0.0	13.7	50.0	13.8	36.2	RUN		1.16	0.151	3.589
9:42:00	225.0	63.2	27.3	-0.1	0.0	13.6	50.0	14.0	36.0	RUN		1.19	0.172	3.584
9:42:30	250.0	70.1	27.6	-0.1	0.0	13.8	50.0	13.8	36.2	RUN		1.21	0.193	3.589
9:43:00	275.0	77.0	28.1	0.0	0.0	14.0	50.0	13.6	36.4	RUN		1.24	0.214	3.595
9:43:30	300.0	83.8	28.0	0.0	0.0	13.9	50.0	13.8	36.2	RUN		1.27	0.235	3.589
9:44:00	325.0	90.6	27.7	-0.1	0.0	13.8	50.0	13.6	36.4	RUN		1.29	0.257	3.595
9:44:30	350.0	97.4	27.6	-0.1	0.0	13.7	50.0	13.6	36.4	RUN		1.32	0.279	3.595
9:45:01	375.0	104.2	27.9	-0.1	0.1	13.9	50.0	13.6	36.4	RUN		1.35	0.302	3.595
9:45:30	400.0	110.9	28.5	-0.1	0.1	14.2	50.0	13.4	36.6	RUN		1.38	0.325	3.600
9:46:01	425.0	117.7	28.0	-0.1	0.0	13.9	50.0	13.4	36.6	RUN		1.42	0.348	3.600
9:46:31	450.0	124.3	27.6	-0.1	0.1	13.7	50.0	13.4	36.6	RUN		1.45	0.372	3.600
9:47:00	475.0	130.9	28.0	-0.1	0.1	13.9	50.0	13.2	36.8	RUN		1.49	0.396	3.605
9:47:31	500.0	137.6	28.1	-0.1	0.1	13.9	50.0	13.4	36.6	RUN		1.52	0.422	3.600
9:48:01	525.0	144.2	28.2	-0.1	0.1	14.0	50.0	13.2	36.8	RUN		1.56	0.447	3.605

Abbreviations:
MT = Military Time, HH:MM:SS FF = Pump Rate, "Feed" Rate
CV = Cumulative Feed Volume, ml FP = Permeate Collection Rate ("Flux"), gr/min
FQ = Collected Filtrate /Permeate Weight FR = Re-circulation Rate; FR = FF - FP
P1 = Feed Line Pressure, psi ST = Pump Status, START, RUN, PAUSE, EXIT
P2 = Retentate Line Pressure, psi AL = Alarm, e.g. AL: CV Cumul. Volume Alarm
P3 = Permeate Line Pressure, psi CV = 1, Cumulative Volume Alarm is "OFF"
TM = Calculated Trans-Membrane Pressure RT = 2, Run Time Alarm is "ALERT ONLY"
RT = Run Time, 00:00:00 at START HP = 3, High Pressure Alarm is "PUMP STOP"
CW = Clockwise Pump Direction LP = 1, Low Pressure Alarm is "OFF"
CCW =Counter Clockwise Pump Direction LF = 2, Low Flow Alarm is "ALERT ONLY"
CF = Concentration Factor

Concentration / Diafiltration Vessel: The PureTec comes with a graduated diafiltration vessel (500 ml) that can be removed from the SS magnetic stirrer base. The diafiltration vessel is made of FDA approved polycarbonate. Materials of construction are compatible with disinfectant i.e. isopropyl alcohol, bleach or dilute sodium hydroxide solutions. Seals and sealing surfaces don't contact your process solution. All fluid connections consist of 316 SS Female Luer with 0.15" ID SS tubing lining all fluid channels. SS Luer connectors and SS tubing are permanently epoxied into the vessel body. No exposed threads in which contaminating organism could flourish. The vessel is designed for maintaining an aseptic fluid environment.

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