DRYER PAPER AND PAPER PULP

BSG

made in china

General Description

In the paper machine, the paper is formed and most of the properties of the paper are determined. The paper machine is actually a large dewatering device consisting of a headbox, a wire section, press section and dryer section. The most common machine design to date is the Fourdrinier forming process in which the sheet is formed onto a continuous horizontal wire or fabric onto which the suspension of fibres is supplied from the headbox. Also, twin wire formers are used for web formation. In twin wire formers, the fibre suspension is fed between two wires operating at the same speed where the water is drained in two directions. There are different types of twin wire formers (e.g. gap formers). In gap formers, the diluted stock is injected directly into the gap between the two wires. A third alternative is to combine the Fourdrinier and a top wire. These are referred to as hybrid formers.

Figure 1 shows the key features of a twin wire paper machine.

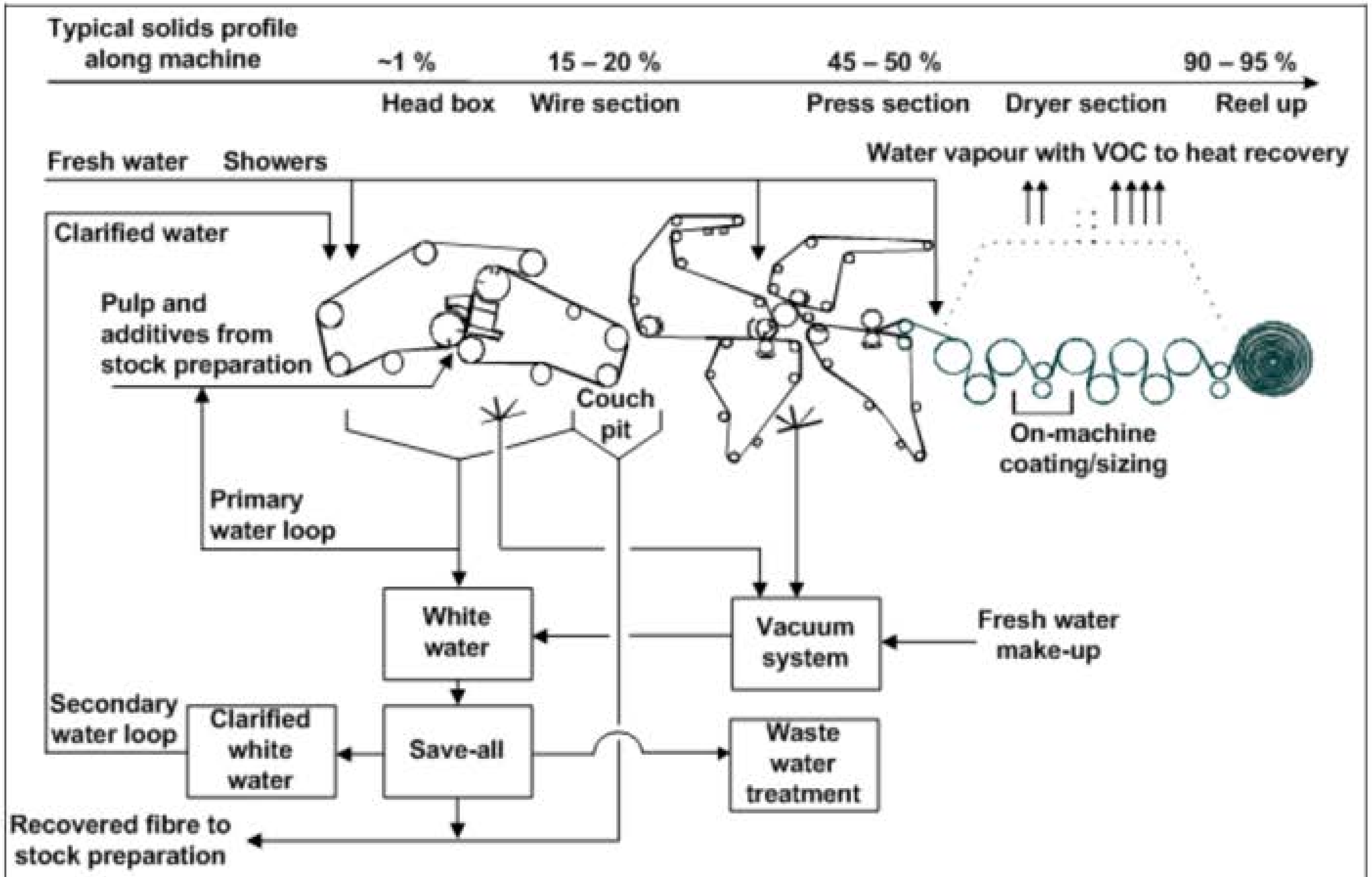

Figure 1: Key features of a twin wire paper machine

all the heat used for drying ends up in the hood as exhaust air. The temperature of the exhaust air is normally 80 – 85 °C and the humidity is 140 – 160 g H2O/kg dry air. A part of the moisture (about 1 – 1.5 m3/t of paper) is driven off to the atmosphere. For economic reasons, all paper mills have installed heat recovery systems. Figure 7.2 shows a schematic picture of an example o the drying and heat recovery section of a paper machine.

In the first heat exchanger of the heat recovery system, heat is recovered in order to heat the incoming supplied air. The next heat exchanger is for the heating of incoming fresh water. In some cases, heat is also recovered to the wire pit water to compensate for the heat losses at the wet end. The last heat exchanger is for circulation water. The circulation water is used to heat the incoming ventilation air. The supply air and shower water are heated to their final temperatures (90 – 95 °C and 45 – 60 °C respectively) using steam.

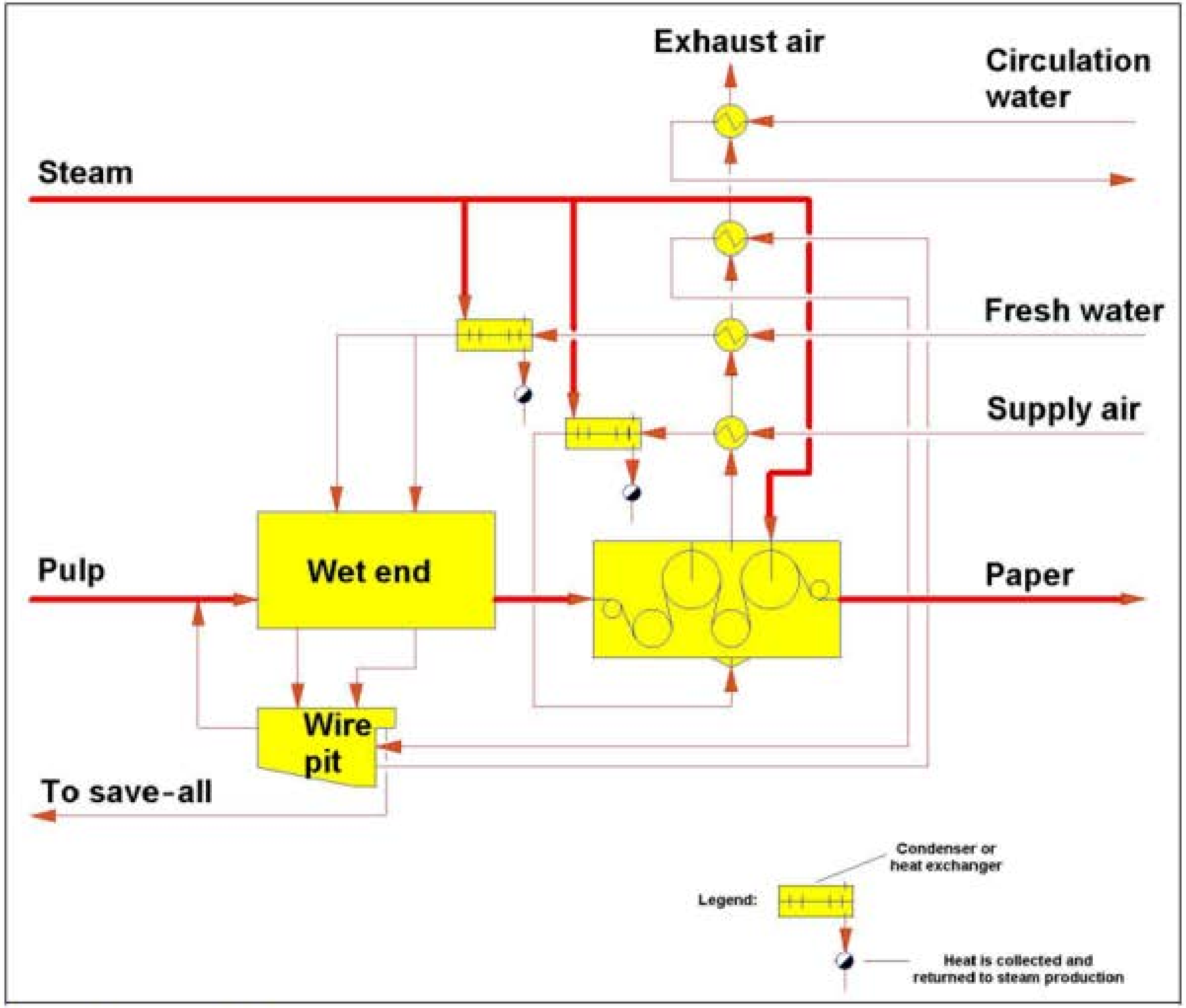

Figure 2: Paper machine heat recovery system

Table 1 shows an example of heat flows in a typical large, modern paper machine. The production capacity of the machine is 240 120 t/yr (667 t/d). The dry content of the web entering the drye section is 44.5 % and leaving is 91 % dryness. The temperature of the exhaust air is 82 °C and the humidity is 160 g H2O/kg dry air. The values are for Scandinavian winter conditions. In countries with a warmer climate, there is no need for the heating of circulation water that is used for machine room heating. Heat recovery to the circulation water decreases or disappears and the exhaust to atmosphere increases correspondingly.

Table 1: Example of heat recovery and heat losses of a paper machine with a production of 667 t/d

Sources of heat recovery	Destination of heat flow from the drying section	Distribution of heat (%)
Supply air	1.8 MW_{th} or 233 MJ/t	6
Wire pit water	3.6 MW_{th} or 466 MJ/t	11
Fresh water	5.5 MW_{th} or 712 MJ/t	19
Circulation water	8.0 MW_{th} or 1 036 MJ/t	27
Exhaust to atmosphere	10.8 MW_{th} or 1 399 MJ/t	37
Total (Exhaust air from hood)	29.7 MW_{th} or 3 847 MJ/t	100
Source: Valmet, 1998.		

One alternative to drying the paper for the production of light-weight machine-glazed paper or conventional tissue is the use of a large diameter, heated 'Yankee' cylinder on the machine. The drying of the paper web is carried out during one rotation of the cylinder. In a simple papermaking set-up, the paper may then be reeled and sent for cutting and finishing. In more complex cases, a variety of different stages are incorporated within the machine, e.g. a film press where starch and other chemicals are applied on the surface of the paper by dipping or spraying, with residual water being removed in a short after-drying section.

In most applications, the edges of the web are continually trimmed with cutting water jets, into the couch pit, as it leaves the wire. Whenever the web breaks (it can happen a number of times per day), there is a considerable loss of paper. Similar losses occur on regular start-ups. All of this paper, termed 'broke', is repulped and returned to the stock chests in the stock preparation area. Losses of dry paper may be repulped immediately or stored and reintroduced later to the system. Coloured or coated broke is recycled if possible but sometimes needs to be bleached or chemically treated first.

There is a continuous need to prevent the build-up of solids on the fast-moving wires, felts or rollers as these would quickly lead to web breaks. The showers or sprays for this purpose are the primary consumers of fresh water and/or cleaned water in the system. Vacuum systems can also consume substantial amounts of fresh water. However, water-free vacuum systems are also available.

The retention of solids (fibres, fines and fillers) and solubles (added chemicals, organic material from the pulp, etc.) in the paper web, rather than passing them through the mesh and allowing them to remain in the water circuit, is important. It affects the likely destination of any substance – either to the product or to the effluent. On-line consistency monitoring is often used to stabilise retention. The retention of solids on the wire can be increased by the addition of retention aids (chemicals improving retention), and this is normal practice for most paper grades. However, this is constrained for some grades by product quality.

Energy consumption efficiency of paper machine

In order to reduce the consumption of thermal and electrical energy, BAT is to use a combination of the techniques given below.

	Technique	Applicability
a	Energy saving screening techniques (optimised rotor design, screens and screen operation)	Applicable to new mills or major refurbishments
b	Best practice refining with heat recovery from the refiners	
c	Optimised dewatering in the press section of paper machine/wide nip press	Not applicable to tissue paper and many speciality papers grades
d	Steam condensate recovery and use of efficient exhaust air heat recovery systems	Generally applicable
e	Reduction of direct use of steam by careful process integration using e.g. pinch analysis	
f	High efficient refiners	Applicable to new plants
g	Optimisation of the operating mode in existing refiners (e.g. reduction of no load power requirements)	Generally applicable
h	Optimised pumping design, variable speed drive control for pumps, gearless drives	
i	Cutting edge refining technologies	
j	Steam box heating of the paper web to improve the drainage properties/dewatering capacity	Not applicable to tissue paper and many speciality papers grades
k	Optimised vacuum system (e.g. turbo fans instead of water ring pumps)	Generally applicable
l	Generation optimisation and distribution network maintenance	
m	Optimisation of heat recovery, air system, insulation	
n	Use of high efficient motors (EFF1)	
o	Preheating of shower water with a heat exchanger	
p	Use of waste heat for sludge drying or upgrading of dewatered biomass	
q	Heat recovery from axial blowers (if used) for the supply air of the drying hood	
r	Heat recovery of exhaust air from the Yankee hood with a trickling tower	
s	Heat recovery from the infrared exhaust hot air	