4 OPERATING INSTRUCTIONS

1

MACHINE OPERATING INSTRUCTIONS

1.1 Start-up/Shut down

- Heating Up

Each Dryer has a suitable working pressure, dependent on design and production.

In order to bring the Dryer to steady operating conditions as soon as possible after the sheet begins to pass over it, the mean temperature of the shell before the sheet reaches it should be as near as possible to the same as the mean shell temperature under normal operating conditions. This can be attained by selecting a suitable steam pressure in the Dryer before the sheet passes over it. Fig. 1 shows the relationship between operating pressure and suitable steam pressure without a sheet on the Dryer. The diagram only applies, under the condition, that the hood neither heats nor cools the Dryer. If a transfer of heat occurs between Hood and Dryer in one or the other direction, this must be taken into account. The steam pressure is raised successively in accordance with 4.1.2 and Fig. 2 until the temperature has become steady. The Doctors can then be applied and the sheet brought forward.

The above procedure will raise the mean temperature of the Dryer about 90°F (50° C) per hour. As soon as operating conditions have become steady with the sheet on the Dryer, the steam pressure should be increased to suitable working pressure.

- Cooling

The practice of cooling the Dryer face by running with saturated felts is not recommended, as this can produce dangerous stresses in the Dryer. Valmet recommends that the Dryer is allowed to cool whilst rotating without any induced aids. If a quicker rate of cooling is required, the Hood exhaust fans (only) may be operated to draw room air over the Dryer.

- Shutdowns

When the Dryer is not in operation during a temporary production shutdown, it should be run at crawl rate as for Sunday operation to prevent permanent distortion.

Liquid paraffin (mineral oil) should be applied to the face to prevent corrosion. This oil does not need to be wiped off when production is re-started.

During a long shutdown the surface temperature should be maintained at 95 - 104°F (35 - 40°C) to prevent corrosion. This will also reduce the time required to warm up again.

1.2
Warm-up Procedure

The warming-up rate of the Dryer is based on a maximum allowed temperature increase of 90°F (50°C) per hour of any part of the Dryer. If this condition is controlled by steam pressure, the increase rate of the pressure should follow the diagram attached (Fig. 2).

A simple way of controlling the temperature increase is to allow only a limited flow of steam to the Dryer. For this Dryer the flow should be 960 lbs (435 kg) steam per hour.

With the air initially in the Dryer, the partial pressure of the steam in the Dryer will approximately follow the curve on the diagram. After about 1.5 hour the air is completely evacuated from the Dryer and the steam pressure starts to increase above the atmospheric pressure.

The same steam flow rate must be maintained until the required pre-set sheet-off steam pressure is reached.

Some amount of steam may escape from the Dryer with the evacuated air during the warming-up period and thus prolong the heating. When experience has been gained the given steam flow rate may be increased to a value, which compensates for the steam loss. However, this increased flow must not lead to an increase of the steam pressure in the Dryer until 1.5 hours after the steam valve has been opened.

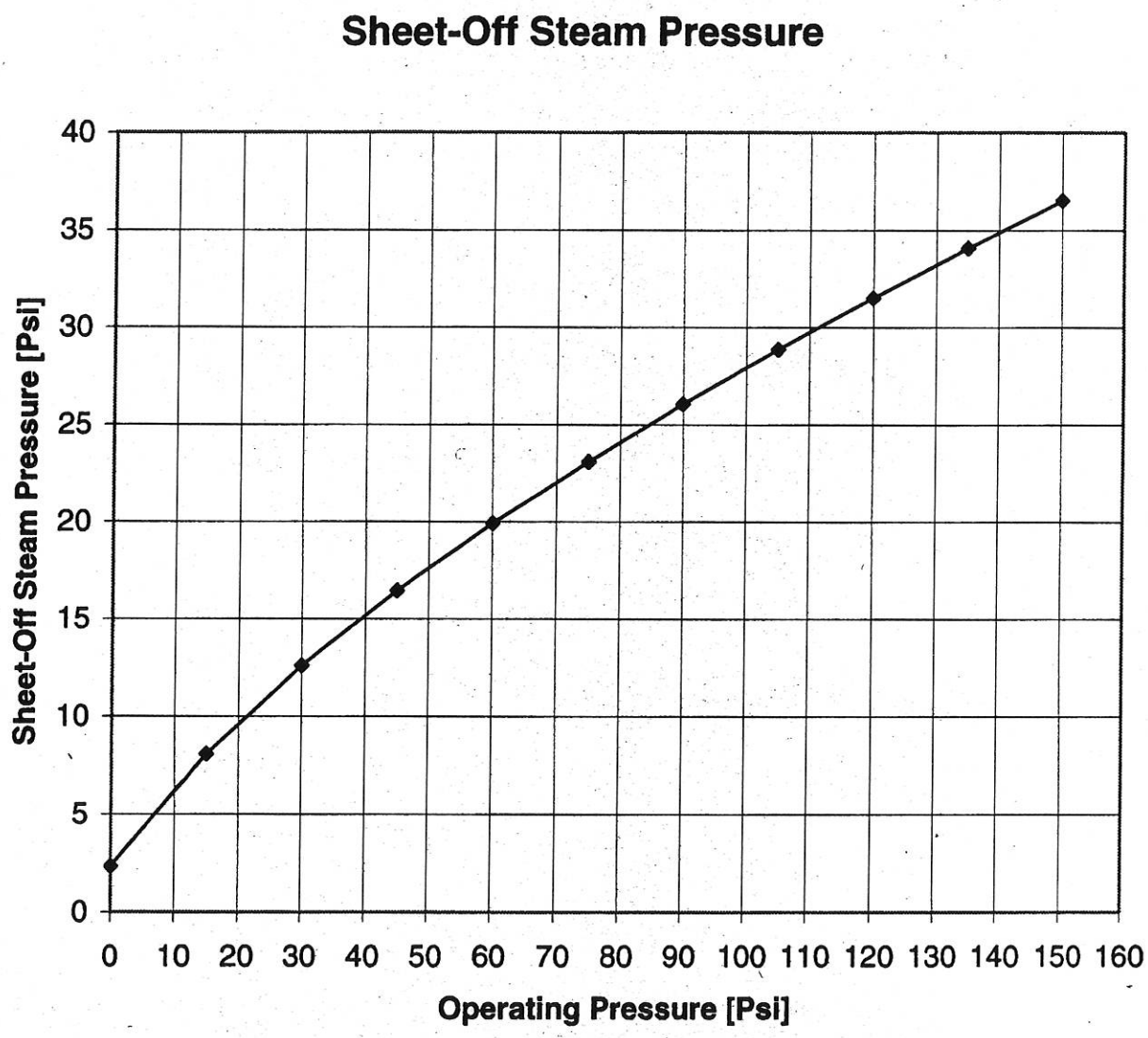
Sheet-Off Steam Pressure
Sheet-Off Steam Pressure [Psi]
0
5
10
15
20
25
30
35
40
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160
Operating Pressure [Psi]

Figure 1

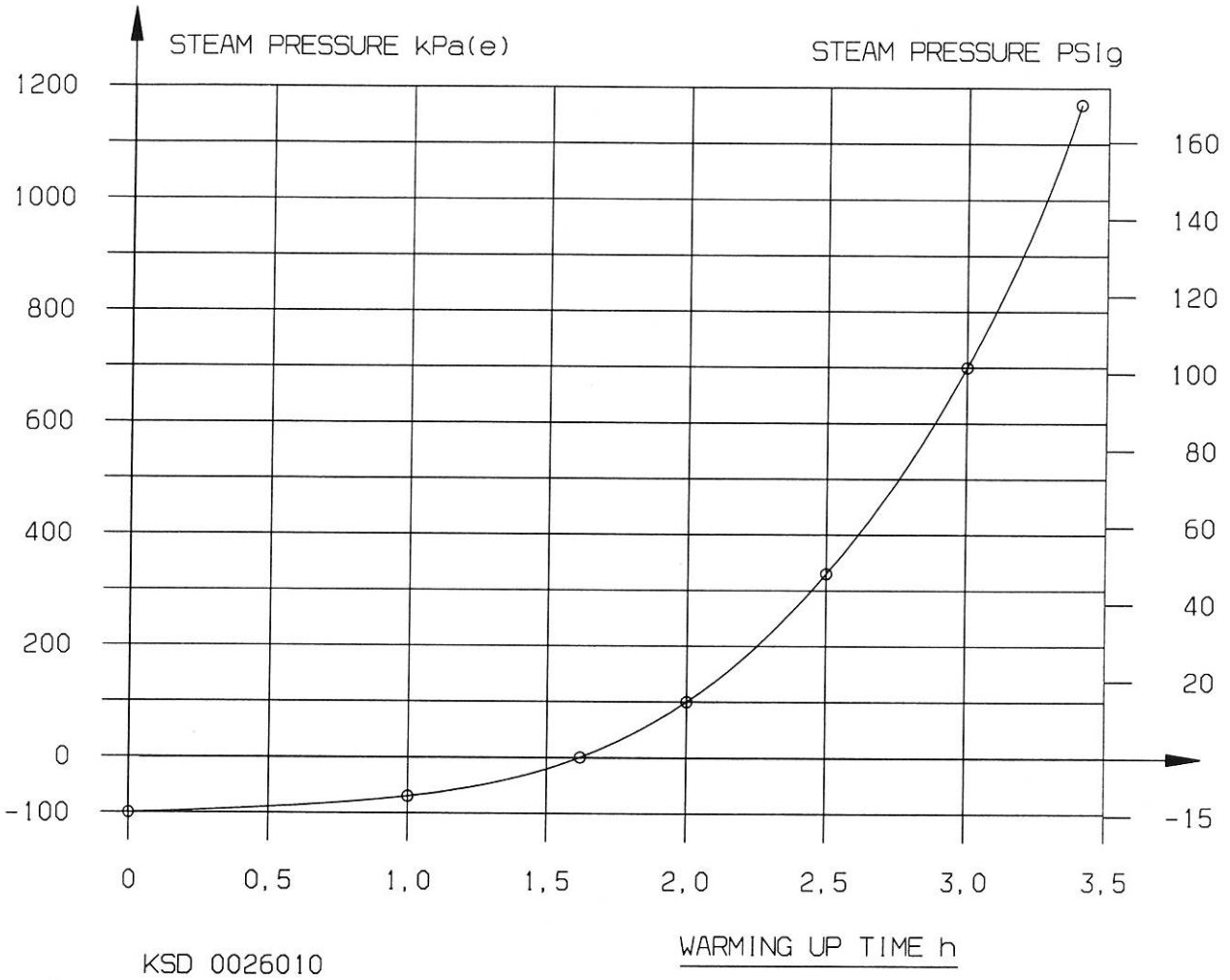
STEAM PRESSURE kPa(e)
STEAM PRESSURE PSIg
1200
1000
800
600
400
200
0
-100
160
140
120
100
80
60
40
20
-15
0
0,5
1,0
1,5
2,0
2,5
3,0
3,5
KSD 0026010
WARMING UP TIME h

Figure 2

1.3
Normal operation

Limitation of operation parameters and shell thickness in the center of the shell at delivery and during the life time of the Dryer can be found in the derating diagram (Fig. 3).

The Dryer is at delivery grinded and crowned suitable for an operation steam pressure of 30 psi (207 kPa).

Obtainable condensing rates and blow through steam are shown on attached Fig. 4 for a number of different operating conditions. Using other steam pressures than 30 psi (207 kPa) changes the water evaporation but has also other effects: A higher pressure gives drier sheet edges and lower pressure the opposite due to change of deformation of the Dryer.

The adjustment of the total evaporation required to the correct final moisture content of the sheet should be made by the hood, preferably by adjusting the air temperature and the blowing velocity.

The operation period before the first regrind should be used to find out the correct combination of crown profile (= existing), nip and steam pressure. When a higher evaporation from the Dryer is required, this will make it possible to select the correct crown profile for a higher steam pressure.

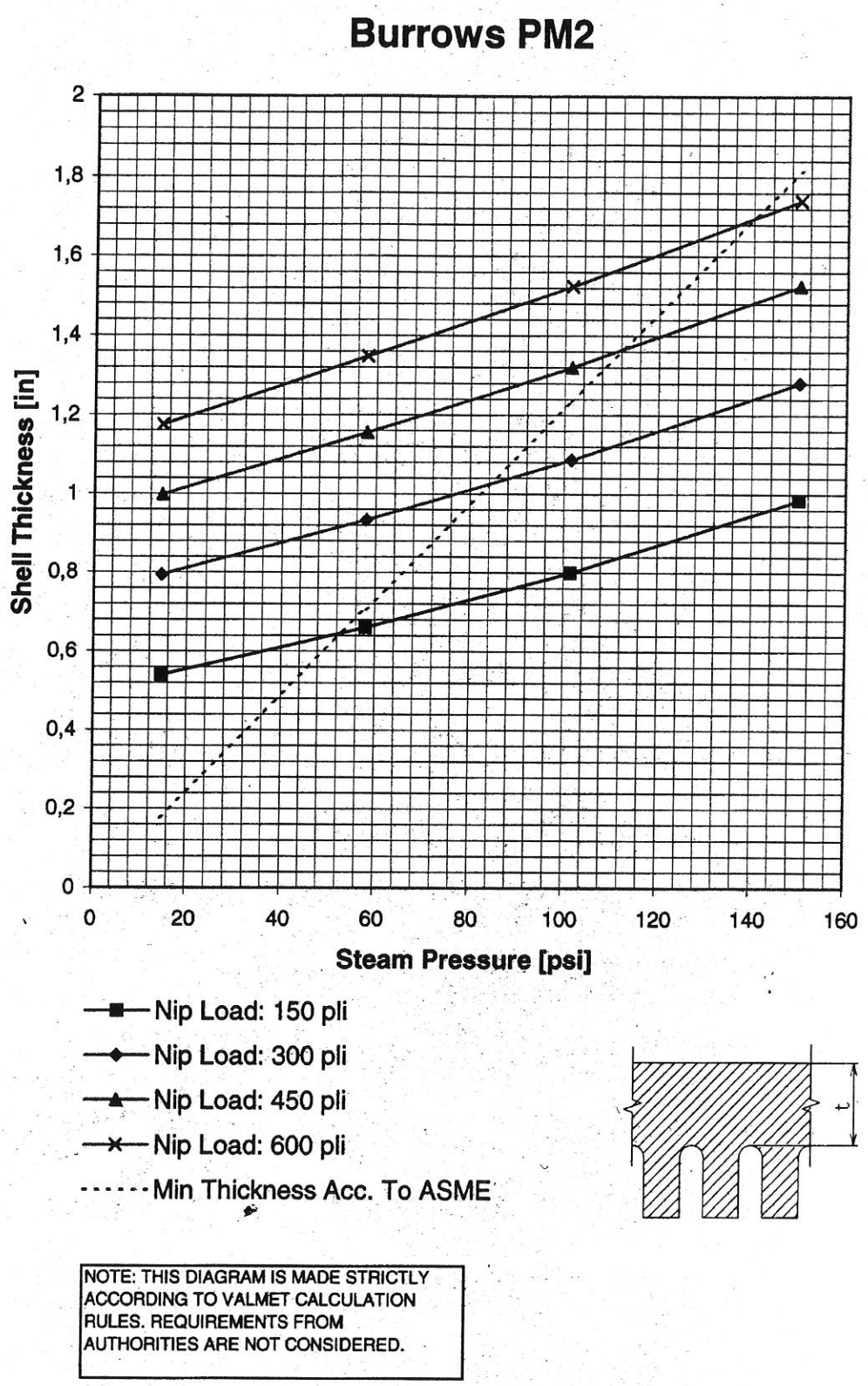
Burrows PM2
Shell Thickness [in]
2
1,8
1,6
1,4
1,2
1
0,8
0,6
0,4
0,2
0
0
20
40
60
80
100
120
140
160
Steam Pressure [psi]
Nip Load: 150 pli
Nip Load: 300 pli
Nip Load: 450 pli
Nip Load: 600 pli
Min Thickness Acc. To ASME
t
NOTE: THIS DIAGRAM IS MADE STRICTLY ACCORDING TO VALMET CALCULATION RULES. REQUIREMENTS FROM AUTHORITIES ARE NOT CONSIDERED.

Figure 3

Burrows PM2 MG Dryer

MG Dryer pressure			MG Dryer surface temperature			Condensed steam in the MG Dryer			Blow through steam	
Barg	psig		deg. C	deg. F		kg/h	lbs/h		kg/h	lbs/h
9,0	130,5		99	210		2556	5635		1845	4068
8,0	116,0		99	210		2383	5254		1669	3679
7,0	101,5		99	210		2201	4852		1492	3289
6,0	87,0		99	210		2008	4427		1315	2898
5,0	72,5		99	210		1799	3966		1136	2505
4,0	58,0		99	210		1570	3461		957	2109
3,0	43,5		99	210		1309	2886		776	1710
2,0	29,0		99	210		1001	2207		592	1305
1,0	14,5		99	210		609	1343		405	893

Figure 4

Pressure drop across the Dryer from steam inlet to condensate outlet about 11,6 - 16,0 psi (0,8 - 1,1 bar). Higher value for higher speed.

For design of the thermo-compressor the pressure drop in the pipes from the condensate outlet of the Dryer to the inlet flange of the thermo-compressor shall be added.

The condensating rate is calculated for a nominal shell thickness of 2,17"(55 mm)
If the shell thickness reaches its max. Value of 2,17"
(2,17" + 0,12"/0"/55 mm + 3 mm/0 mm), the above condensing rate figures shall be decreased with about 4%.

2
CONTROL PARAMETERS

2.1
Theory

The parameter controlling the evaporation capacity of the Dryer is mainly the steam pressure in the Dryer.

The higher the steam pressure is the higher the inside temperature of the Dryer will be and thereby also the evaporating capacity.

As the crown curve on the Dryer is correct for only one combination of operating parameters, the pressure in the Dryer should be kept as constant as possible and the necessary capacity changes should be taken care of by changing the Hood parameters.

The steam pressure in the Dryer is controlled by regulators in the Steam and Condensate System.

Another important parameter for the evaporation capacity of the Dryer is the surface temperature of the Dryer. This parameter cannot be controlled directly but is an effect of the operating condition of the Dryer and Hood.

To ensure the condensate is removed efficiently from the Dryer, the amount of blow through steam is controlled by the flow meters in the Steam System.

3

MACHINE WASH

As the Dryer is a very big steam heated pressure vessel the washing, especially with water spraying, must be done with extremely great care.

NOTE:

It is under no circumstances allowed to spray water with a water hose directly on to the hot surface of the Dryer. This would cool down the outer surface of the Dryer and create too high thermal stresses in the Shell that may cause a Dryer failure.

One must always bear in mind the above, especially if there is a fire around the Dryer.

To prevent the occurrence of a fire, it is very important to keep the top of the Doctor Bodies clear of any dust build-up and in the hot areas around the Dryer and the Hood.

4

NIP CHECK

The nip check on a Dryer is always difficult due to the high temperatures and the fact that the nip is calculated to be straight during operation with paper on the Dryer, which is a condition that can never be fulfilled during a nip check.

What can be checked is if the nip impression has a symmetrical shape, that means the balancing of different Roll weight in TS and DS is correctly made.

The magnitude of the Roll Crown has to be evaluated from the moisture profiles obtained during operation.

5

INTERLOCKINGS

The following interlockings are required to ensure the quality and functions of the Dryer.

Make sure that the lubrication systems for the MG Dryer bearing and the gearbox are in operation prior to starting the MG Dryer drive.

Stop the Dryer, if a lubrication flow or oil pressure failure has occured.

When loading the pressure rolls, the speed must be within given tolerances.