

Vacuum Lumber Drying

Presented by,
Jim Parker



Bring your Cash Flow out of the woods

Presentation Outline

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- Vacuum Drying Principles
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 - » Vacuum Pressure Principles
 - » Super-Heat
 - » Controlling EMC
- VacuPress Operation
 - » Heating System
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Vacutherm, Inc



- Founded 1980 in Warren, Vermont USA
- Family Owned and Operated
- Representatives in Italy, France, New Zealand, USA, Brazil, China, Japan, Norway
- Over **5,000** installations world wide
- Owner of original patents on vacuum drying in North America



SPEED

QUALITY

EFFICIENCY



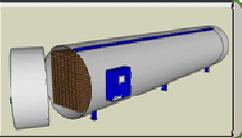
Product List

VACUPRESS
Fastest Drying System



- Heating plates
- Continuous vacuum
- 500 to 4,000 board feet

AIRVAC
Fast Drying System



- Air Heated
- EMC control / lumber conditioning
- No plates, loaded with traditional sticker pile
- 1,000 to 40,000 board feet

DEHUMIDIFICATION
Low Cost Drying System



- No vacuum
- Dehumidification of lumber

TOUCHDRY
Touch Screen Kiln Control



- Integrated moisture meter
- EMC control
- Used on any kiln

INFLATE-A-FORK
Lumber Lifting Device



- Inflatable lumber lifting device
- Straighten stickers
- Eliminate the need for 3 inch bolsters
- Increase kiln capacity 5 to 10%



Partial Customer List

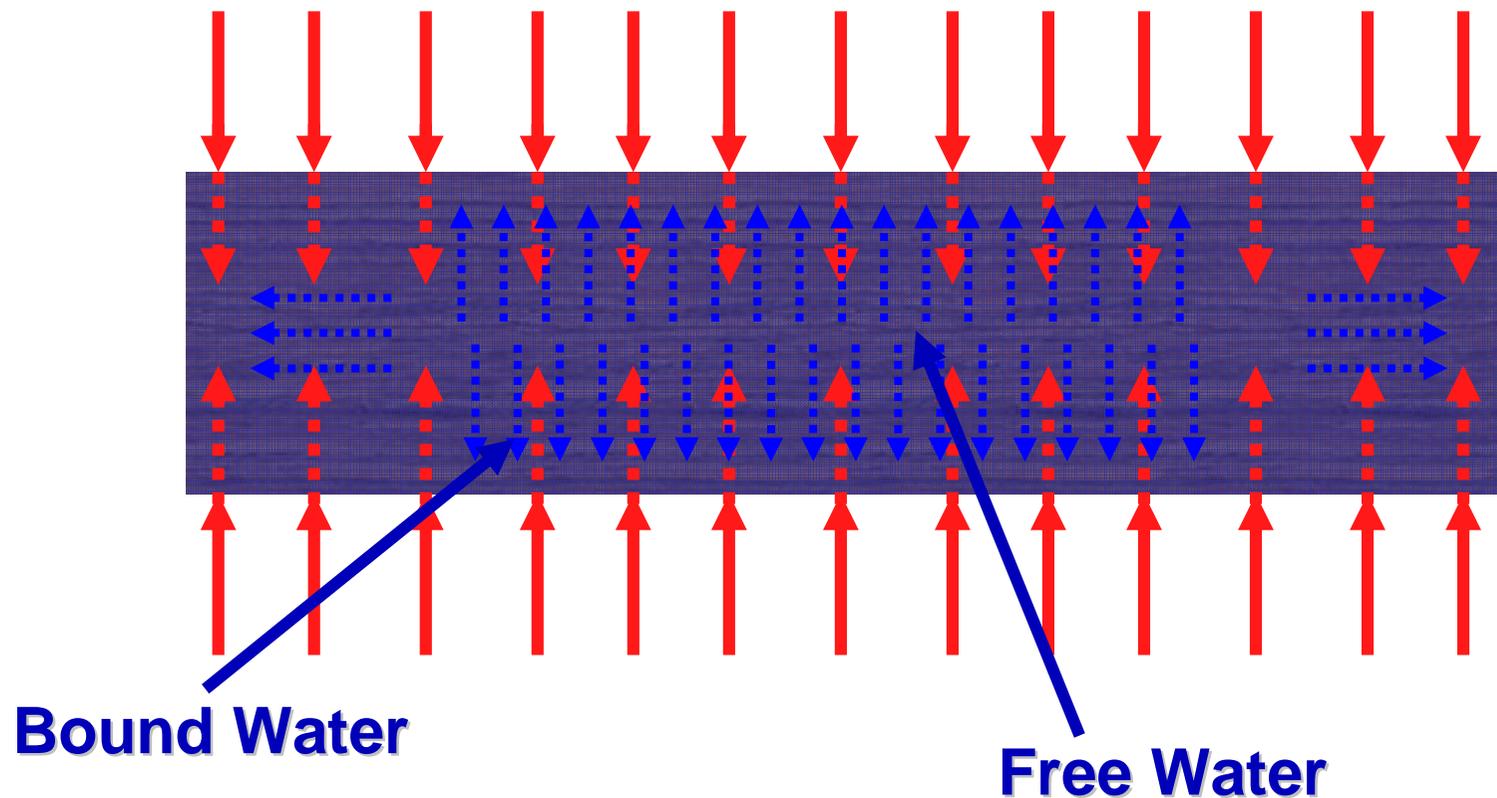
- **JM Champeau:** Furniture parts, musical instrument parts, flooring, lumber
 - (12) VacuPress 4000 kilns
 - Central Vacuum System
 - Central Control System
- **Lashway Lumber:** Hard and softwood flooring, dried lumber
 - (1) VacuPress 4000
 - (1) DH200 (dehumidification kiln)
- **Wightman Lumber:** Flooring, moulding, stair treads
 - (2) AirVac8
- **Cedarland Forest Products:** Cedar paneling, siding, custom profiles
 - (2) AirVac40 (40,000bf each)
- **Collector Specialty Woods:** specialty lumber, hardwood slabs, thick stock
 - (1) AirVac2.5
 - (1) DH500
- **Majestic Wood:** Red oak, walnut other northern hardwood lumber
 - (1) AirVac4
- **Broadleaf Lumber:** Black Walnut
 - (1) AirVac4



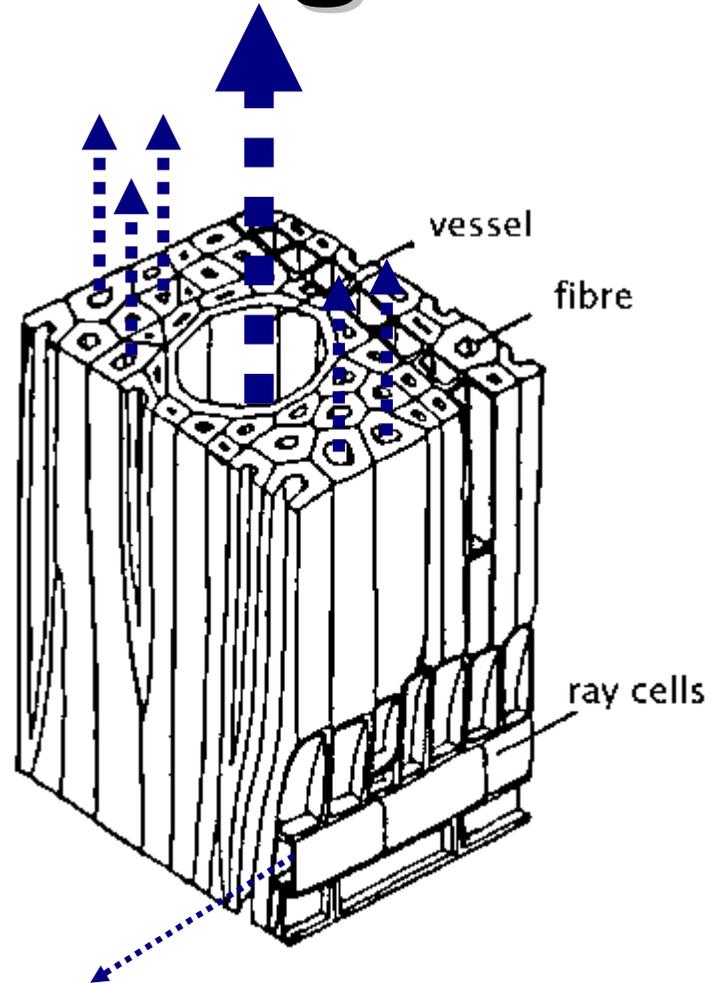
Vacuum Drying Principles

Moving Water

Heat In = Moisture Out in two forms

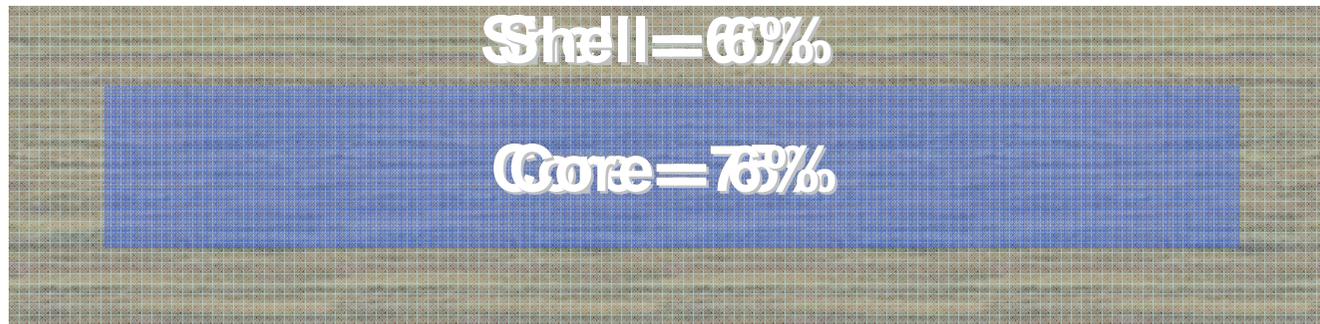


Moving Water



Moisture Gradient

EMC = 6%



Atmospheric Pressure

10.0 inches of mercury =

Water boils at 72°C =



= 29.92 inches of mercury

= Water boils at 100°C

SPEED

QUALITY

EFFICIENCY



Atmospheric Pressure Gradient

28.0 in Hg

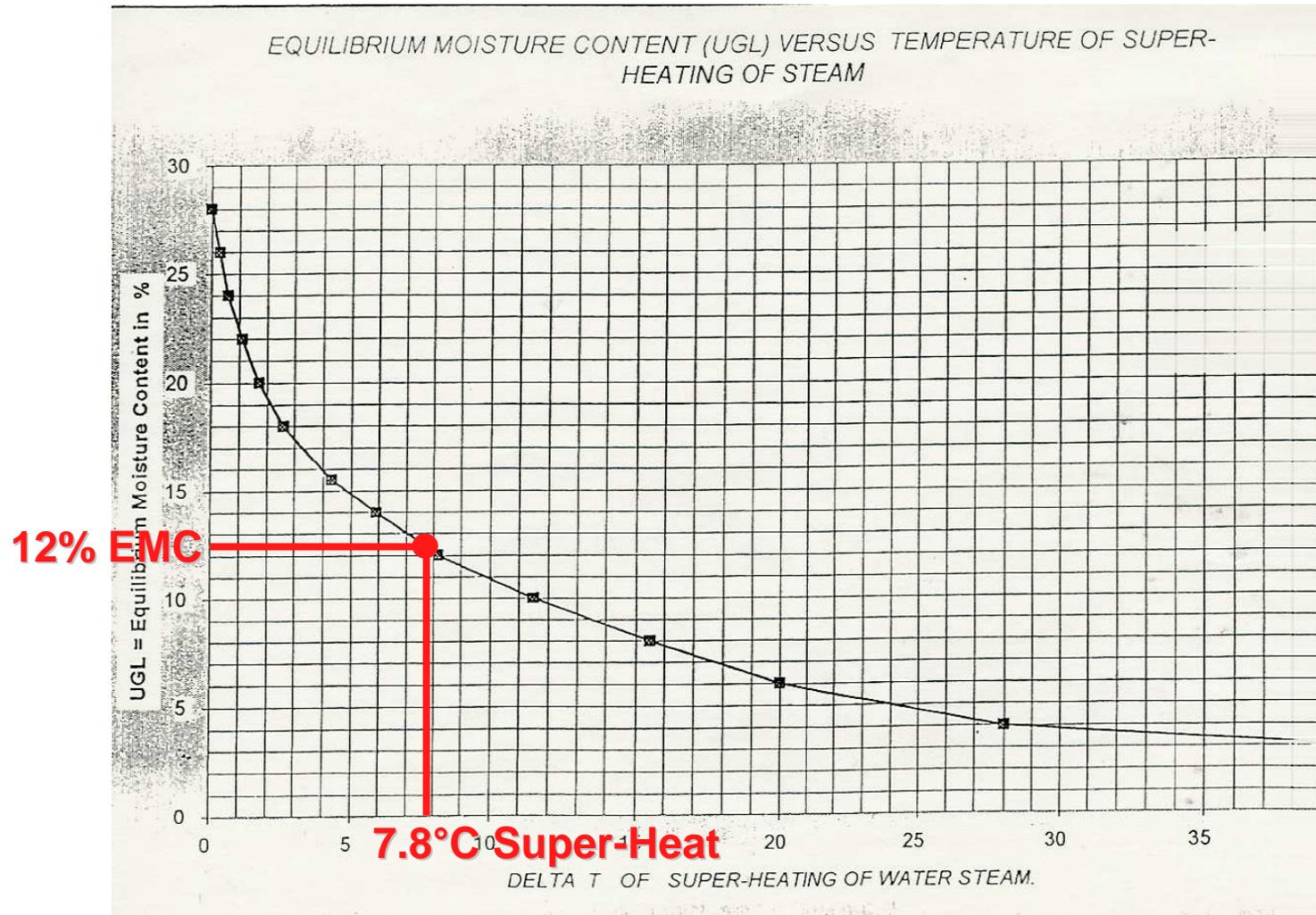
29.92 in Hg

Temperature vs. Pressure

TEMPERATURE		ABSOLUTE PRESSURE				VACUUM		TEMPERATURE	
°C	F	mbar	mm Hg.	psia	Inch Hg.	cm Hg.	Inch Hg.	°C	F
52.2	126	137.2	103.2	1.9555	4.063	65.68	25.858	76.7	178
52.8	127	141.3	106.0	2.0503	4.175	65.40	25.746	77	170
53	127.4	142.9	107.2	2.0729	4.220	65.28	25.701	77.2	171
53.3	128	145.2	108.9	2.1074	4.289	65.11	25.632	77.8	172
53.9	129	149.2	111.9	2.1938	4.406	64.81	25.515	78	173
54	129.2	150.0	112.5	2.1754	4.429	64.75	25.492	78.3	175
54.4	130	153	114.9	2.2225	4.525	64.51	25.396	78.9	177
55	131	157	118.7	2.2826	4.647	64.20	25.274	79	175
55.6	132	162	122.2	2.3440	4.773	63.88	25.148	79.4	175
56	132.8	165	123.8	2.3939	4.874	63.62	25.047	80	174
56.1	133	166	124.5	2.4069	4.901	63.55	25.020	80.6	177
56.7	134	170	127.8	2.4712	5.031	63.22	24.890	81	177
57	134.6	171	129.8	2.5103	5.110	63.02	24.811	81.1	177
57.2	135	175	131.2	2.5370	5.165	62.88	24.756	81.7	179
57.8	136	180	134.7	2.6042	5.302	62.53	24.619	82	179
58	136.4	181	136.1	2.6314	5.358	62.39	24.563	82.2	180
58.3	137	184	138.2	2.6729	5.442	62.18	24.479	82.8	181
58.9	138	189	141.9	2.743	5.585	62.81	24.336	83	181
59	138.2	190	142.6	2.757	5.614	61.74	24.307	83.3	181
59.4	139	194	145.6	2.815	5.732	61.44	24.189	83.9	183
60	140	199	149.4	2.889	5.882	61.06	24.039	84	183
60.6	141	204	153.3	2.964	6.034	60.67	23.887	84.4	184

7.8°C

Controlling EMC

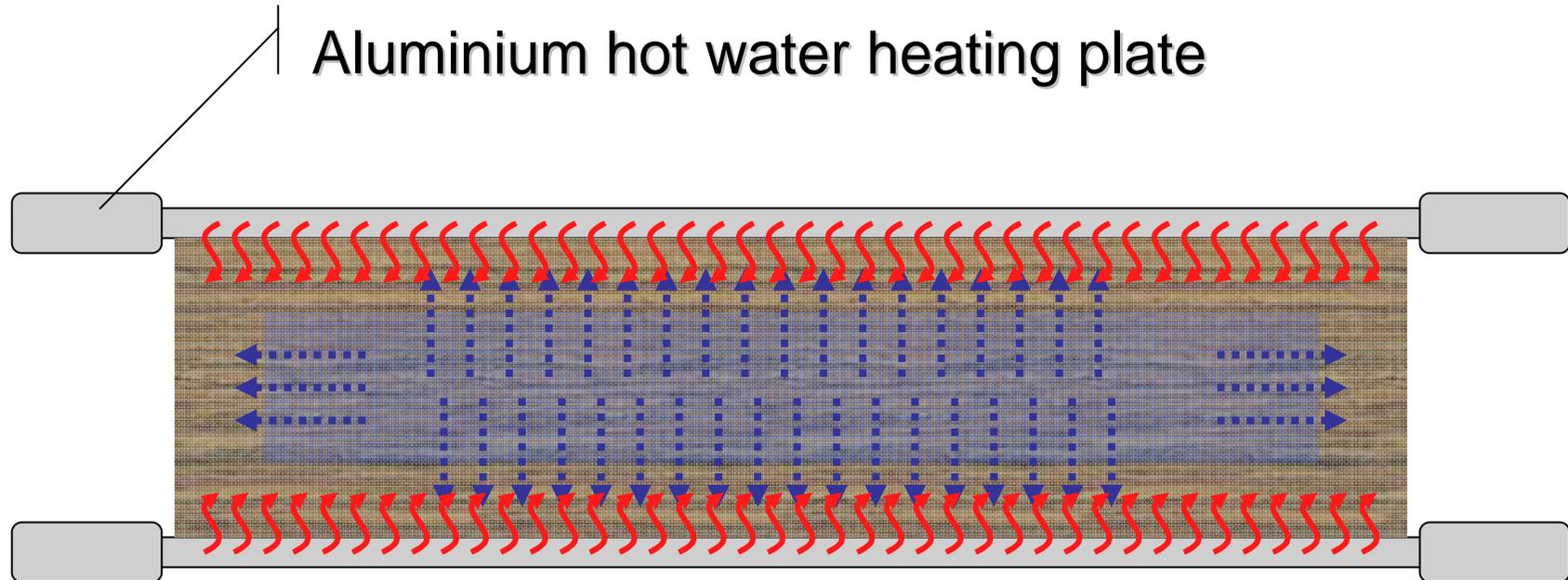


VacuPress Operation

VacuPress – Vacuum Kiln

- 8 to 12 times faster than conventional kilns
- Hot Water Heating Plates
- No Air Circulation
- Rubber Membrane Press
- Continuous vacuum for color brightness

Contact Heating



The “Press” in VacuPress

Atmospheric Pressure (29.92 in Hg.)



Atmospheric Pressure (29.92 in Hg.)

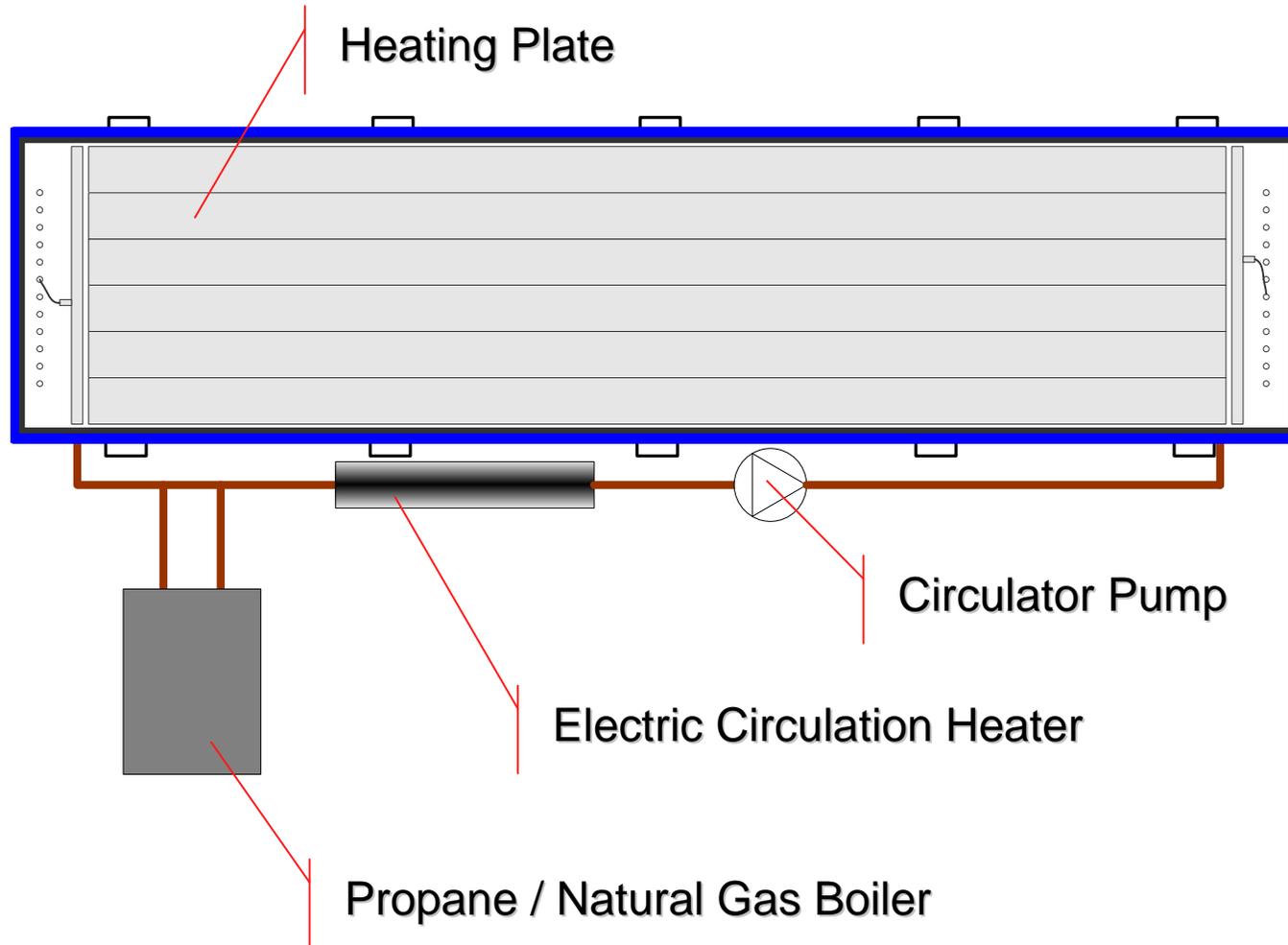


The “Press” in VacuPress

- Appox. 1200 lbs per foot of pressure
- Does not affect dimension of wood
- Prevents:
 - Cup
 - Bow
 - Twist
- Can Eliminate cup, bow and twist already in lumber

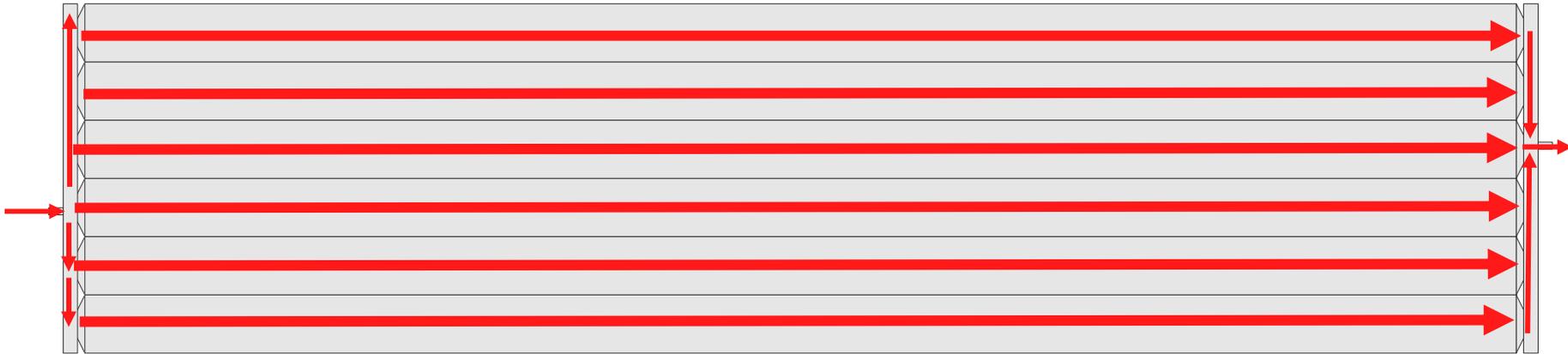


Heating System



Heating Plates

→ Water Flow Through Heating Plates →



Pressure Vessel



- Stainless Steel for Corrosion resistance
- Ruggedly reinforced



Material Handling



SPEED

QUALITY

EFFICIENCY



Material Handling



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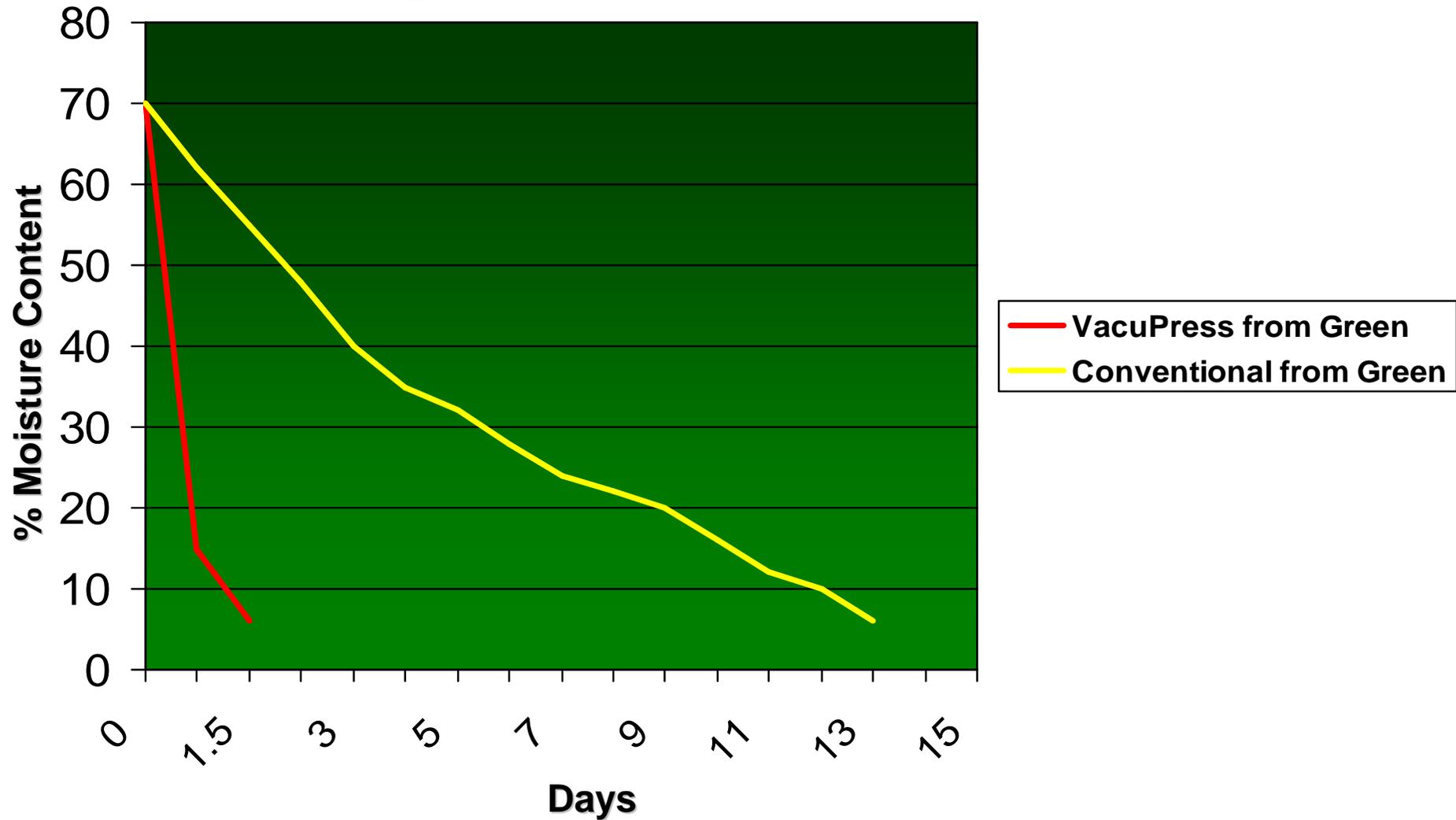


Drying Times

Drying time (hours)						
Species	4/4	5/4	6/4	8/4	10/4	12/4
Maple	30	35	42	48	96	140
Birch	40	48	55	70	120	192
Red Oak	92	125	145	168	186	212
Walnut	45	50	58	65	115	168
White Pine	24	30	38	48	55	96



Drying Time Comparison



AirVac Operation



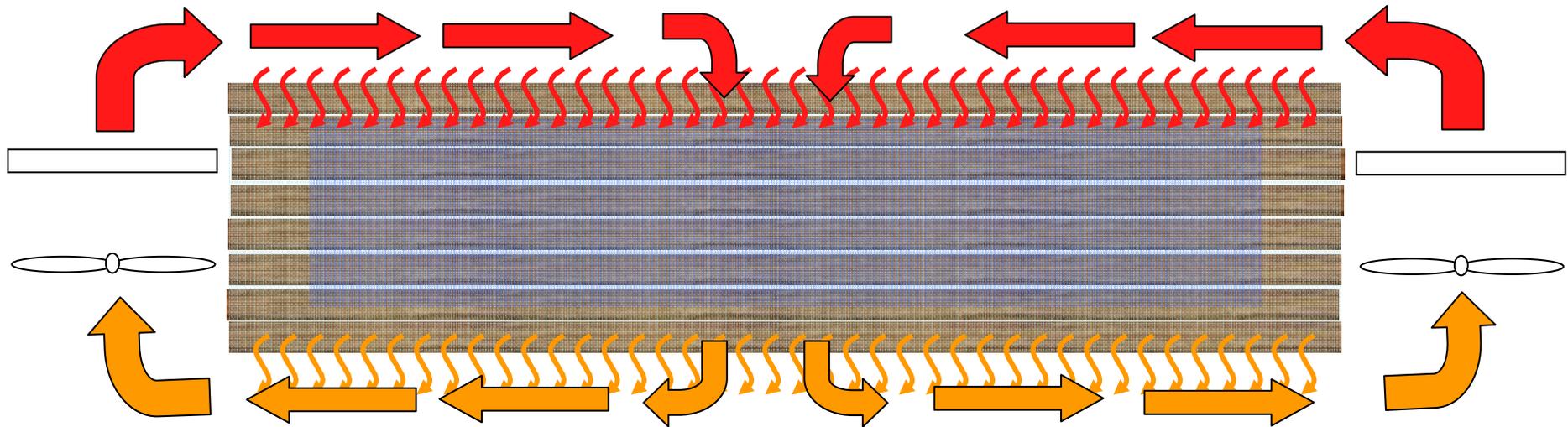
AirVac – Vacuum Kiln

- 5 to 8 times faster than conventional kilns
- Circulated Hot Air
- Loaded with Stickered Pile
- Optional Press
- Continuous or Discontinuous vacuum
- Humidification conditioning system (EMC Control)
- Best Kiln for Red Oak, timbers, high volume



Air Heating under a Vacuum?

- Lateral / Longitudinal Airflow (LOLA)
- High pitched fan blades on VFD controls
- Heated with steam, hot water or electric heat exchangers



Conditioning

- Manipulate Vacuum Pressure and Temperature to control EMC
- Cold water humidification System
- Eliminate Internal and External Stress
- Eliminate Degrade (i.e. – end checking, honeycomb, moisture pockets)

AirVac - Pressure Vessel



- Stainless steel chamber (10 year warranty)
- Fans installed in either end (2,4 or 6 fans)
- Capacities of 1,000bf to 40,000bf
- Built to fit your conventional kiln lumber pack

SPEED

QUALITY

EFFICIENCY



AirVac - Material Handling



- Forklift loaded
- Track loaded or side loaded (AirVac2.5 or smaller)
- Baffling can be done with plywood or cinderblocks

SPEED

QUALITY

EFFICIENCY



AirVac - Drying Times

From Green (+70% to 6% moisture content)

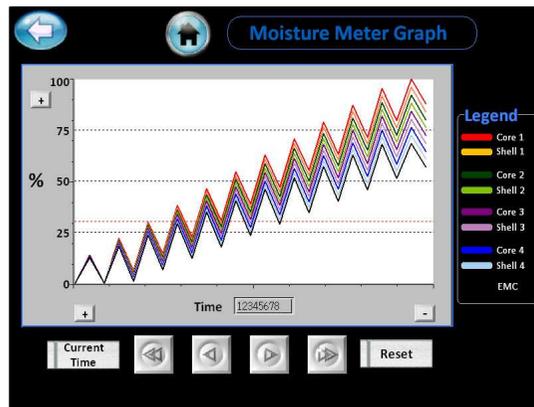
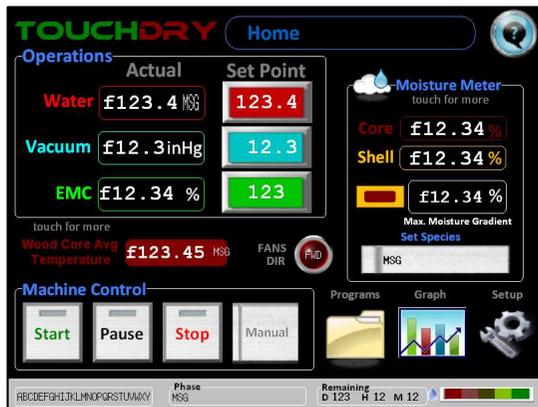
Drying time (HOURS)						
Species	4/4	5/4	6/4	8/4	10/4	12/4
Maple	48	56	60	72	110	192
Birch	48	56	60	72	120	210
Red Oak	36	44	48	96	144	212
Walnut	36	38	48	100	148	264
White Pine	30	36	38	48	55	96



TOUCHDRY® Kiln Controls



- 8.5" Color Touch Screen with PLC
- Integrated Wireless Moisture Meter
- Automatic or Manual Control
- Remote control
- Historical Graphing



SPEED

QUALITY

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Economics

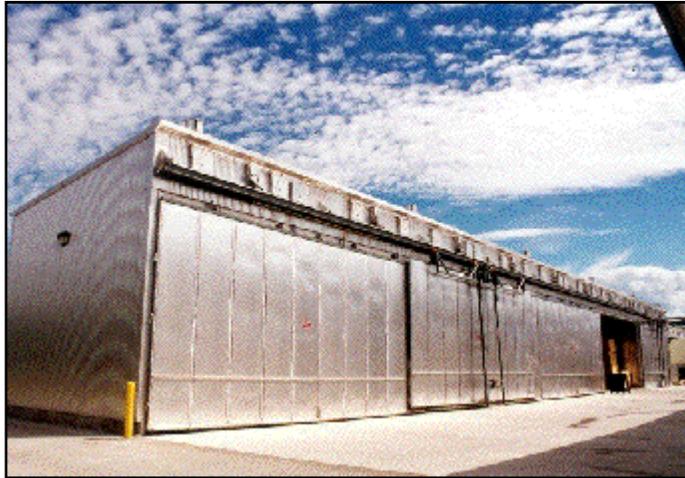


Applications

- Specialty wood products
- High quality Hardwood Flooring
- Furniture Parts
- Baseball bats
- Pool Cue blanks
- Musical Instrument Parts
- Exotic woods



Production Comparison



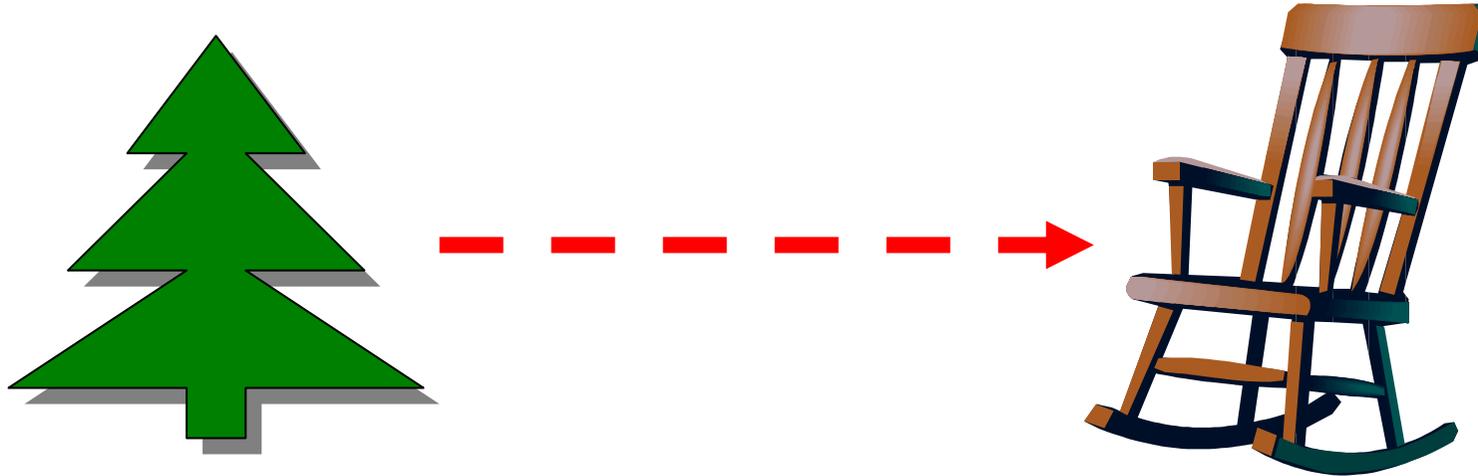
VS



	Conventional Steam Kiln	VacuPress 4000
Capacity	50,000 bf	4,000 bf
Drying Time (4/4 Hard Maple)	15 days	30 Hours
Annual Throughput (350 days)	1,166,666 bf	1,120,000 bf



Production Throughput



- Eliminates the 'bottleneck'
- Increases responsiveness to market
- Just-in-Time Inventory/production
- Cash flow Machine



Equipment Costs

Drying 4/4 Hard Maple

Model	Cost per Bf of production (paid for over 5 years + interest)
VacuPress 500	\$0.09
VacuPress 1000	\$0.05
VacuPress 2500	\$0.04
VacuPress 4000	\$0.03
AirVac2.5	\$0.10
AirVac4	\$.08
AirVac8	\$0.07
AirVac20	\$0.06
AirVac40	\$0.04



Total Energy Cost

Method of Heating: **Propane**

Model	Cost per Bf of production (8/4)			
	Maple	Birch	Red Oak	Cherry
VacuPress 500	\$0.09	\$0.11	\$0.12	\$0.07
VacuPress 1000	\$0.09	\$0.10	\$0.11	\$0.07
VacuPress 2500	\$0.08	\$0.03	\$0.04	\$0.02
VacuPress 4000	\$0.01	\$0.02	\$0.03	\$0.02

Energy Costs are similar in both VacuPress and AirVac



Total Energy Cost

Method of Heating: **Wood**

Model	Cost per Bf of production (8/4)			
	Maple	Birch	Red Oak	Cherry
VacuPress 500	\$0.02	\$0.04	\$0.05	\$0.03
VacuPress 1000	\$0.02	\$0.05	\$0.06	\$0.03
VacuPress 2500	\$0.02	\$0.03	\$0.04	\$0.02
VacuPress 4000	\$0.01	\$0.02	\$0.03	\$0.02

Energy Costs are similar in both VacuPress and AirVac



Where does Vacuum Drying fit?

MAY 2011

SUN

MON

TUES

WED

THURS

FRI

SAT

	<i>GET ORDER</i>	<i>SAW LOG</i>	<i>DRY</i>	<i>DRY</i>	<i>DRY</i>	<i>DRY</i>
<i>DRY</i>	<i>DRY</i>	<i>DRY</i>	<i>DRY</i>	<i>DRY</i>	<i>DRY</i>	<i>DRY</i>
<i>DRY</i>	<i>DRY</i>	<i>DRY</i>	<i>DRY</i>	<i>DRY</i>	<i>DRY</i>	<i>DRY</i>
<i>DRY</i>	<i>DRY</i>	<i>SHIP ORDER</i>				



MAY 2011

SUN	MON	TUES	WED	THURS	FRI	SAT
<i>Go fishing</i>	<i>GET ORDER</i>	<i>SAW LOG</i>	<i>DRY</i>	<i>DRY</i>	<i>SHIP ORDER</i>	<i>Go fishing</i>
<i>Go fishing</i>	<i>GET ORDER</i>	<i>SAW LOG</i>	<i>DRY</i>	<i>DRY</i>	<i>SHIP ORDER</i>	<i>Go fishing</i>
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<i>Go fishing</i>	<i>GET ORDER</i>	<i>SAW LOG</i>	<i>DRY</i>	<i>DRY</i>	<i>SHIP ORDER</i>	<i>Go fishing</i>



Thank You

Please Visit our Web site at:

www.vacutherm.com

Contact us for more information:

1-802-496-4241



Questions