

THDF lines

Thin High Density Fiber Boards – A Dieffenbacher success

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Your Benefits

- Dieffenbacher has sold and delivered more than 40 thin fiber board production lines with product thicknesses of as low as 1.0 mm. Dieffenbacher's specially developed THDF line offers a very economical production process for fiberboard with thicknesses ranging from 1.5 to 12 mm at low raw density resulting in low consumption of wood and glue. For example, an average board density below 800 kg/m^3 can be achieved when producing 3 mm board, paintable on one side and with a surface layer density above $1,000 \text{ kg/m}^3$. The average board density can be set in a wide range up to max. 1.050 kg/m^3 , which also allows the production of flooring boards with an average density of 950 kg/m^3 on a Dieffenbacher HDF line. A special UTHDF-line concept allows the production of 1mm boards.
- The production of HDF flooring board on the high-speed Dieffenbacher line excels by an extremely low sanding allowance of 0.4 mm as compared with other continuous presses, which results in significantly lower costs for wood and glue.



Fig. 1: Thin boards for various applications

Application Areas

■ The market for HDF Board

Boards in the thickness range between 1.5 – 10 mm and densities above 800 kg/m³ will be referred to as HDF board herein. Table 1 shows the individual qualities of MDF and HDF board available in the market.

- Table 1: Market for thin MDF and HDF boards

Board type	Properties	Applications
Board thickness 1.5 – 4 mm	- Smooth and paintable on one side - Surface layer density more than 1000 kg/m ³ on the painted side	Drawer bottoms, rear panels of furniture, door surfaces formed or smooth, rear panels of posters, surface layers for sandwich boards
	- Smooth and paintable on both sides - Thickness swelling below 20% - Good internal bond - Thickness tolerance +/- 0.1 mm	Building of cars and RV, interior trim of railway compartments, picture frames, packing material, printed circuit boards, surface layers for OSB, underlay eg for drills, formwork
Board thickness 4 – 10 mm	- Light MDF with densities below 650 kg/m ³	Wall facing, furniture
	- MDF with thickness 650 – 800 kg/m ³	Partition walls, furniture, conversion of attics
	- HDF with thickness 800 – 1,050 kg/m ³ - Quality depending on 24-h thickness swell	Flooring board with lamination

Characteristics

■ Properties of HDF Board

- Table 2: Properties of HDF board produced on Dieffenbacher lines with the new Dieffenbacher fiber spreading system and CPS press

Board type	Painted Board	Flooring Board
Board thickness	1.5 mm	5.6 – 8 mm
Mat weight variation perpendicular, around mean board value 100*100 mm ² sample	+/- 2%	+/- 1.9%
Thickness tolerance	+/- 0.06 mm	+/- 0.6 mm
Density profile across the board width	Even	Even
Density profile across thickness	Precisely controllable	Precisely controllable
Surface quality	2 Good sides	2 Good sides
Paintability Sanding allowance	Both sides paintable without sanding	0.4 mm sanding allowance
Glue content UF Standard quality	Approx. 10%	Approx. 10 – 18% per thickness swell

Success based on continuous development

■ Production and Process Characteristics of the Dieffenbacher System

- Dieffenbacher has so far sold and supplied 40 thin high-density fiberboard lines with board thicknesses less than 6 mm (see table 3). Success in the market was made by consistent development of machines for the production of different qualities of HDF board at low raw material costs.
The Dieffenbacher HDF production line is the result of straightforward, quality-oriented machine development.
- Table 3: Milestones of development, thin board MDF / HDF lines

Milestones of development, thin board lines for MDF / HDF	Country, company and year of start-up
Short continuous press with high flexibility of the heating platen through decompression joint	New Zealand, Carter Hold Harvey 1992
Long, flexible infeed with early and high specific pressure and practically simultaneous contact of the mat with the upper and lower steel belts	Germany, Baruth 2001
Forming line and press designed for a feed speed of 1,500 mm/s. Production speed of more than 1,300 mm/s already realized	USA, Unilin 2002
Preheating of the surface layers	Poland, 2002
High-accuracy mat forming line and integrated dissolving roller in the outfeed of the spreader bin	China, Gaofeng 2003
Continuous press with parallel press gap, with speeds of up to 1,750 mm/s	Hungary, Kronospan 2007
Continuous press with parallel press gap, speeds of close to 2,000 mm/s	Poland, Homanit 2008
Continuous press with parallel press gap,	Thailand, Siam-Fibre 2009
Continuous press with parallel press gap, speeds of up to 2,000 mm/s	Poland, Swedspan 2011

Production Lines Specifications

■ Major requirements to HDF production lines are listed below

- Production of boards with a wide range of density

The average density must be set between 600 and 1,050 kg/m³ depending on requirements to the individual HDF board. Reliable production at high machine availability can only be guaranteed for densities up to 830 kg/m³ with calendars which is due to limited specific pressure – and up to 860 kg/m³ for continuous presses with chains.

- Production of boards with defined density profile

The density profile of the board is determined mainly by the flexibility of the heating platens in the longitudinal and perpendicular direction as well as by the design of the infeed. A very short pressureless well time at the lower steel belt, nearly simultaneous top and bottom mat contact and early application of high specific pressure are necessary for obtaining density profiles with maximum density of the surface layer available near the board surface (see Fig. 4, Density profile of a thin board, pressed on a short CPS). This is of special importance for minimizing paint consumption in the case of unsanded boards (see Fig. 5, unsanded board coming from a CPS, sprayed on one side). With upstroking presses, which do not permit flexible infeed and outfeed of the transfer nose at simultaneous height adjustment, the density profile cannot be optimized in each case because of unsymmetrical mat contact and longer pressureless dwell time.

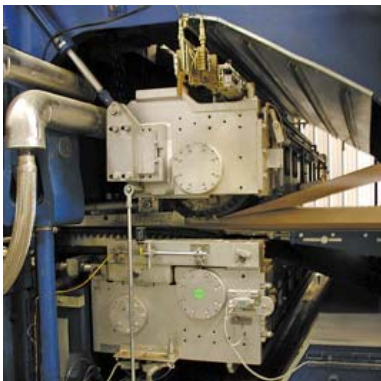


Fig. 2: CPS press infeed



Fig. 3: Surface layer steaming

Enabling Technology

- The flexibility of the heating platen per meter of the press length has an influence on further pressing, i.e. reduction of the surface layer density and amount of the core layer density. High flexibility is necessary especially when producing light MDF board where a big difference in density is required for the surface and the core layer. Controlled preheating of the mat surface layer is another possibility of optimizing the density profile and reducing the pressing time. Furthermore, it is possible to reduce the costs of release agents and do away with water spraying.

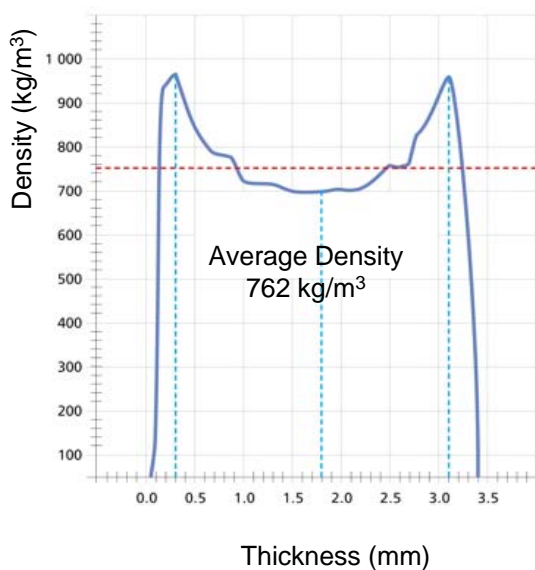


Fig. 4: Density profile HDF board
Produced on a short press type
CPS (18m)

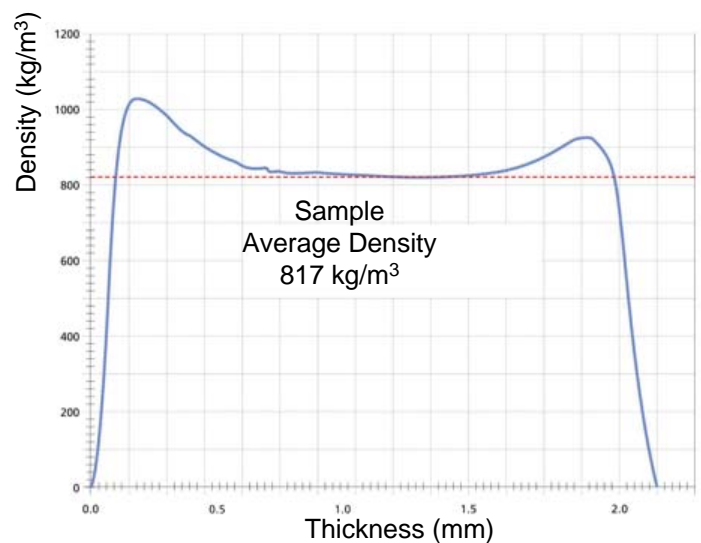


Fig. 5: Density profile HDF board
One side sprayed (Dieffenbacher
CPS production line)

- High consistency of thickness and minimum sanding allowance**
 Accurate mat forming with negligible variation of the mat weight in longitudinal and perpendicular direction, combined with precise control of the pressure across the board, early application of high specific pressure and precisely repeatable position measurement inside the press is possible on the Dieffenbacher HDF line (see Table 2).

Enabling Technology

- Little mat weight variation longitudinally and transversally to the direction of production has been achieved by combined measures. The weight difference between the line without mat in longitudinal direction and mean weight of the mat forming line is considered during fiber spreading.

The shape, arrangement and speed of the outfeed rollers of the spreading bin have been optimized to achieve even fiber discharge across the full width. Fiber classification already in the outfeed of the spreading bin avoids air turbulences in the area of the spreader head. Fiber classification rollers directly installed above the spreader head would cause air turbulences inside the spreader head and higher variations in mat weight. In the Dieffenbacher spreader head, fibers are gently deposited on the mat. Residual unevenness of the mat is corrected through knife-edge scalping.

- The cross profile of the lower heating platen can be precisely adjusted by means of multipot cylinders that are arranged under the lower heating platen. The multipots are designed to allow a specific pressure of 20 % above the maximum frame pressure. It is possible, for example, to apply a pressure of 2.5 N/mm³ in the calibration range designed with a specific pressure of 2.1 N/mm³. To achieve low thickness tolerances in the production of HDF board with a density above 920 kg/m³, sometimes it is necessary to apply a specific pressure of 2.3 N/mm³ of the calibration zone in the middle of the press (seen across the width). The multipot pressure - as a value relative to main cylinder pressure – can be easily set by the operator who therefore only needs a short training period to be able to safely control the production of boards with optimum density profiles and excellent thickness tolerance across the entire width.

Enabling Technology

- Specific pressure applied early results in a narrow zone of maximum thickness close to the board surface and thus the pressing skin is so thin that it allows removal by 0.15 mm grinding from each side. This is the reason why the grinding allowance could be reduced from 0.5 to 0.4 mm in several new Dieffenbacher flooring board lines with Dieffenbacher spreading system. A minimum grinding allowance of 0.5 mm can be achieved with other continuous double-belt press systems in well optimized lines. The 0.1 mm reduction of the grinding allowance results in cost savings of at least 0.4 million € per year (line with 40 t dry fiber per hour, costs for 1 kg of glued fiber 0.15 €, board thickness 6 mm, cost reduction in grinding not considered).
- **High line capacity and forming line speed**

The hot press infeed must be designed with accurately adjustable compression geometry to allow production at a high forming line speed of 1,750 mm/s. The CPS infeed fulfils this demand by application of a double-jointed system. Single-jointed systems only allow speeds up to approx. 900 mm/s for the mat forming line.
- **High reliability and uptime**

Fast forming belt speeds demand a special concept for steel belt protection. In this regard, Dieffenbacher has taken a range of measures to increase the service life of the steel belts decisively. Oversize fiber clumps are broken up or separated out right back in the spreading phase. In the forming belt, the Dieffensor reliably monitors the mat for excessive density values and triggers a gating-out of incorrect material if necessary. At the press infeed, the multipot cushion fitted with the corresponding sensors ensures that the system stops immediately and the press is depressurized straight away in case of blowholes or mat doubling. This prevents damage to the steel belt.

Particular Engineering and References

- Special engineering of the Dieffenbacher HDF production line avoids glue and water spots. Maintenance is very easy and uptime is high because all press areas are easily accessible and main components such as cylinders and distance transducers are installed outside the high-temperature range. Major components have a long service life which also contributes to availability. Availability is further increased by the possibility of changing the board thickness while production goes on. The press is characterized by extremely low operating costs also including low consumption of lubricating oil.

Press size	Name	Location	Thick-ness	Achieved line speed	Designed line speed	Start-up
1) 9' x 18m	Carter Holt Harvey	Rangiora, New Zealand	1.6 mm	800 mm/s	700 mm/s	1992
2) 8' x 20m	Medite, Europe	Clonmel, Ireland	2.5 mm	850 mm/s	800 mm/s	1994
3) 8' x 20m	Masisa	Concordia Argentina	2.5 mm	800 mm/s	800 mm/s	1995
4) 8,5' x 28m	Robin Resources	Mentakap, Malaysia	3.0 mm	900 mm/s	700 mm/s	1996
5) 8' x 20m	Masisa	Concepción, Chile	2.5 mm	800 mm/s	800 mm/s	1995
6) 9' x 23m	Daiken	Bintulu, Malaysia	2.5 mm	800 mm/s	800 mm/s	1996
7) 8' x 19m	PTP I	Ledhan, P.R. China	2.5 mm	800 mm/s	750 mm/s	1996
8) 10' x 35m	Wespine	Quesnel, Canada	3.0 mm	900 mm/s	800 mm/s	1996
9) 9' x 25m	N & E Co.	Komatsu-shima, Japan	3.0 mm	800 mm/s	800 mm/s	1996

References

Press size	Name	Location	Thick-ness	Achieved line speed	Designed line speed	Start-up
10) 8' x 19m	PTP II	Shishou, P.R. China	2.0 mm	1,000 mm/s	1,000 mm/s	1998
11) 8' x 15m	Evergreen	Johor Baru Malaysia	2.5 mm	800 mm/s	700 mm/s	2000
12) 9' x 34m	Unilin	Mt. Gilead USA	1.6 mm	1,400 mm/s	1,500 mm/s	2002
13) 8' x 23m	Guangxi Gaofeng	Rong Xiang, P.R. China	2.0 mm	1,200 mm/s	1,200 mm/s	2003
14) 8' x 23m	Lishui Oak, MM	Lishui, P.R. China	2.0 mm	1,200 mm/s	1,200 mm/s	2003
15) 9' x 43m	Sunway Forest Prod.	Wuzhou, P.R. China	2.5 mm	1,200 mm/s	1,200 mm/s	2003
16) 9' x 28m	Zhenghe Wood Ind.	Guang Rao, P.R. China	2.0 mm	1,200 mm/s	1,200 mm/s	2003
17) 8,5' x 31m	Asia Dekor	Guangzhou, P.R. China	3.0 mm	1,300 mm/s	1,200 mm/s	2004
18) 9' x 28m	Weihua Group	Guangzhou, P.R. China	2.0 mm	1,200 mm/s	1,200 mm/s	2004
19) 8' x 23m	Hebei Yingang	Zehngding, P.R. China	2.0 mm	1,200 mm/s	1,200 mm/s	2004
20) 8,5' x 40,6 m	Sichuan Guodong	Chengdu, P.R. China	2.0 mm	1,300 mm/s	1,500 mm/s	2005
21) 8' x 23m	Shanxi Zhong Xing	Xian, P.R. China	2.0 mm	1,200 mm/s	1,200 mm/s	2005
22) 9' x 20,4m	Hubei Baoyuan	Jinmen, P.R. China	2.0 mm/s	1,200 mm/s	1,200 mm/s	2005

References

Press size	Name	Location	Thick-ness	Achieved line speed	Designed line speed	Start-up
23) 8' x 18m	Weihua Group II	Taishan, P.R. China	2.0 mm	1,200 mm/s	1,200 mm/s	2006
24) 7' x 18,5m	Krono-span	Mofa, Hungary	2.0 mm	1,750 mm/s	1,750 mm/s	2007
25) 8' x 33,6m	Unopan	Burgos, Spain	2.5 mm	1,300 mm/s	1,500 mm/s	2007
26) 8' x 26m	Anhui DongDun	Chizhou City P.R. China	2.0 mm	1,300 mm/s	1,500 mm/s	2007
27) 10' x 28,4m	Krono-span	Eastaboga, USA	3.0 mm	1,300 mm/s	1,500 mm/s	2007
28) 8' x 18,2m	Sichuan Shengda	Chengdu, P.R. China	2.0 mm	1,200 mm/s	1,200 mm/s	2007
29) 8' x 28,1m	Homanit	Karlino, Poland	1.5 mm	1,800 mm/s	2,000 mm/s	2008
30) 8' x 24,2m	Dare Wood	Maoming, P.R. China	2.0 mm	1,350 mm/s	1,500 mm/s	2008
31) 8' x 24,2m	OOO Rimbuan MDF	Chabarovsk, Russia	1.5 mm		1,500 mm/s	2010
32) 8' x 24,2m	Weihua Hubei	Xiangfan City P.R. China	2.0 mm	1,500 mm/s	1,500 mm/s	2008
33) 8' x 24,2m	Weihua Hebei	Qiu County, P.R. China	2.0 mm	1,500 mm/s	1,500 mm/s	2008
34) 8' x 28,4m	Siam Fibre THDF 3	Hatyai, Songkhia, Thailand	1.5 mm		2,000 mm/s	2009
35) 8' x 23,6m	Xian II	Shaanxi Province, P.R. China	2.0 mm		1,500 mm/s	2009

References

Press size	Name	Location	Thick-ness	Achieved line speed	Designed line speed	Start-up
36) 8' x 23,6m	PTP II	Leshan, P.R. China	2.0 mm		1,500 mm/s	2009
37) 9' x 21,1m	Eucatex	Salto, Brazil	2.0 mm		1,500 mm/s	2010
38) 8' x 27,9m	Greenply	Rampura, India	2.5 mm		1,500 mm/s	2010
39) 8' x 26m	Guodong II	Chengdu Province, P.R. China	2.0 mm		1,500 mm/s	2009
40) 8' x 23,5m	Guangyuan Shengda	Guangyuan, China	2.0 mm		1,500 mm/s	2010
41) 9,5' x33,5m	Yongan	Yongan, China	2.0 mm		1,500 mm/s	2010
42) 8' x 23,5m	Guangxi Hezhou	Hezhou City, China	2.0mm		1,350 mm/s	2011
43) 8'x 23m	Swedspan	Poland	1.0 mm		1,800 mm/s	2011
44) 8'x 28m	Yiyang Senhua	Yiyang City, China	2.0 mm		1,500 mm/s	2011