Options Available

The standard units are horizontal single or double nozzle machines normally designed to operate at electric motor synchronous speeds; however, the turbines can be supplied vertical, with more than two nozzles, and at various operating speeds.

Hayward Tyler standard machines are available from 20 to 1480 HP operating on pressures from 650 to 1050 psi. Higher HP machines are also available on a custom design basis.

The inlet pipe can be angularly placed above or below the turbine center-line, or to either side.

The ERT Turbines can be fitted with overspeed trip controllers, and a Jet Stream Deflector as required by the application.

Hayward Tyler
The Pump Company

Versatile	Hayward Tyler Pump Company designs, manufactures, sells and services a wide range of turbines, centrifugal and mixed flow pumps from 5 hp to 3000 hp.
Experienced	Every unit we build is the result of over 50 years of experience and technology.
Progressive	In co-operation with our parent company, we have access to the latest R&D, keeping our product lines current and cost effective.
Services Many Markets	Our customers are in the energy and resource-oriented industries such as pulp and paper, mines, desalination, refineries, fossil and nuclear power plants.
Extensive Sales Coverage	We have sales offices in Burlington, Cherry Hill, Houston, Atlanta, Denver, Los Angeles, San Francisco, Vancouver, Toronto, Mexico City and representatives in the Middle East and Asia. Combined with a close working relationship with our other pump operations in England, Scotland, Holland, Italy, South Africa and the U.S., we can service our customers throughout the world.
Export Minded	We are internationally oriented, more than half our turnover is shipped to locations around the world.
Modern Facility	Our modern manufacturing facility is equipped with up-to-date C.N.C. machine tools and a computerized test loop. We are capable of fabricating and machining a large variety of materials such as high alloy stainless steel, monel and aluminum bronze.
International Production	In conjunction with our sister company facility in the U.K., we can expand our production capability for large international jobs, or for customer financing considerations.
High Quality	We have a rigorous Quality Assurance system,* which controls quality for all levels of parts. Our system is also approved by the ASME for 'N' stamp nuclear equipment.
Large Product Range	Our range of turbine and pump types and sizes permits us to select the most cost and energy efficient machine for the job.
Growing With The World Markets	These broad-based capabilities put us on a growing number of bidder lists throughout the international market place.

*Our Quality Grid TM system is explained in our brochure—write us for it.

Hayward Tyler
The Pump Company

Hayward Tyler Pump Company
80 Industrial Pkwy., P.O. Box 492,
Burlington, VT 05402-0492
(802) 863-2351
Telex: 954646

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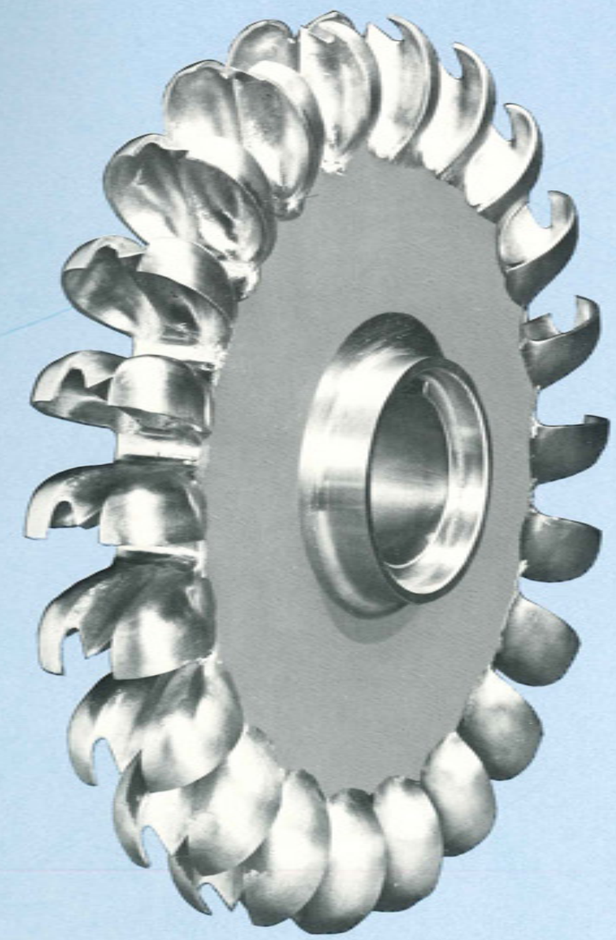
Printed in U.S.A.

Type ERT Energy Recovery Turbine



Hayward Tyler
The Pump Company

Hayward Tyler offers a range of Pelton Impulse Turbines for energy recovery applications, particularly for use in Reverse Osmosis Desalination Systems.

The Type ERT Turbine is marketed and manufactured by Hayward Tyler under an exclusive agreement with Pelton Power Inc., California.

The machines are designed in conjunction with one of North America's most experienced Pelton Turbine Design Engineers and are based on sixty years of hydraulic design and model testing.

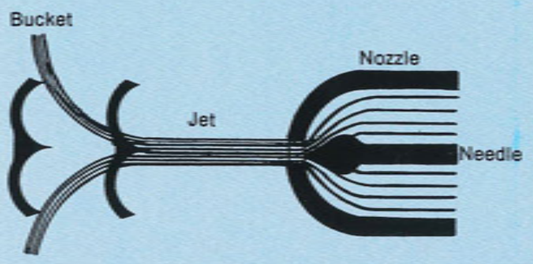
The latest rotor dynamic, materials, and quality assurance technology available today are incorporated into the design of the machines.

The materials of construction have been proven on similar service in seawater applications for MSF desalination and thermal generating plants.

The **basic principle** of the Pelton impulse turbine, is in the conversion of the potential energy of a liquid under pressure into kinetic energy.

A nozzle directs a jet of liquid tangentially onto a specially designed Pelton Wheel. The rotating wheel recovers the energy from the jet and discharges the liquid to atmospheric pressure.

The Hayward Tyler ERT Turbines offer efficiencies in excess of 80% from 40 to 120% of full load capacity.



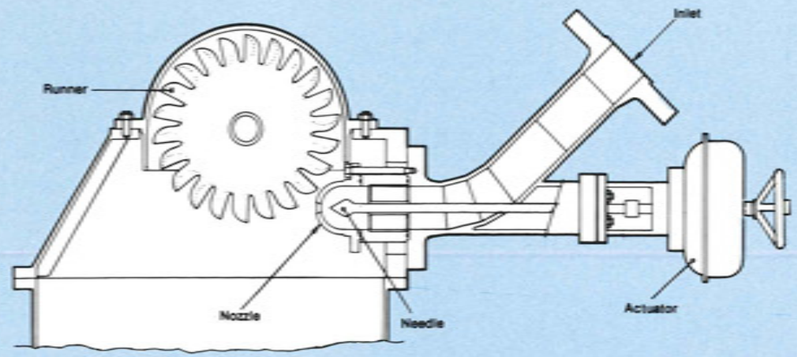
Application

Although primarily designed for use with Reverse Osmosis Plants, the machines may be used in any type of application where liquid at high pressure can be utilized, i.e., refinery or petrochemical application.

The ERT is a Pelton-type impulse turbine system which can take the place of a normal system relief or "letdown" valve.

Instead of wasting the energy in the fluid, the ERT system develops rotating mechanical power that can be used to drive a generator or be mechanically connected to other rotating equipment, such as a motor-pump set, to reduce the normal input power required by the Reverse Osmosis System. At start-up the turbine can be driven "dry" without damage while requiring little additional power from the motor.

Sectional Arrangement — ERT Turbine



Detail Features

The Hayward Tyler ERT Turbine has only two basic moving parts, the runner assembly and the control nozzle needle, both designed for ease of replacement.

Control is simple, either a simple manually operated handwheel or an automatic pneumatic actuator, may be used to actuate the nozzle needle.

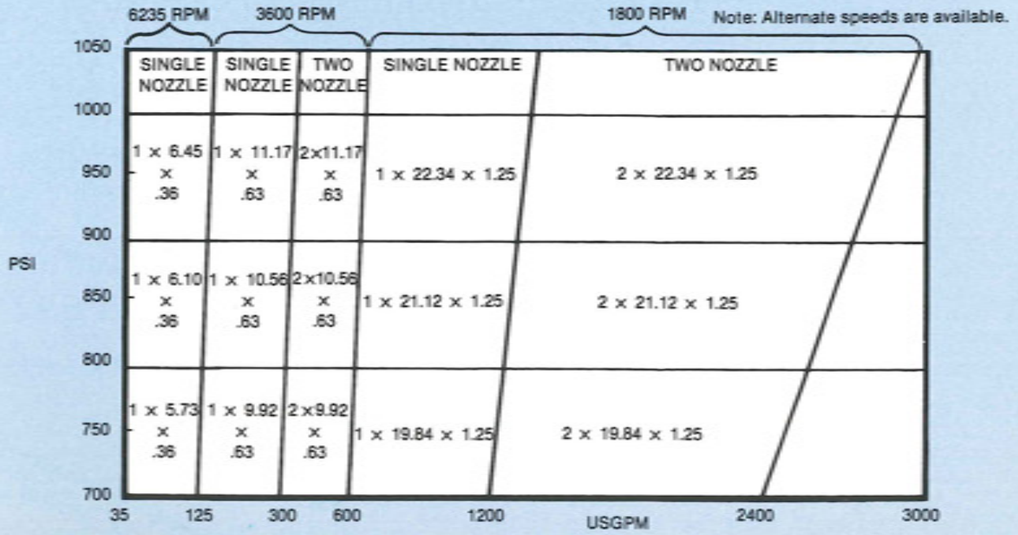
The basic turbine range is fitted with a single jet nozzle, but two or more may be fitted as the application requires.

The design incorporates a horizontal split casing which allows the inspection or replacement of the rotor or nozzle with the minimum down time.

The turbine is available in a variety of materials but normally is supplied in aluminum bronze or stainless steel.

Oil lubricated antifriction bearings are used, designed for maximum life.

Performance Range



Example of **ENERGY RECOVERY SAVINGS** possible in a SEA WATER REVERSE OSMOSIS PLANT, utilizing H.T. ENERGY RECOVERY TURBINES.

Estimated Annual Cost Savings

Qp-Product (fresh) water flow

M^3/DAY	USGPD	Turbine Power Output KW	Annual Cost Savings $US
28.38	7,500	4.5	3,600
56.75	15,000	9.0	7,200
113.50	30,000	18.0	14,400
189.00	50,000	30.0	24,000
378.00	100,000	60.0	48,000
567.00	150,000	90.0	72,000
945.00	250,000	150.0	120,000
1,890.00	500,000	300.0	240,000
3,780.00	1,000,000	600.0	480,000
7,560.00	2,000,000	1,200.0	960,000
1,5120.00	3,000,000	1,800.0	1,440,000
2,2680.00	5,000,000	3,000.0	2,400,000

Given:

salt water to fresh water conversion rate (Y) = 26%
reject brine outlet pressure = 850 psig
reject brine specific gravity = 1.035
turbine efficiency = 85%
8000 hrs/year operation
10 US cents/kw hour

Efficiency

The Hayward Tyler ERT Impulse Turbine is more efficient and reliable than the reaction (pump) turbine. Compare these seven important features.

ERT IMPULSE TURBINE

TYPE: Pelton Wheel

1) Turbine Nozzle replaces high-pressure valve.

2) Recovers all pressure energy in fluid.

3) Simple casing and short rotor construction with no running clearance for maximum reliability.

4) Optimum efficiency 85% over very broad operating range.

5) Retains efficiency over its operating life.

6) Non contact labyrinth shaft seals.

(7) Can be "run dry" if system requires turbine to freewheel.

REACTION PUMP TURBINE

TYPE: Reverse Running Pump

1) Requires high-pressure control valve.

2) Requires back pressure and waste of equivalent energy.

3) Multi-stage casing and long rotor with close running clearances requires increased maintenance.

4) Optimum efficiency 75% over small operating range.

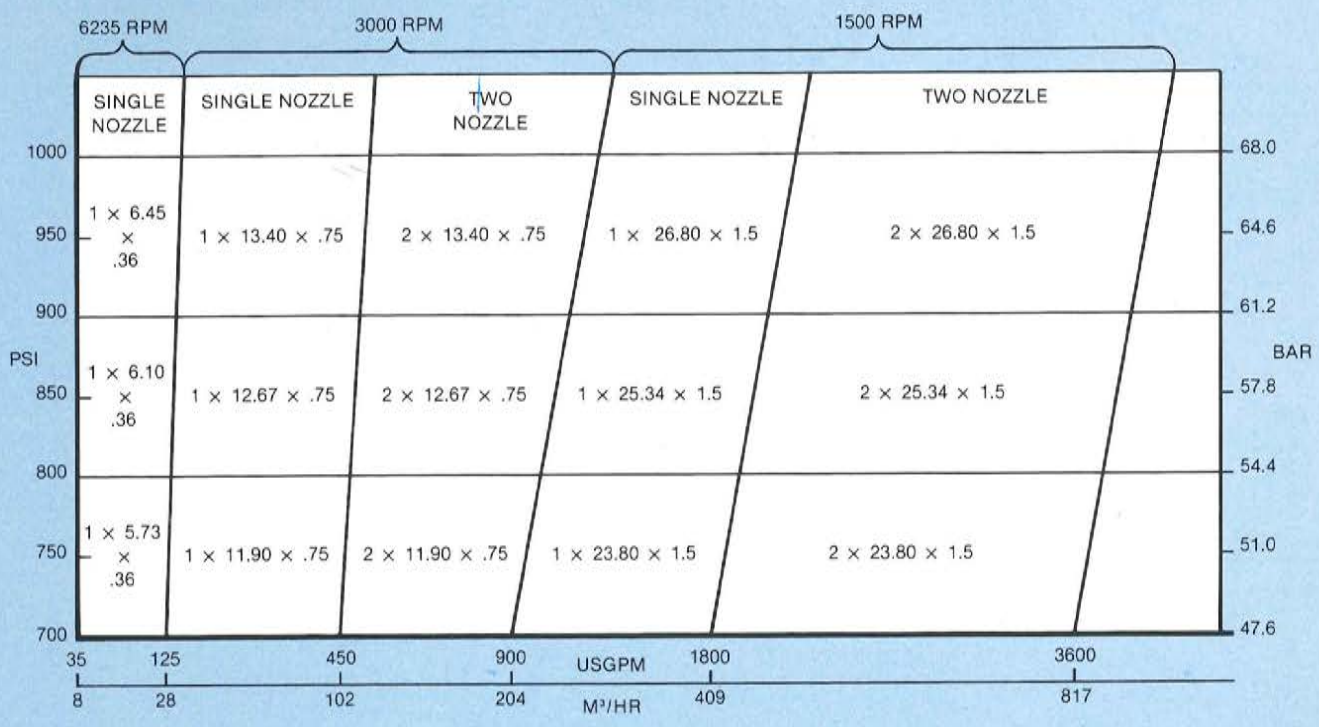
5) Efficiency falls off as clearances wear, requiring trade-off between spare parts, maintenance cost, and downtime versus reduction in energy savings.

6) Shaft mechanical seals required.

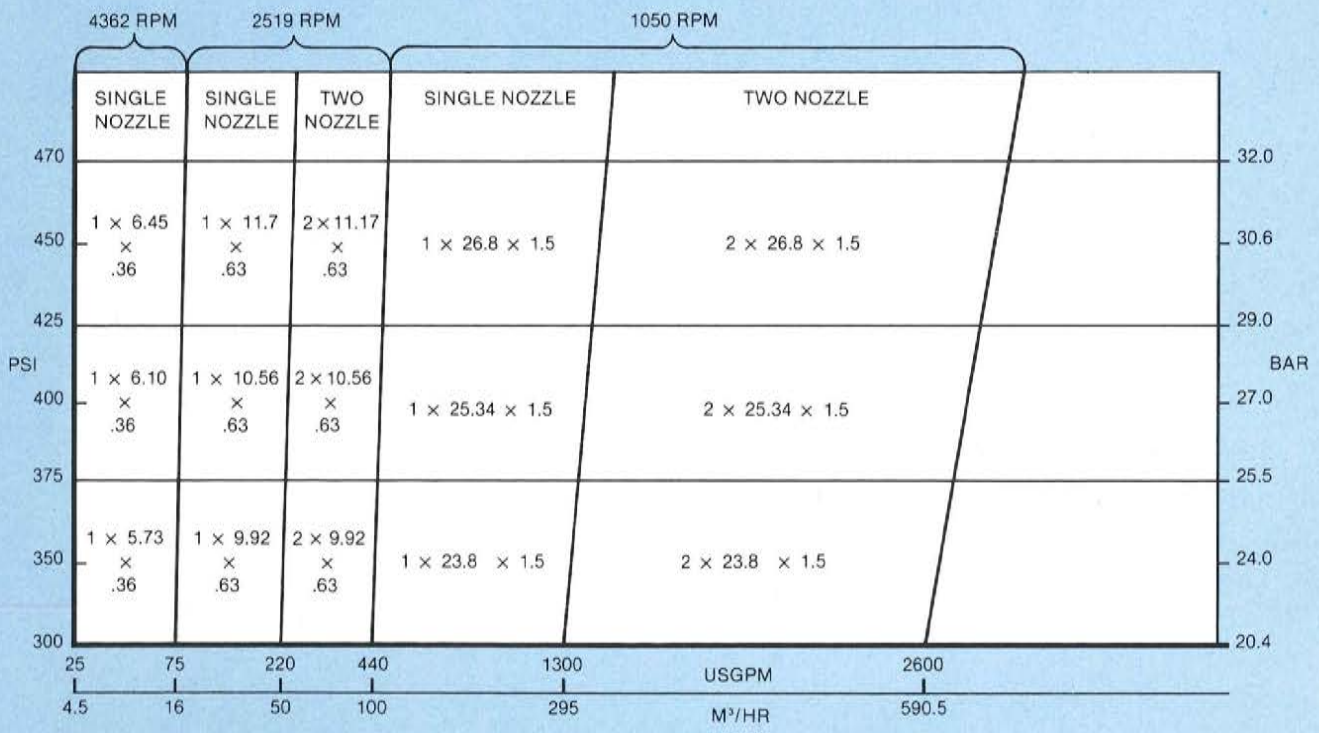
(7) Can only be operated full of water requiring added power at start-up or freewheeling.

Performance Range

50 CYCLE SPEED MACHINES



*Note: Alternate speeds are available.



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Hayward Tyler
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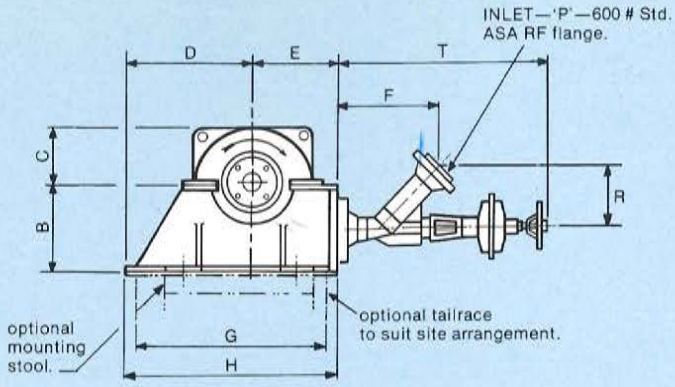
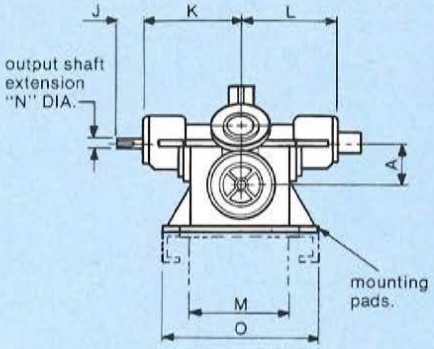
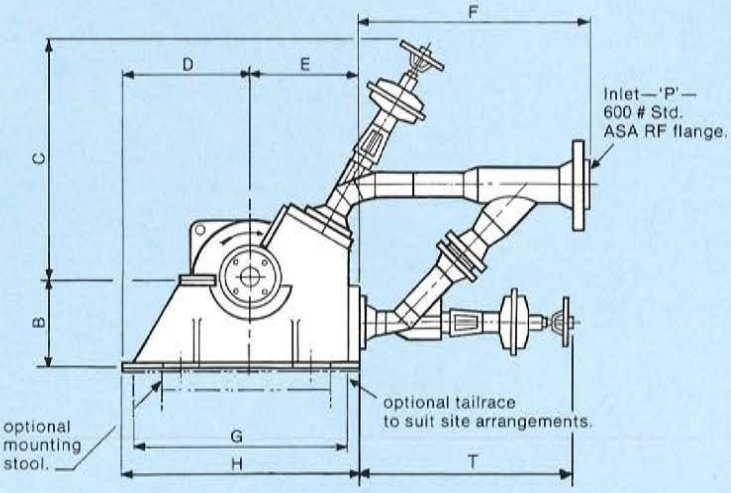
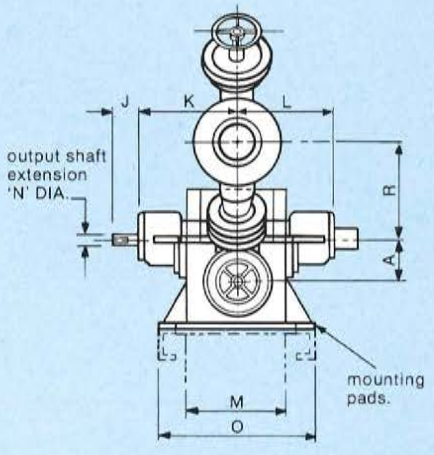
Outline Dimensions





	SINGLE NOZZLE ERT TURBINE DIMENSIONS (INCHES)																
TURBINE SIZE	A	B	C	D	E	F	G	H	J	K	L	M	N	O	P	R	T
1 × 6.45 × .36	3.22	7.0	5.5	10.5	6.25	10.75	14.25	16.75	2.0	6.5	6.5	7.5	1.19	13.5	2.0	6.18	35.5
1 × 6.10 × .36	3.05	7.0	5.5	10.5	6.25	10.75	14.25	16.75	2.0	6.5	6.5	7.5	1.19	13.5	2.0	6.18	35.5
1 × 5.73 × .36	2.86	7.0	5.5	10.5	6.25	10.75	14.25	16.75	2.0	6.5	6.5	7.5	1.19	13.5	2.0	6.18	35.5
1 × 11.17 × .63	5.59	10.0	7.25	15.75	10.75	13.25	23.63	26.63	4.0	11.25	11.78	12.0	1.63	21.5	3.0	8.35	38.0
1 × 10.56 × .63	5.28	10.0	7.0	15.75	10.75	13.25	23.63	26.63	4.0	11.25	11.78	12.0	1.63	21.5	3.0	8.35	38.0
1 × 9.92 × .63	4.96	10.0	7.0	15.75	10.75	13.25	23.63	26.63	4.0	11.25	11.78	12.0	1.63	21.5	3.0	8.35	38.0
1 × 13.4 × .75	6.70	12.0	8.75	19.25	11.75	13.25	33.35	36.5	5.0	13.25	13.25	15.25	1.63	23.25	3.0	8.35	38.0
1 × 12.67 × .75	6.34	12.0	8.75	19.25	11.75	13.25	33.35	36.5	5.0	13.25	13.25	15.25	1.63	23.25	3.0	8.35	38.0
1 × 11.9 × .75	5.95	12.0	8.75	19.25	11.75	13.25	33.35	36.5	5.0	13.25	13.25	15.25	1.63	23.25	3.0	8.35	38.0
1 × 26.8 × 1.5	13.4	24.0	17.5	39.0	34.0	26.5	67.0	73.0	8.0	26.0	26.0	30.5	3.25	47.0	6.0	17.7	42.0
1 × 25.34 × 1.5	12.67	24.0	17.5	39.0	34.0	26.5	67.0	73.0	8.0	26.0	26.0	30.5	3.25	47.0	6.0	17.7	42.0
1 × 23.8 × 1.5	11.69	24.0	17.5	39.0	34.0	26.5	67.0	73.0	8.0	26.0	26.0	30.5	3.25	47.0	6.0	17.7	42.0





	TWO NOZZLE ERT TURBINE DIMENSIONS (INCHES)																
TURBINE SIZE	A	B	C	D	E	F	G	H	J	K	L	M	N	O	P	R	T
2 × 11.17 × .63	5.59	10.0	41.25	15.75	10.75	31.25	23.63	26.63	4.0	11.25	11.78	12.0	2.0	21.5	4.0	12.0	38.0
2 × 10.56 × .63	5.28	10.0	41.25	15.75	10.75	31.25	23.63	26.63	4.0	11.25	11.78	12.0	2.0	21.5	4.0	12.0	38.0
2 × 9.92 × .63	4.96	10.0	41.25	15.75	10.75	31.25	23.63	26.63	4.0	11.25	11.78	12.0	2.0	21.5	4.0	12.0	38.0
2 × 13.4 × .75	6.70	12.0	45.0	19.25	16.25	39.5	32.37	35.87	5.0	13.25	13.25	15.25	2.0	23.25	4.0	12.0	38.0
2 × 12.67 × .75	6.34	12.0	45.0	19.25	16.25	39.5	32.37	35.87	5.0	13.25	13.25	15.25	2.0	23.25	4.0	12.0	38.0
2 × 11.9 × .75	5.95	12.0	45.0	19.25	16.25	39.5	32.37	35.87	5.0	13.25	13.25	15.25	2.0	23.25	4.0	12.0	38.0
2 × 26.8 × 1.5	13.4	24.0	48.0	39.0	34.0	40.0	67.0	73.0	8.0	26.0	26.0	30.5	4.25	47.0	8.0	24.0	42.0
2 × 25.34 × 1.5	12.67	24.0	48.0	39.0	34.0	40.0	67.0	73.0	8.0	26.0	26.0	30.5	4.25	47.0	8.0	24.0	42.0
2 × 23.8 × 1.5	11.9	24.0	48.0	39.0	34.0	40.0	67.0	73.0	8.0	26.0	26.0	30.5	4.25	47.0	8.0	24.0	42.0

For dimensions of larger machines—consult Hayward Tyler.