DOWNLOAD PDF PAPER MACHINE WET PRESS MANUAL

Chapter 1 : Paper Machine Wet Press Manual, Fourth Edition

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Paper with legible Chinese writings on it has been dated to 8 BCE, [2]. The traditional inventor attribution is of Cai Lun , an official attached to the Imperial court during the Han Dynasty BCE CE , said to have invented paper about CE using mulberry and other bast fibres along with fishnets, old rags, and hemp waste. In the 8th century, papermaking spread to the Islamic world , where the process was refined, and machinery was designed for bulk manufacturing. Muslims invented a method to make a thicker sheet of paper. This innovation helped transform papermaking from an art into a major industry. This fiber is soaked, cooked, rinsed and traditionally hand-beaten to form the paper pulp. The long fibers are layered to form strong, translucent sheets of paper. In Eastern Asia, three traditional fibers are abaca , kozo and gampi. In the Himalayas, paper is made from the lokta plant. In Europe , papermaking moulds using metallic wire were developed, and features like the watermark were well established by CE, while hemp and linen rags were the main source of pulp, cotton eventually taking over after Southern plantations made that product in large quantities. This machine produces a continuous roll of paper rather than individual sheets. These machines are large. Some produce paper meters in length and 10 meters wide. Keller had invented the machine and associated process to make use of wood pulp in papermaking. Manual papermaking[edit] Five seminal steps in ancient Chinese papermaking outlined in a woodcut. Papermaking, regardless of the scale on which it is done, involves making a dilute suspension of fibres in water, called "furnish", and forcing this suspension to drain through a screen, to produce a mat of interwoven fibres. Water is removed from this mat of fibres using a press. The process of manufacturing handmade paper can be generalized into five steps: Separating the useful fibre from the rest of raw materials. Beating down the fibre into pulp Adjusting the colour, mechanical, chemical, biological, and other properties of the paper by adding special chemical premixes Screening the resulting solution Pressing and drying to get the actual paper Screening the fibre involves using a mesh made from non-corroding and inert material, such as brass, stainless steel or a synthetic fibre, which is stretched in a wooden frame similar to that of a window, this tool being knows as a paper mould. The size of the paper is governed by the open area of the frame. The mould is then completely submerged in the furnish, then pulled, shaken and drained, forming a uniform coating on the screen. Excess water is then removed, the wet mat of fibre laid on top of a damp cloth or felt in a process called "couching". The process is repeated for the required number of sheets. This stack of wet mats is then pressed in a hydraulic press. The fairly damp fibre is then dried using a variety of methods, such as vacuum drying or simply air drying. Sometimes, the individual sheet is rolled to flatten, harden, and refine the surface. Finally, the paper is then cut to the desired shape or the standard shape A4, letter, legal, etc. The deckle leaves the edges of the paper slightly irregular and wavy, called "deckle edges", one of the indications that the paper was made by hand. Deckle-edged paper is occasionally mechanically imitated today to create the impression of old-fashioned luxury. The impressions in paper caused by the wires in the screen that run sideways are called "laid lines" and the impressions made, usually from top to bottom, by the wires holding the sideways wires together are called "chain lines". Watermarks are created by weaving a design into the wires in the mould. Handmade paper generally folds and tears more evenly along the laid lines. Handmade paper is also prepared in laboratories to study papermaking and in paper mills to check the quality of the production process.

Chapter 2 : Affordable Paper Making PressAffordable Binding Equipment

"The Paper Machine Wet Press Manual, Fourth Edition" is a project of the Water Removal Committee of TAPPI's Engineering Division pages, soft cover.

The process sections[edit] Paper machines usually have at least five distinct operational sections: Forming section , commonly called the wet end, is a continuous rotating wire mesh which removes water from the paper by sucking it out of suspension. Press section where the wet fibre web passes between large rolls loaded under high pressure to squeeze out as much water as possible. Drying section , where the pressed sheet passes partly around, in a serpentine manner, a series of steam heated drying cylinders. Infra-red driers are also used to supplement cylinder drying where required. Calender section where the dried paper is smoothened under high loading and pressure. Only one nip where the sheet is pressed between two rolls is necessary in order to hold the sheet, which shrinks through the drying section and is held in tension between the press section or breaker stack if used and the calender. Extra nips give more smoothing but at some expense to paper strength. Reel section where paper coming out of the machine is wound onto individual spools for further processing. There can also be a coating section to modify the surface characteristics with coatings such as china clay. History[edit] Before the invention of continuous paper making, paper was made in individual sheets by stirring a container of pulp slurry and either pouring it into a fabric sieve called a sheet mould or dipping and lifting the sheet mould from the vat. While still on the fabric in the sheet mould, the wet paper is pressed to remove excess water and then the sheet is lifted off to be hung over a rope or wooden rod to air dry. Fourdrinier machine[edit] In , Louis-Nicolas Robert of Essonnes , France, was granted a patent for a continuous paper making machine. Didot thought that England was a better place to develop the machine. But during the troubled times of the French Revolution , he could not go there himself, so he sent his brother-in-law, John Gamble, an Englishman living in Paris. Through a chain of acquaintances, Gamble was introduced to the brothers Sealy and Henry Fourdrinier , stationers of London, who agreed to finance the project. Gamble was granted British patent on 20 October The Fourdrinier machine used a specially woven plastic fabric mesh conveyor belt known as a wire, as it was once woven from bronze in the forming section, where a slurry of fibre usually wood or other vegetable fibres is drained to create a continuous paper web. The original Fourdrinier forming section used a horizontal drainage area, referred to as the drainage table. With the help particularly of Bryan Donkin , a skilled and ingenious mechanic, an improved version of the Robert original was installed at Frogmore Paper Mill , Apsley, Hertfordshire , in , followed by another in The Fourdriniers also bought a mill at St Neots intending to install two machines there and the process and machines continued to develop. Thomas Gilpin is most often credited for creating the first U. S cylinder type papermaking machine at Brandywine Creek , Delaware in This machine was also developed in England, but it was a cylinder mould machine. Pulp paper The plant fibres used for pulp are composed mostly of cellulose and hemi-cellulose, which have a tendency to form molecular linkages between fibres in the presence of water. After the water evaporates the fibres remain bonded. It is not necessary to add additional binders for most paper grades, although both wet and dry strength additives may be added. Rags of cotton and linen were the major source of pulp for paper before wood pulp. Today almost all pulp is of wood fibre. Cotton fibre is used in speciality grades, usually in printing paper for such things as resumes and currency. Sources of rags often appear as waste from other manufacturing such as denim fragments or glove cuts. Fibres from clothing come from the cotton boll. Bleach and other chemicals remove the colour from the fabric in a process of cooking, usually with steam. The cloth fragments mechanically abrade into fibres, and the fibres get shortened to a length appropriate for manufacturing paper with a cutting process. Rags and water dump into a trough forming a closed loop. A cylinder with cutting edges, or knives, and a knife bed is part of the loop. The spinning cylinder pushes the contents of the trough around repeatedly. As it lowers slowly over a period of hours, it breaks the rags up into fibres, and cuts the fibres to the desired length. The cutting process terminates when the mix has passed the cylinder enough times at the programmed final clearance of the knives and bed. Another source of cotton fibre comes from the cotton ginning process. The seeds remain, surrounded by short fibres known as linters for their short length and resemblance to lint. Linters are too short for successful use in fabric. Linters removed from the cotton seeds are available as first and second cuts. The first cuts are longer. The two major classifications of pulp are chemical and mechanical. Chemical pulps formerly used a sulphite process , but the kraft process is now predominant. Kraft pulp has superior strength to sulphite and mechanical pulps. Both chemical pulps and mechanical pulps may be bleached to a high brightness. Chemical pulping dissolves the lignin that bonds fibres to one another, and binds the outer fibrils that compose individual fibres to the fibre core. Lignin, like most other substances that can separate fibres from one another, acts as a debonding agent, lowering strength. Strength also depends on maintaining long cellulose molecule chains. The kraft process, due to the alkali and sulphur compounds used, tends to minimize attack on the cellulose and the non-crystalline hemicellulose , which promotes bonding, while dissolving the lignin. Acidic pulping processes shorten the cellulose chains. Kraft pulp makes superior linerboard and excellent printing and writing papers. Groundwood, the main ingredient used in newsprint and a principal component of magazine papers coated publications , is literally ground wood produced by a grinder. Therefore, it contains a lot of lignin, which lowers its strength. The grinding produces very short fibres that drain slowly. Thermomechanical pulp TMP is a variation of groundwood where fibres are separated mechanically while at high enough temperatures to soften the lignin. Between chemical and mechanical pulps there are semi-chemical pulps that use a mild chemical treatment followed by refining. Semi-chemical pulp is often used for corrugating medium. Bales of recycled paper normally old corrugated containers for unbleached brown packaging grades may be simply pulped, screened and cleaned. Recycling to make white papers is usually done in a deinking plant, which employs screening, cleaning, washing, bleaching and flotation. Deinked pulp is used in printing and writing papers and in tissue , napkins and paper towels. It is often blended with virgin pulp. At integrated pulp and paper mills, pulp is usually stored in high density towers before being pumped to stock preparation. Non integrated mills use either dry pulp or wet lap pressed pulp, usually received in bales. The pulp bales are slushed in a [re]pulper. Stock pulp preparation[edit] Stock preparation is the area where pulp is usually refined, blended to the appropriate proportion of hardwood , softwood or recycled fibre, and diluted to as uniform and constant as possible consistency. The pH is controlled and various fillers, such as whitening agents, size and wet strength or dry strength are added if necessary. Additional fillers such as clay , calcium carbonate and titanium dioxide increase opacity so printing on reverse side of a sheet will not distract from content on the obverse side of the sheet. Fillers also improve printing quality. Historically these were made of special ceramic tile faced reinforced concrete, but mild and stainless steels are also used. Low consistency pulp slurries are kept agitated in these chests by propeller like agitators near the pump suction at the chest bottom. In the following process, different types of pulp, if used, are normally treated in separate but similar process lines until combined at a blend chest: From the unrefined stock chest stock is again pumped, with consistency control, through a refiner. The discs have raised bars on their faces and pass each other with narrow clearance. This action unravels the outer layer of the fibres, causing the fibrils of the fibres to partially detach and bloom outward, increasing the surface area to promoting bonding. Refining thus increases tensile strength. For example, tissue paper is relatively unrefined whereas packaging paper is more highly refined. Refined stock from the refiner then goes to a refined stock chest, or blend chest, if used as such. Refining can cause the softwood fibre tube to collapse resulting in undesirable properties in the sheet. From the refined stock, or blend chest, stock is again consistency controlled as it is being pumped to a machine chest. It may be refined or additives may be added en route to the machine chest. The machine chest is basically a consistency levelling chest having about 15 minutes retention. This is enough retention time to allow any variations in consistency entering the chest to be levelled out by the action of the basis weight valve receiving feedback from the on line basis weight measuring scanner. Many paper machines mistakenly control consistency coming out of the machine chest, interfering with basis weight control. The forming section makes the pulp into the basis of for sheets along the wire. The press section, which removes much of the remaining water via a system of nips formed by rolls pressing against each other aided by press felts that support the sheet and absorb the pressed water. The dryer section of the paper machine, as its name suggests, dries the paper by way of a series of internally steam -heated cylinders that evaporate the moisture. Calenders are used to make the paper surface extra smooth and glossy. In practice calender rolls are normally placed vertically in a stack. Diagram showing the sections of the Fourdrinier machine Forming section or wet end[edit] A worker inspecting wet, bleached wood pulp on an old-fashioned Hollander pulper or "beater". From the machine chest stock is pumped to a head tank, commonly called a "head tank" or stuff box, whose purpose is to maintain a constant head pressure on the fiber slurry or stock as it feeds the basis weight valve. The stuff box also provides a means allowing air bubbles to escape. Flow from the stuff box is by gravity and is controlled by the basis weight valve on its way to the fan pump suction where it injected into main flow of water to the fan pump. The main flow of water pumped by the fan pump is from a whitewater chest or tank that collects all the water drained from the forming section of the paper machine. Before the fiber stream from the stuff box is introduced, the whitewater is very low in fiber content. The whitewater is constantly recirculated by the fan pump through the headbox and recollected from the wire pit and various other tanks and chests that receive drainage from the forming wire and vacuum assisted drainage from suction boxes and wet fiber web handling rolls. On the way to the head box the pulp slurry may pass through centrifugal cleaners, which remove heavy contaminants like sand, and screens, which break up fibre clumps and remove over-sized debris.

Chapter 3 : Breaks of the Web (Troubleshooting Guide)

*Paper Machine Wet Press Manual (Tappi Press books ; no. 34) [Richard A. Reese] on calendrierdelascience.com *FREE* shipping on qualifying offers. Designed as an introduction to wet pressing technology in the paper industry and practical application of paper machines.*

In the video, the recess the press screw foot goes in on top of the upper platen is no longer a part of this press, as it was found it was not needed and just added extra cost. The current model is shown in the below pictures. I suggest drying the press completely between pressings, to preserve your press. A coat of wax on the wood once in awhile will also help. The color of the laminate on the one you get may be different than the picture, as I use extra pieces from my shop. The tops are capped with steel acorn nuts as protection. The bottom has Baltic birch plywood feet with non-skid rubber discs so you can really tighten the screw without the press sliding around on the table. This leaves the press completely open for putting the felts in. No more struggling to fit them under the upper platen! Just set them in, place the lower platen on top of the felts, run the screw down and press. It also comes with a removable base not shown that you can couch your paper on and then place into the press. This makes for easier loading of the press. Nice and portable for classes and demonstrations! It can also be used for pressing books, flowers, foliage, collage, print making and anything else that needs pressing. A versatile multi-function press at an affordable price. Customized paper making presses are available too. Send your special requirements though the contact page and I will get back to you. This press is heavier than most of my other products. You are also welcome to pick it up from my shop and avoid shipping charges. Also, the cup the press-foot sets into on the upper platen has been replaced with a flat piece of flat aluminum, as shown in the pictures.

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Chapter 4 : Charge Analyzer Wet End Papermaking

*Paper Machine Wet Press Manual [Peter Seifert] on calendrierdelascience.com *FREE* shipping on qualifying offers. A brief introduction to wet pressing in the paper industry, covering both the basic ideas and day-to-day aspects of operation.*

For instance, the drives of the paper machine may be unstable or poorly adjusted. Some detective work may be needed to determine why the paper web is breaking. The location at which the web is breaking may be your first clue: DRY-END BREAKS can result from a weak points or holes in the paper, b insufficient ability to stretch , relative to the draw applied to the paper, c air-handling and fluttering issues, or d adhesion of the paper web to tacky surfaces. Weak points may result from variations in retention or drainage. Alternatively, a sudden increase in the amount of fines retained in paper is likely to weaken the paper and slow the rate of dewatering. A wetter web may have insufficient tensile strength to make it through parts of the paper machine system. Holes may be the result of biological slime becoming incorporated into the paper. Slime can be controlled by a biocide program. The paper machine system is especially vulnerable to slime in the headbox area. Since the headbox comes after the pressure screens , any slime that gets entrained into the flow is likely to end up in the paper. Biocide treatments often involve a combination of an oxidizing agent such as chlorine dioxide and one or more antibacterial agent [Edwards, ; Hoekstra,]. Excessive adhesion of the web to dryer can surfaces sometimes results from deposition of tacky substances [Douek et al. Tacky substances may become transferred from the paper surface and build up on dryer cans. Subsequently, the paper may adhere excessively to the dryer can surface and become torn. Papermakers often address this type of problem with the installation of doctor blades to minimize build-up of anything onto the can surfaces. Wet-end chemical approaches include the use of talc [Allen et al. The problem can be especially vexing on paper machines that have traditional "pond"-type size presses not blade-metered, rod-metered, or gate-roll film-presses. Application of starch to the surface of paper has the potential to temporarily weaken the paper, especially if there is insufficient hydrophobic nature imparted by internal sizing agents. Click on the appropriate links to get information about optimization of internal sizing with rosin , AKD , or ASA wet-end sizes. Rosin sizing problems may be related to dosage of either the rosin or an aluminum compound , pH , or addition points. AKD sizing problems can be due to insufficient dosage, poor retention , or inadequate drying. Since AKD is relatively slow-curing, any wet spots perhaps due to drops of condensate landing on the paper web are likely to result in unsized areas. Likewise, streaks of higher moisture may fail to become well sized. Sometimes AKD sizing issues can be minimized by over-drying the paper before the size press, though such practices tend to embrittled the resulting paper. ASA sizing is less susceptible to cure problems because of higher reactivity. However, poor sizing efficiency can result if there is significant decomposition of the size before the paper is dried. Premature decomposition of ASA can be minimized by using the emulsion immediately after its preparation, acidifying the emulsion by adding alum or adipic acid to the starch solution to lower the pH, adding the ASA after the hydrocyclone cleaners , and maintaining high first-pass retention. Many causes are likely to be related to wet-web mechanical properties such as wet-web tensile strength and stretch. Excellent analyses of wet-web strength issues have been published [see references that follow]. In brief, it has been shown that the ability of a wet web to resist breakage is a function of both tensile strength and stretch, and that both of these variables are affected by moisture content. That means that any variations in moisture content after the forming section are likely to cause large variations in wet-web strength properties. Since it is impractical to adjust draws to compensate for very rapid changes in stretch of the wet-web, large variations easily can result in a web break. A common way to increase wet-web tensile strength is to increase the softwood content of the furnish. For sake of completeness, it might also be mentioned that wet-web tensile strength and toughness are favored by high surface tension of the white water. Surfactants and other materials that tend to lubricate the contacts between fibers tend to weaken the wet web. Other factors that may cause wet-end breaks are closely related to those mentioned in the case of dry-end breaks. Deposition of tacky materials onto press felts and transfer rolls in the wet-press section can result in excessive adhesion of the paper in these areas. The information in this Guide is provided as a public service by Dr. Users of the information contained on these pages assume complete responsibility to make sure that their practices are safe and do not infringe upon an existing patent. There has been no attempt here to give full safety instructions or to make note of all relevant patents governing the use of additives. Please send corrections if you find errors or points that need better clarification. Go to top of this page.

Chapter 5 : Troubleshooting Guide for Papermaking Chemistry

Pressing of the web on the paper machine follows entering of wet web through the nip of two rolls running under pressure. Under the effect of pressure between the two rolls further water removal of.

Chapter 6 : Papermaking - Wikipedia

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Chapter 7 : Paper machine - Wikipedia

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