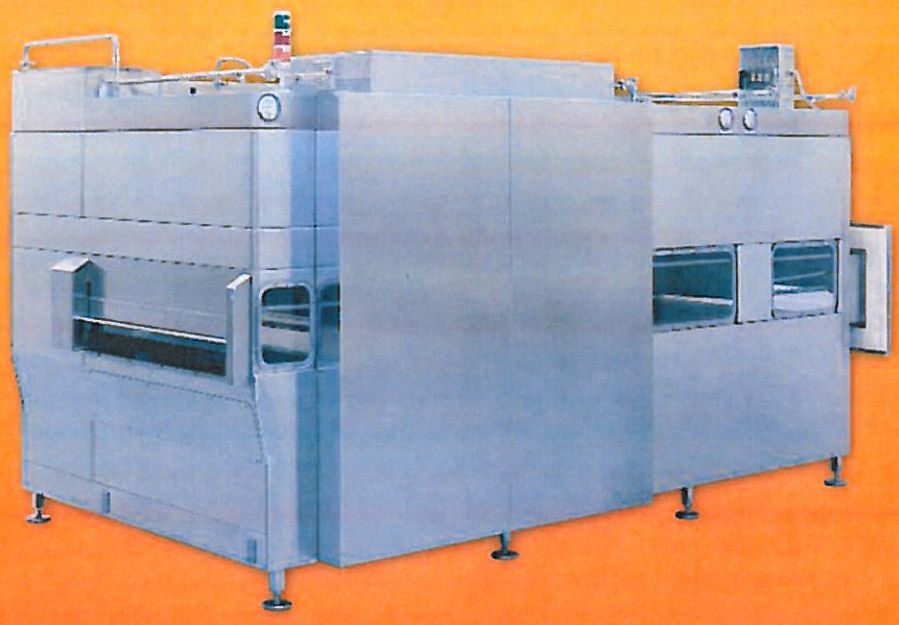
PennTech Sterilizing and Depyrogenation Tunnels

Uniquely Engineered to Outperform™



PennTech
Machinery Corporation

PennTech's Unique Sterilizing and Depyrogenation Tunnels are Engineered for Increased Energy Efficiency and Smaller Footprint

PennTech laminar air flow tunnels have been designed to continuously sterilize and depyrogenate pharmaceutical glass containers in a class 100 environment according to US Federal Standard 209d.

The Tunnels are comprised of three chambers:

- The Infeed Chamber
- The Sterilizing Chamber
- The Cooling Chamber

Infeed Chamber

The Infeed Chamber creates a thermal barrier between the vial washing room and the Sterilizing Chamber, to protect the vials from contamination and to pre-heat the vials.

Vertical unidirectional HEPA-filtered air blows over the vials at 0.5m/s. The Infeed Chamber is pressurized to 28Pa (1Pa=0.1mm), one Pa less than the Sterilizing Chamber. This small pressure drop allows for some hot air to flow from the Sterilizing Chamber to the Infeed Chamber for drying and pre-heating of the vials.

Sterilizing Chamber

The Sterilizing Chamber is fully insulated and can be heated up to temperatures of 350°C (660°F). Heat is generated by stainless steel, SCR-controlled heating elements. The sterilization time of the vials is a function of the air temperature and air velocity. The air velocity is adjustable. The thermal cycle is designed to obtain a 3-log pyrogen reduction in 15 minutes (D-value) at a temperature of 250°C. Every 46.4°C increase in temperature (referred to E.colli endotoxin), reduces the D-value by 1-log cycle.

	1-log cycle	2-log cycle	3-log cycle	4-log cycle
Z250 →	D5min.	D10min.	D15min.	D20min.
Z296.4 →	D30sec.	D60sec.	D90sec.	D120sec.
Z342.8 →	D3sec.	D6sec.	D9sec.	D12sec.

The Sterilizing Chamber is pressurized to 29Pa, one Pa less than the Cooling Chamber. This small pressure drop causes a counter flow from the Cooling Chamber to the Sterilizing Chamber.

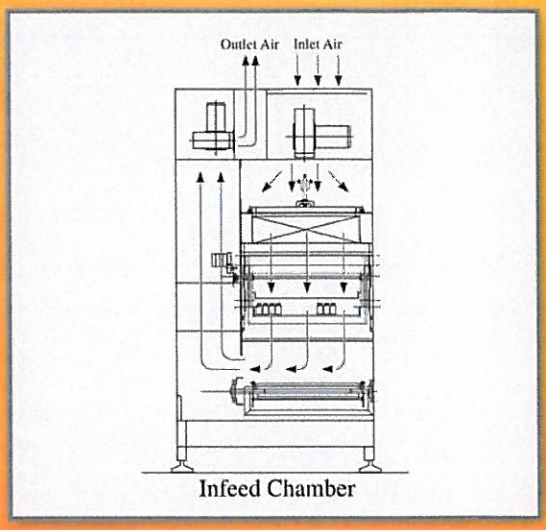
Some options include:

- DOP testing of HEPA filters
- Automatic height setting of infeed and outfeed door

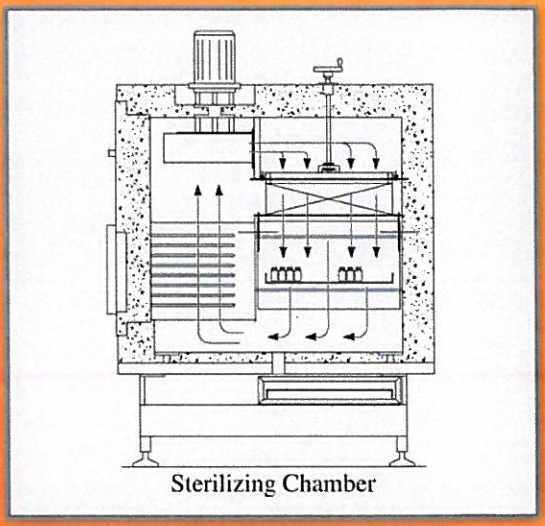
Cooling Chamber

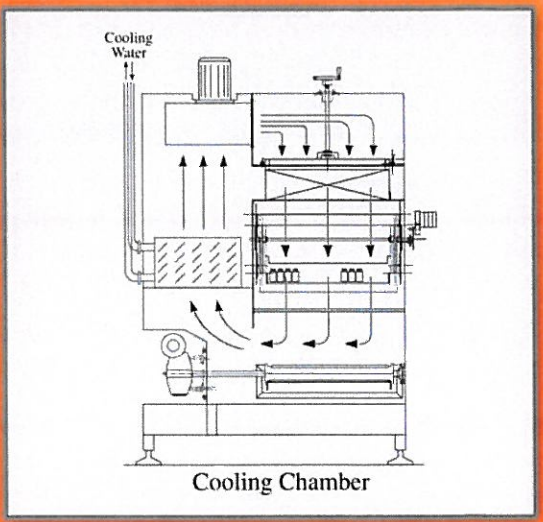
Depending on the tunnel size, one or two cooling coils assist in the cooling of the vials to ambient temperature. Regular tap water or chilled water may be used. Depending on the format, vials stay in the Cooling Chamber for 15-20 minutes.

Optionally, the Cooling Chamber can be heat sterilized by HEPA-filtered hot air of 200°C for a D-value of 7.2 minutes at a temperature of 170°C. The air pressure in the Cooling Chamber is 30Pa.



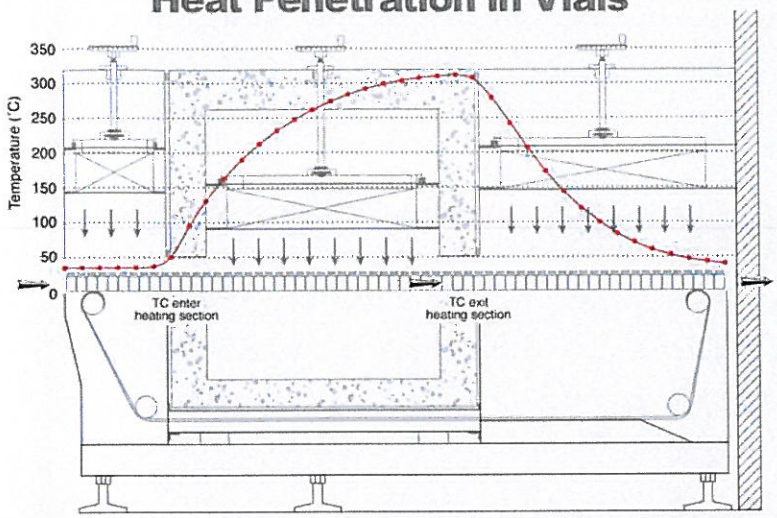
Infeed Chamber


Sterilizing Chamber

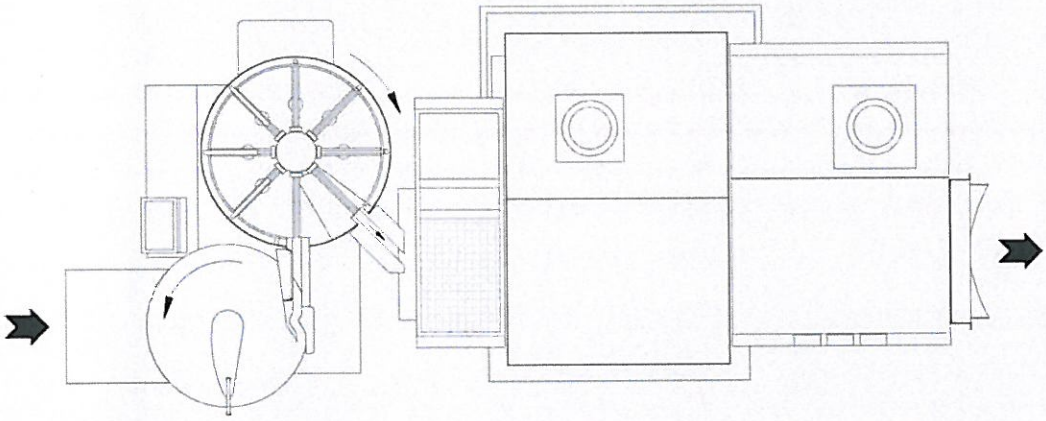


Cooling Chamber

Heat Penetration in Vials



PennTech Rotary Vial Washer & Sterilization Tunnel



Control System

PennTech's sterilizing tunnels are standard equipped with Allen Bradley® SLC-series or ControlLogix PLC's in combination with an Allen Bradley® PanelView or Siemens HMI (Human Machine Interface). The HMI displays alarm conditions when they occur. GE's Fanuc Intellution iFIX software package is used for system validation according to Title 21 Code of Federal Regulations (21 CFR part 11).

Night Mode

When the tunnel is not being used, it can be operated in the "night-mode" to save energy while avoiding contamination.

Specifications of PennTech Sterilizing Tunnels

	Output in vials/min. (A=Tubular H=molded)					
Model	2ml(A)	5ml(A)	10ml(A)	30ml(A)	50ml(H)	100ml(H)
ST1/450/1980*	240	125	100	67	21	12
ST1L/450/2130	296	155	125	80	26	14
ST2/450/2285	390	200	170	100	34	18
ST2L/450/2435	480	250	200	130	40	23
ST3/600/2485	550	285	235	150	48	26
ST4/600/2800	640	335	275	175	55	31
ST5/600/3075	730	380	315	200	63	35
ST6/800/2925	800+	430	355	225	71	39
ST7/800/3260	800+	480	395	250	79	44
ST8/800/3565	800+	525	430	275	87	47
ST9/800/3870	800+	600	500	300	100	53
ST12/1250/3160	800+	670	555	350	110	60
ST13/1250/3460	800+	750	620	390	125	68
ST13B/1250/3920	800+	750+	680	430	140	75
ST14/1250/4200	800+	750+	680+	550	170	95
ST15/1250/4560	800+	750+	680+	550+	240	133
ST18/1600/4680	800+	750+	680+	550+	240+	133+

***ST1/450/1980** = Belt width 450mm, Overall Tunnel Length 1980mm

Technical Specifications

Model	Infeed Chamber		Sterilzing Chamber		Cooling Chamber-1		Cooling Chamber-2	
	HEPA filters	airflow (m^3/hr)	HEPA filters	airflow (m^3/hr)	HEPA filters	airflow (m^3/hr)	HEPA filters	airflow (m^3/hr)
ST1/450/1980*	457X305	418	457X610	1002	457x610	1066	N/A	N/A
ST1L/450/2130	457X305	418	457X610	1002	457x610	1303	N/A	N/A
ST2/450/2285	457X305	418	457x762	1210	457x762	1303	N/A	N/A
ST2L/450/2435	457X305	418	457x762	1210	457x914	1539	N/A	N/A
ST3/600/2485	610x305	546	610x762	1593	610x914	1967	N/A	N/A
ST4/600/2800	610x305	546	2@610x457	1940	(610x610)+(610x457)	2271	N/A	N/A
ST5/600/3075	610x305	546	(610x610)+(610x457)	2214	610x1219	2573	N/A	N/A
ST6/800/2925	762x305	716	2@762x610	2561	762x1219	3319	N/A	N/A
ST7/800/3260	762x305	716	(762x457)+(762x762)	2922	(762x610)+(762x762)	3814	N/A	N/A
ST8/800/3565	762x305	716	2@762x610	3286	2@762x762	4203	N/A	N/A
ST9/800/3870	762x305	716	(762x610)+(762x762)	3647	(762x762)+(762x914)	4593	N/A	N/A
ST12/1250/3160	2@610x457	1524	4@610x457	3958	1219x610	2647	1219X610	2647
ST13/1250/3460	2@610x457	1524	2@(610x610)+2@(610x457)	4516	1219x762	3234	1219X610	2647
ST13B/1250/3920	2@610x457	1524	4@610x610	5078	1219x914	3820	1219X762	3234
ST14/1250/4200	2@610x457	1524	2@(610x610)+2@(610x762)	5636	1219x914	3820	1219X914	3820
ST15/1250/4560	2@610x457	1524	4@610x762	6194	(1219x610)x(1219x457)	4565	1219X914	3820
ST18/1600/4680	2@763x457	1937	4@762x762	7895	2@762x1219	6303	2@762x914	4818

Power Consumption

Model	Belt (kW)	Infeed Chamber		Sterilzing Chamber		Cooling Chamber-1		Cooling Chamber-2		Total Power Consumption (kW)
		Recirc. fan(kW)	Exhaust fan(kW)	Recirc. fan(kW)	Heaters (kW)	Recirc. fan(kW)	Exhaust fan(kW)	Recirc. fan(kW)	Exhaust fan(kW)	
ST1/450/1980*	0.11	0.37	0.25	1.5	21.0	0.55	0.12	N/A	N/A	22
ST1L/450/2130	0.11	0.37	0.25	1.5	21.0	0.55	0.12	N/A	N/A	22
ST2/450/2285	0.11	0.37	0.25	1.5	24.6	0.55	0.12	N/A	N/A	28
ST2L/450/2435	0.11	0.37	0.25	1.5	24.6	0.55	0.12	N/A	N/A	28
ST3/600/2485	0.11	0.37	0.25	1.5	28.8	0.75	0.12	N/A	N/A	33
ST4/600/2800	0.18	0.37	0.25	1.5	31.5	0.75	0.12	N/A	N/A	37
ST5/600/3075	0.18	0.37	0.25	3.0	36.0	1.1	0.12	N/A	N/A	41
ST6/800/2925	0.18	0.55	0.37	3.0	40.5	1.1	0.12	N/A	N/A	48
ST7/800/3260	0.18	0.55	0.37	3.0	45.0	1.5	0.12	N/A	N/A	51
ST8/800/3565	0.18	0.55	0.37	3.0	48.6	2.2	0.12	N/A	N/A	55
ST9/800/3870	0.18	0.55	0.37	3.0	51.6	2.2	0.12	N/A	N/A	61
ST12/1250/3160	0.37	0.55	0.55	4.0	54.0	1.1	0.25	1.1	N/A	63
ST13/1250/3460	0.37	0.55	0.55	4.0	63.0	1.1	0.25	1.1	N/A	70
ST13B/1250/3920	0.37	0.55	0.55	4.0	67.5	2.2	0.25	1.1	N/A	83
ST14/1250/4200	0.37	0.55	0.55	4.0	72.0	2.2	0.25	1.5	N/A	92
ST15/1250/4560	0.37	0.55	0.55	4.0	72.0	2.2	0.25	2.2	N/A	92
ST18/1600/4680	0.37	0.55	0.55	6.0	81.0	2.2	0.75	2.2	N/A	114

***ST1/450/1980** = Belt width 450mm, Overall Tunnel Length 1980mm

Information subject to change

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