DEVELOPMENT OF A SYSTEM FOR AUTOMATICALLY CLEANING THE BLANKETS OF A WEB OFFSET PRESS

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Abstract: A system for automatically cleaning the blankets of a web offset perfecting press at printing speed is described. A complete system consists of a control box, a solvent metering box for each print unit, and a cloth handling unit for each blanket cylinder. The principle employed emulates a manual wash-up in that solvent is applied to a web of disposable cloth, which in turn is pressed against the blanket cylinder. Periodically the cloth is advanced and additional solvent is applied as necessary.

Wash-ups, which are initiated by a button on the control panel, are carried out with the blanket cylinders "on impression", the ink form rollers lifted, and the ink ductor roller silenced. At the completion of a wash-up, which typically takes 20 seconds, the press is automatically returned to printing condition. The number of signatures lost or wasted is about 250.

In addition to describing the final system design, the paper provides information on blanket piling, blanket wash-up requirements, outlines some of the more significant development problems encountered, and describes some of the test work carried out as part of the development program. Wash-up performance using the automatic system is compared with average performance for manual wash-ups.

Introduction

Early in 1980, a program was initiated by Baldwin-Gegenheimer Corporation to develop an automatic blanket cleaning system for commercial web presses. The program strategy called for utilizing the system concept

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which had been so successfully developed in Europe by Baldwin-Gegenheimer GmbH for use on sheetfed presses (Foley, 1977) and to make adaptions as necessary for application to the higher speed commercial web presses. As a first step in the program, a survey was made of web printers to establish wash-up practices and requirements and to determine what design advances would be needed for the web application. This survey also served to confirm the program premise that an automatic blanket cleaner for web presses had great potential for significantly improving press productivity.

Two prototype wash-up units were built, and tested under printing conditions on one printing tower of a Harris M-1000 press in December of 1980. The results were so encouraging that a complete system for washing up all four printing units was built and installed on the same press in July of 1981. Since that time, two additional systems have been built and much useful information obtained. The performance of the system has exceeded expectations in that wash-up times of 20 seconds have been achieved with significant reductions in signatures lost due to wash-up. Two of the three systems built are in regular use while the third, awaiting installation in Europe (in May of 1982), will be evaluated under printing conditions in Europe.

The main objective of this paper is to describe the design of the system which has evolved from the development program, i.e., the systems presently in operation and in production. Toward this end, a considerable amount of space is devoted in latter sections to descriptions of the major design features of the system and its performance characteristics. The initial sections of the paper present general information on blanket piling, specific information on the nature of blanket piling on heatset web offset presses, and descriptions of manual wash-up practices, together with estimates of the amount of waste which accrues as a result.

Background Information

Blanket contamination is one of the limitations of the lithographic process. That is, sooner or later, on any lithographic press, the build-up of debris on the blankets will accumulate to a point where the printing operation must be interrupted and the blankets must be cleaned, even when printing on metal. The debris must be removed to prevent deterioration in print quality and/or damage to the blanket. Such debris consists of very finely divided particles which gradually build up or pile on the blanket surface; hence the more common name, blanket piling.

Typically, blanket piling can contain spray powder (on sheetfed presses), gum glaze, paper lint or fibers, paper coating, and ink constituents or particles. Depending on its composition, the piling or debris may be soluble in water or may require the application of an ink compatible solvent to affect its removal.

Although the frequency at which blankets must be cleaned varies widely with printing conditions, it is a significant limitation in many, many printing plants. For example, on large sheetfed presses printing on board or paper of poor quality, the time spent on blanket cleaning can amount to a loss in productivity of as much as 10 percent (MacPhee, 1977-2). In this particular application (in the United States), troublesome blanket piling is most often ink-colored, which requires an ink compatible solvent for cleaning. The generally accepted explanation for this phenomenon is that the tacky inks used on sheetfed presses pick or pull particles from the paper or board surface and that these particles, bound together by the ink they contaminate, pile up on the blanket. However, in some instances, water-soluble-paper-colored piling made up primarily of paper fibers, may also be very troublesome.

Newspaper presses are also troubled by lint piling (Lebel and Petersen, 1980) even though news inks are much less tacky than the ink used on sheetfed presses. This, no doubt, is due to the fact that the uncoated ground wood paper used in such printing has much less resistance to weakening by water than does the coated paper used widely in commercial printing. Generally, the piling which accumulates on newspaper press blankets can be washed off with water. The most likely explanation for why water can be used is that the great bulk of this debris is made up of paper fibers which are already saturated with water.

Blanket Piling on Heatset Web Offset Presses

Except for a survey made by GATF many years ago (Hull, 1970), very little has been published on this subject. Nevertheless, much is known about blanket piling on commercial web presses by both printers and suppliers and these sources have provided much useful information to the authors. Blanket piling on heatset web offset presses is not a universal phenomenon in that it varies widely from one printing plant to the next. About the only general statement that can be made is that blanket piling is an important problem in a large percentage of web plants and often accounts for a significant amount of running waste on a commercial web press.

Figure 1 shows one way of categorizing blanket piling on commercial web presses; in terms of whether it is ink-colored or paper-colored, and in terms of on what area of the blanket it accumulates. Figure 2 shows one type of piling commonly encountered; ink-colored (current ink) piling in the nonimage area. This piling is a mixture of mostly ink constituents and small amounts of paper coating - with the ink source being that ink emulsified in or tinting the fountain solution which is carried on the plate. On the particular job being run (on a Harris M-110 press), it was necessary to wash the blankets after every 40,000 impressions. Aside from the time and paper lost, this type of piling also produces hickeys since, as shown in Figure 2, the piled debris peels or chips off and the chips can become attached to the plate. An ink-compatible solvent is needed to remove this type of piling.

Another type of piling often seen is shown in Figure 3; the same as in Figure 2, except that the piling is colored by a previous down ink. Although the composition of this piling is also mostly ink, the source of the ink is the web. Another difference is that the small quantities of paper particles in the piling shown in Figure 2 came from a nonimage area of the web, whereas in Figure 3, they came from an inked or image area of the web. In any case, the type of piling shown in Figure 3, is also quite common and troublesome and requires cleaning with an ink solvent.

A third type of piling, which is very frequent, is shown in Figure 4. This is the thin line of paper-colored piling, or chalk lines which forms rings around the blanket, at the edges of the web. This debris is especially tenancious, as illustrated in the lower photo in Figure 4 which shows that all of it was not removed by a manual wash. (It should be explained that the region to the right of the chalk line in Figure 4 is a nonimage area which has current ink-colored piling, while the dark vertical line at the extreme left is the edge of the blanket.) This type of debris consists primarily of paper particles. The most likely explanation for this is that ends of some of the loose fibers exposed at the edge of the paper become stuck

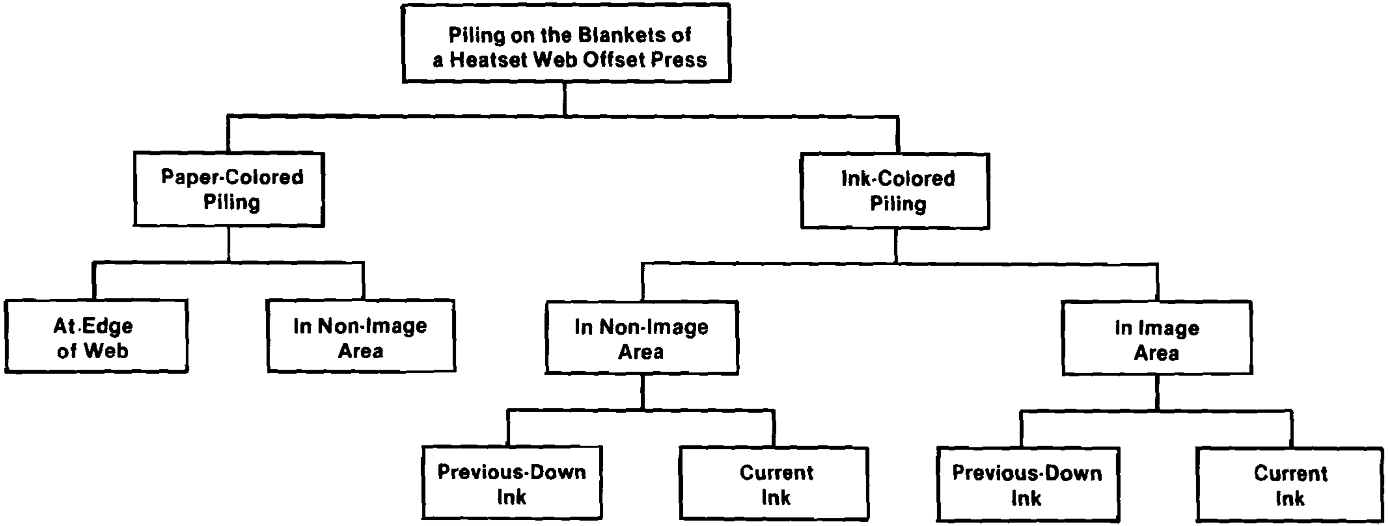


Figure 1 Classification of Piling on Heatset Web Offset Presses

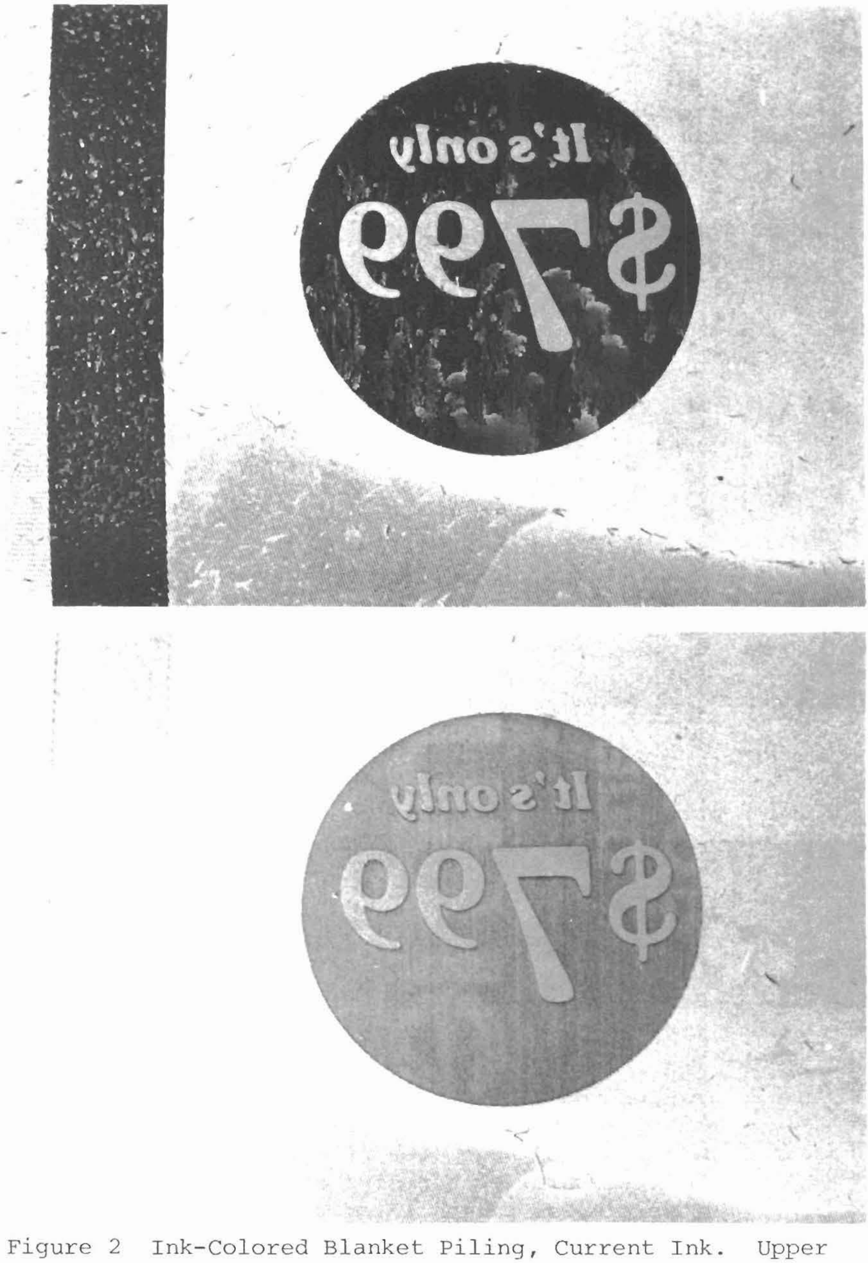
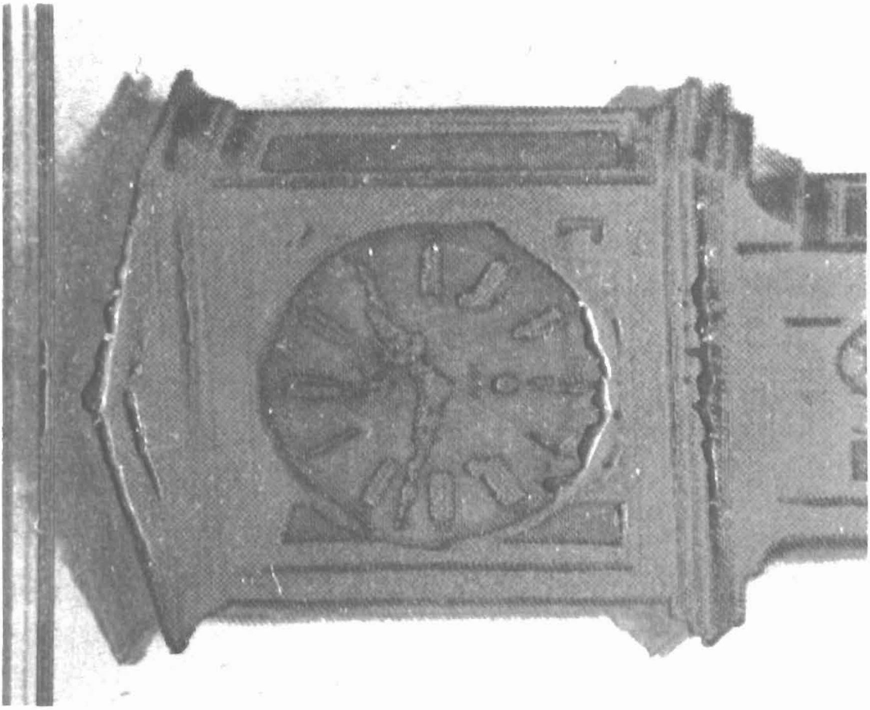


Figure 2 Ink-Colored Blanket Piling, Current Ink. Upper photo shows ink-colored piling in two nonimage areas: the circular field and the vertical stripe. Chips of piled ink in circular area have peeled off. Lower photo shows same area after blanket was washed and printing was resumed.



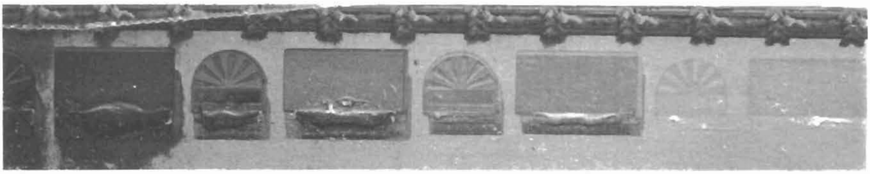


Figure 3 Ink-Colored Blanket Piling. Upper photo shows example of black (previous-down ink) colored piling of nonimage area of yellow blanket. Piling appears as raised deposits of ink. Lower photo shows similar piling in star target areas on same blanket; from left to right, colors are black, black, cyan, cyan, magenta, magenta, yellow and yellow. Severity of piling corresponds to color sequence of black, cyan, magenta, and yellow in that black piling is the heaviest and yellow is the lightest.

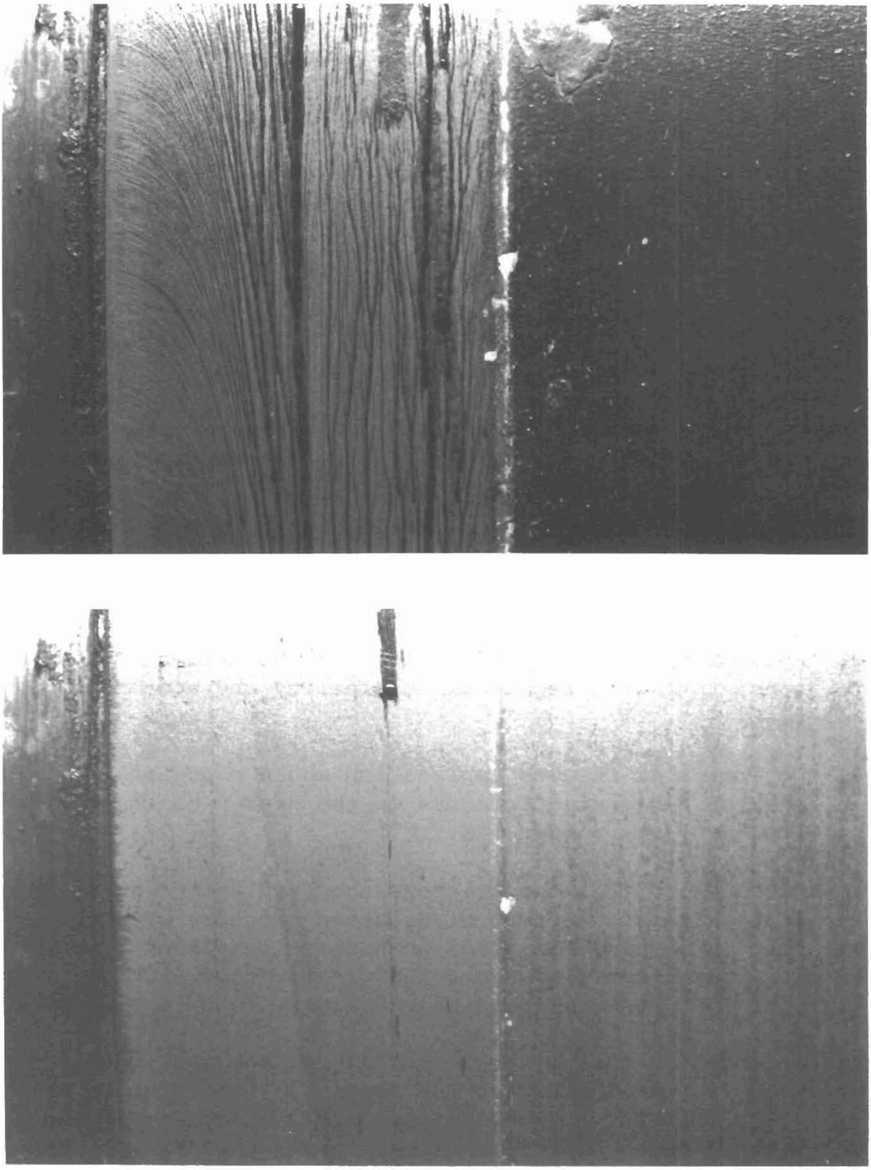


Figure 4 Paper-Colored Blanket Piling at Web Edge. Upper photo shows thin chalk line - paper colored piling formed on the blanket at the edge of the web. Lower photo shows same area after blanket was washed manually and printing was resumed.

to the blanket and are pulled out of the paper, along with some pieces of coating. Although it does not interfere with printing, this type of piling will damage the blanket if allowed to accumulate to an excessive level. That is, heavy chalk lines can produce either a low spot or even a cut in the blanket surface, making it impossible to use the blanket on a subsequent job requiring a wider web. Because chalk lines are composed of paper debris, they can be removed with water. However, because they are so tenacious, chalk lines must be washed frequently; otherwise they will build up over time, as shown by the lower photo in Figure 4.

Manual Wash-up Practices on Web Presses

The first step in the development program was to survey a group of about twenty web printers. The main purpose of the survey was as follows:

1. Establish a reference performance for manual wash-ups to serve as the basis for comparing and judging automatic wash-ups.

2. Establish a target performance for the automatic system, consistent with technical feasibility and economic viability.

3. Determine if the web application would place any special design requirements on the design of the system or any of its components.

Although most of the printers surveyed were located in the United States, a group of European printers was included. The survey disclosed that practice varied from printer to printer. However, the practices of a large group of the printers could be characterized as follows:

Press Condition During Wash - In many of the pressrooms surveyed, it was found that the press was washed up on the fly, i.e., web in, on impression, with ink forms off; and at printing speed. In some cases, it was the practice to reduce speed during a wash-up to 4-600 feet per minute, while in a scattered few, the press was run at creep speed. The conclusion drawn was that there is a large group of printers who wash up on the fly at speeds of 500-1000 feet per minute.

Method and Time of Wash - Most printers were found to use two men to wash the blankets by hand, using wiper cloths.

printing units were washed simultaneously. The average total time to wash a five unit press was judged to be five minutes when using two men. In some cases, the entire press crew took part in the wash-up, in which case wash-up time was reduced to about three minutes. However, the judgment was that five minutes was the best representative figure for a manual wash.

Signatures Lost per Wash - The survey indicated that most printers lose 1,500-2,000 signatures during each wash-up cycle. This includes signatures lost during the wash-up operation plus signatures lost in regaining register and color. As a result of observations made since the original survey, it has been concluded that a more representative range would be 1,000-2,000 signatures. Although some printers lose even less than 1,000 and some waste even more than 2,000, most pressrooms are believed to fall in the range of 1,000-2,000.

Frequency of Wash - The frequency of wash was found to be dependent upon the type of paper used and the quality level sought by the printer. The consensus was that, on an average, a wash is conducted every one to two hours, which is equivalent to every 30-60,000 impressions or approximately every two to five rolls of paper depending on roll size.

Number of Wiper Cloths Used/Wash - Approximately 10 rags were needed to wash a 5-unit 38 inch web press (i.e., 10 blankets).

Type of Wash-up Fluid - The majority of printers wash with only an ink compatible solvent. This is due partly to the fact that most piling is primarily ink and, therefore, can be removed with such a solvent and due partly to a fear of breaking the web when using water.

Amount of Solvent Used - It was established that one typical (14 inch by 22 inch) wiper rag holds 6 ounces of solvent. On this basis, 10 wiper rags (total used/wash) would consume 60 ounces of solvent or approximately two quarts.

Running Waste - If the above average values (1,500 signatures lost per wash-up and one wash-up every 30 to 60,000 impressions) are used, and an average running speed of 30,000 impressions per hour is assumed, running waste due to blanket washing is estimated to be 2.5 to 5 percent. In either case, these figures represent significant losses in paper and production time. Also, since running waste is typically 12-20 percent (Anonymous, 1981), it can be seen that, in some situations, waste attributable to blanket washing can represent a significant fraction of total running waste.

Target Performance and Design Requirements

As a result of the survey made of web printing plants, a set of target performance specifications was established for the automatic blanket cleaner. In addition, the survey aided in identifying design requirements which were peculiar to the web press application.

The following performance characteristics were adopted as design targets, based on trade-offs between what was judged to be needed and what was judged to be technically feasible.

Wash-up Time - The desired wash-up time was established as 30 seconds with an upper limit of 60 seconds. In other words, it was concluded that an automatic blanket cleaning system must be capable of washing up all of the blankets on a perfecting web press in no longer than 60 seconds, and preferably in 30 seconds.

Signatures Wasted - In order to be attractive economically, it was concluded that no more than 1,000 signatures could be lost during a wash-up and, preferably, the waste should be limited to 500, if at all possible.

Type of Wash-up Fluid - Because of the nature of piling on heatset web presses, it was decided that the automatic system must be capable of washing blankets with an ink solvent, water, or a mixture of the two.

The third performance characteristic, listed above, also constituted a challenging design requirement in that most commercially available wash-up solvents are not miscible with water. That is, if a mixture of the two is stored for any length of time, the water and solvent will separate. Thus, one of the design tasks was to develop a system for mixing the two wash-up fluids just prior to use. Furthermore, the amount of fluids mixed has to be limited to the quantities consumed during a single wash-up.

Another very important design requirement stemmed from the use of dryers on heatset web offset presses. The reason dryers are needed is because of the type of inks used in this printing process. Heatset inks consist of a pigment and resin dissolved in a solvent which has a boiling point in the range of 500^{o}F. The ink is dryed by evaporating the solvent component during the web's transit through a heated dryer. The solvent vapors which are boiled off by the dryer are flammable and, therefore, their concentration must be kept below a prescribed level so as to avoid ignition. In the U. S., this is normally accomplished by adjusting the rate of ventilation in the dryer so as to maintain the solvent vapor concentration in the dryer at less than 25% of the lower explosive limit (Anonymous, 1977). This requirement is an important consideration in designing an automatic blanket cleaner because the cleaning solvent may also end up in the dryer and, therefore, have an effect on the required rate of ventilation. Thus, the ideal automatic blanket cleaner should be designed in such a way that the concentration of solvent vapors in the dryer during the wash-up operation, will be less than the concentration which exists during the printing operation. This implies that the amount of solvent required for washing should be minimized and that the amount of solvent that could reach the web be strictly limited to a safe level, through prudent design, even under abnormal or failure conditions.

Design Evolution

The design concept selected for the automatic blanket cleaner was the one invented by Jacob Moestue of Norway (Mosteau, 1977 and 1979) and perfected for use on sheetfed presses by Baldwin-Gegenheimer GmbH of Augsburg, West Germany (MacPhee, 1977-1). A cleaner based on this principle emulates a manual wash-up in that solvent is applied to a web of disposable cloth, which in turn is pressed against the rotating blanket cylinder. In the original concept, shown in Figure 5, a precision ground cylindrical brush is used to press the cloth against the blanket. This is accomplished by moving the entire assembly toward the blanket cylinder. The assembly or cloth unit also consists of a supply roll for storing the fresh cloth, a take-up roll for storing the used cloth, a line of spray nozzles for applying wash-up fluid to the cloth, and an advance mechanism for moving the cloth in increments during the wash-up cycle. This design (shown in Figure 5) was

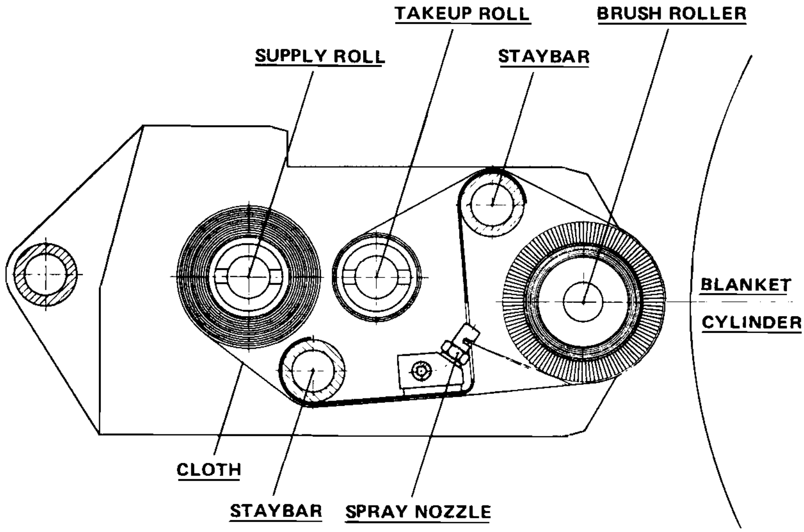


Figure 5 First Generation Blanket Cleaner Design Concept Used on Sheetfed Presses. Precision ground brush presses cloth against blanket cylinder. To go on impression, entire assembly is moved forward toward blanket cylinder.

introduced in Europe in 1975 and since then has been used successfully on approximately 500 sheetfed printing units.

For the web press application, it was decided to use an advanced version of the same concept, which is much simpler in design, more compact, lighter in weight, and less expensive to manufacture (MacPhee, Gasparrini, and Arnolds, 1982). As shown in Figure 6, this newer design utilizes a pneumatically actuated rubber pressure pad to press the cloth against the blanket cylinder. The other major elements of this cloth unit design are the supply roll, take-up roll and spraybar.

A complete automatic blanket cleaning system for a commercial perfecting web offset press consists of one cloth handling unit for each blanket cylinder, one solvent metering box for each printing unit or tower, and a central control system. The control system provides the logic necessary to both initiate and terminate the various steps

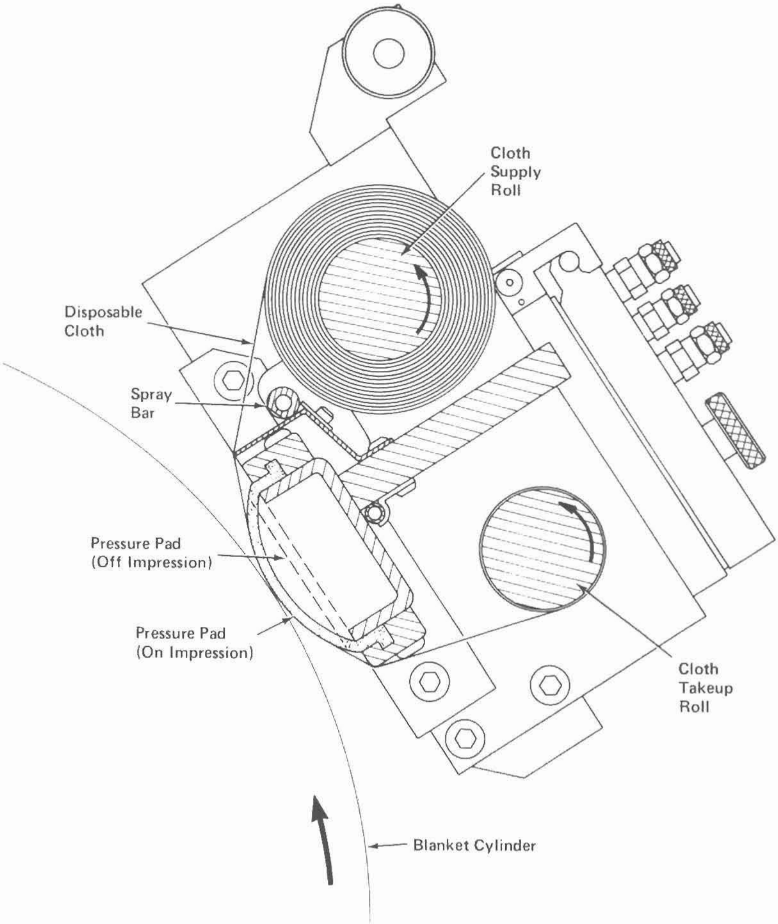


Figure 6 Advanced Blanket Cleaner Design Concept Used on Web Presses. Pneumatic pressure pad provides resilient back-up which presses cloth against blanket cylinder. To go on impression, pressure pad is inflated.

in the wash-up cycle. It also includes means for adjusting the type and duration of the wash-up cycle to suit specific printing conditions and for selecting either solvent, water, or a mixture of the two as the wash-up fluid. The operator station or panel includes a power on/off switch, indicator lights, various selector switches, and the pushbutton for initiating wash-ups. This station is mounted on or near the press console.

Cloth Unit Design

The cloth units are mounted adjacent to each blanket cylinder and utilize rolls of disposable cloth, slightly wider than the blanket. Each unit is equipped with a spray-bar for applying the premetered amount of wash-up fluid to a section of the cloth. The cloth is then advanced and pressed against the blanket cylinder. The cloth unit design as it finally evolved for use on web presses is shown in Figure 7. Two features of this design are worthy of further description: the spray bar and the design of the mechanism which provides for advancing equal increments of cloth, regardless of how much cloth is stored on the supply roll and the take-up roll.

The cloth unit design is unique in that a single spray bar is provided, in spite of the fact that the system is capable of applying either solvent, water, or a mixture of the two fluids to the wash-up cloth. The manner in which this is accomplished with a single spray bar on the cloth unit is explained below in conjunction with the description of the fluid dispensing system.

The other unique feature of the cloth unit design shown in Figures 6 and 7 is the scheme for advancing the cloth in equal increments, regardless of the amount of cloth contained on either the supply or take-up rolls. The wash-up cloth is advanced by a mechanism consisting of an air cylinder and an advance crank, coupled to the take-up roll shaft by a one-way clutch. In addition, the take-up roll shaft is supported by one-way clutches at each end. Thus, as the air cylinder is actuated, the crank arm causes the take-up roll to rotate in the cloth advance direction. If travel of this mechanism were governed by the fixed stroke of the air cylinder, the travel of the take-up shaft would be a fixed number of degrees of rotation. Such a scheme would be undesirable because the amount of cloth advance, measured in inches, would vary depending on the amount of cloth already stored on the take-up roll shaft.

In order to achieve equal amounts of cloth advance, regardless of cloth stored on the take-up roll, the travel of the advance mechanism was designed to be controlled by a traveling crank pin, mounted on the advance crank, as shown in View A in Figure 7. The traveling crank pin is slidably mounted on the advance crank such that its distance from the center of the take-up roll shaft is always equal to the current radius of the take-up roll. Thus, as

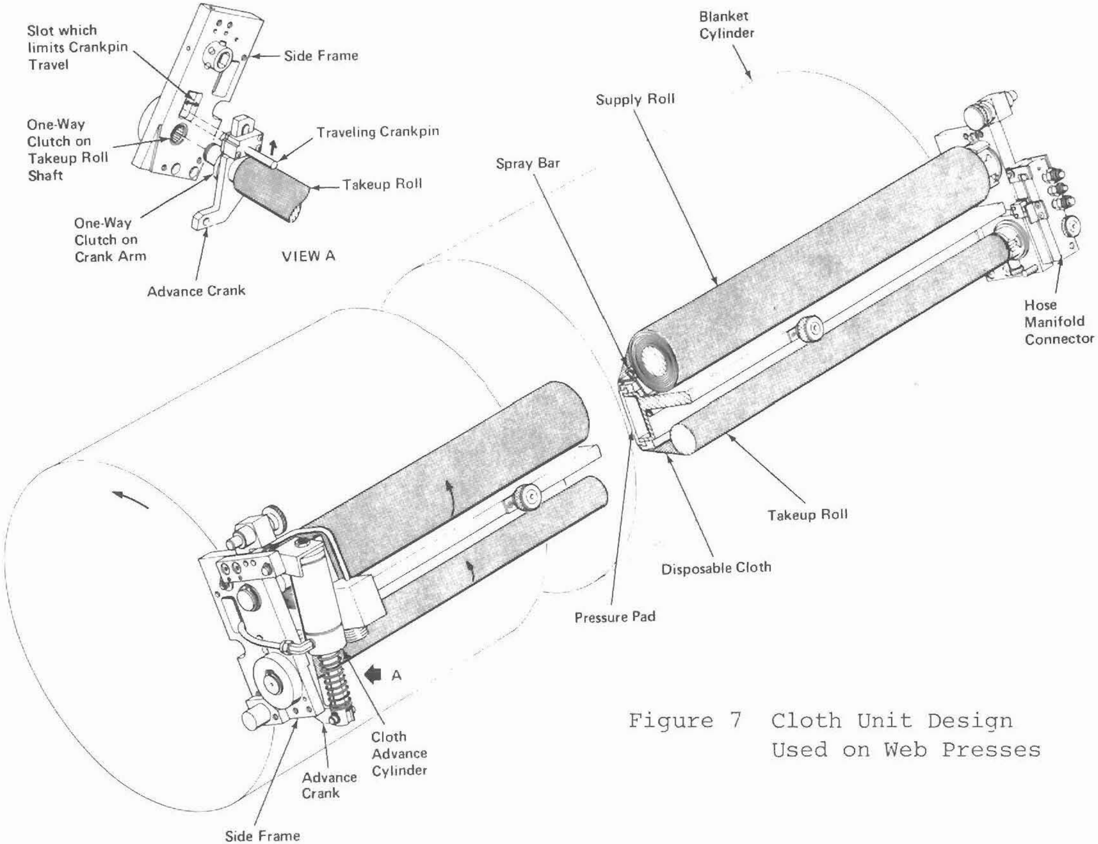


Figure 7 Cloth Unit Design
Used on Web Presses

more used cloth is wound on to the take-up roll, the radius of the take-up roll increases, and the traveling crank pin moves outward, away from the center line of the take-up roll. The side frame of the cloth unit, adjacent to the advance crank, has a slot which limits crank pin travel in the circumferential direction of the take-up roll. Thus, when the cloth advance mechanism is actuated by the cloth advance cylinder, the travel of the mechanism is limited by the movement of the traveling crank pin in the fixed slot in the side frame. Thus, the traveling crank pin moves a fixed distance and since it rests on the outer layer of cloth, the cloth linear travel will be fixed and equal to the amount of movement of the traveling crank pin. For applications on 38 inch web presses, this travel is equal to 1/2 inch; thus each increment of cloth travel is 1/2 inch.

A complete cloth unit, for a 38 inch wide press weighs approximately 40 pounds, including 10 yards of fresh cloth. Thus, when it is necessary to replenish the wash-up cloth, it is feasible for one man to remove the cloth unit and carry it to a bench for installation of a fresh cloth roll. However, in practice, with the press shut down, the cloth unit is simply swung away from the blanket cylinder and fresh cloth rolls are installed on the press. This task takes about 2 minutes per cloth unit and typically must be carried out once a week when operating around the clock.

Fluid Dispensing System

The design of the system for dispensing wash-up fluid, used on the automatic blanket cleaner, is unique in two respects; either solvent, water, or a mixture of the two can be applied to the cloth; and the maximum amount of solvent which can be applied to the web is strictly limited, even under conditions of component malfunction. The manner in which these two features are achieved can be explained with the aid of the simplified schematic, shown in Figure 8.

The ability to apply a mixture of solvent and water to the wash-up cloth, is provided by a plenum, connected to each cloth unit spray bar. When it is desired to apply wash-up fluid to the cloth, measured amounts of solvent, water, or combinations of the two are injected into the plenum by metering cylinders C-1 and C-4, located in the fluid metering box, which serves each printing unit. Once the metered amounts of wash-up fluids have been injected into the plenum, they are ejected from the plenum into the

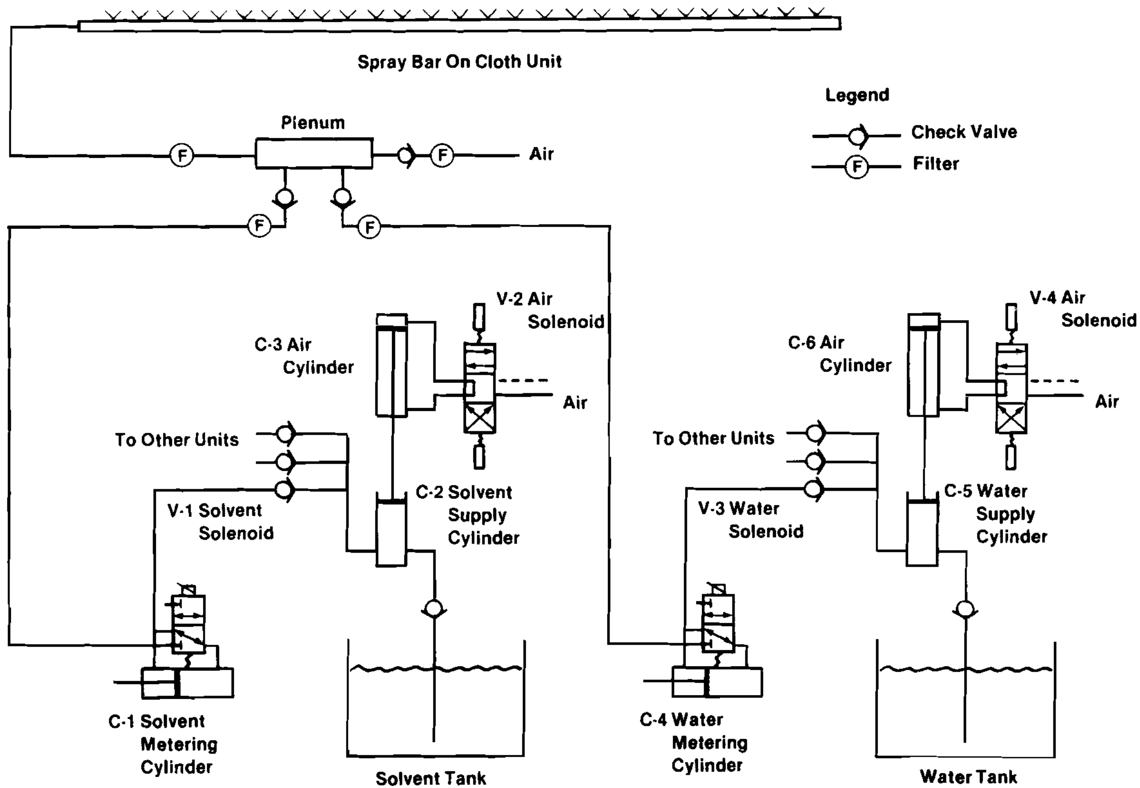


Figure 8 Simplified Schematic Showing Fluid Dispensing System for One Cloth Unit

spray bar by a burst of high pressure air. The burst of air is long enough such that all of the metered fluid is dispensed onto the cloth and both the plenum and spray bar are left completely dry for the next application. The turbulence generated by the blast of air provides complete mixing when water and solvent are ejected from the plenum. In addition, no solvent or water remains in either the plenum or spray bar, thereby eliminating the possibilities that solvent or water residues will build up in the spray bar and result in clogging.

As indicated in Figure 8, each cloth unit is served by a solvent metering cylinder and a water metering cylinder, located in the fluid metering box on the respective printing unit. Thus, for example, a 5-color perfecting web press would be equipped with five fluid metering boxes and each metering box would contain two solvent metering cylinders and two water metering cylinders. In addition to the solvent metering boxes, the fluid dispensing system consists of a separate reservoir and supply cylinder for solvent and for water. As shown in Figure 8, these reservoirs and supply cylinders serve all of the metering cylinders. For example, on a 5-color perfecting web press, a single solvent tank and solvent supply cylinder would serve the ten solvent metering cylinders.

The purpose of the solvent supply cylinder is to provide a pressurized source of solvent, with an upper limit on the amount or volume of solvent which can be dispensed during any given wash-up. This is accomplished by only energizing the solvent supply cylinder during an actual wash-up cycle. Thus, at the beginning of the wash-up cycle, the solvent supply cylinder is retracted by air cylinders, which results in a fixed volume of solvent (equal to the displacement of the cylinder) being drawn from the solvent tank into the cylinder. Once the solvent cylinder has been filled, its air cylinder is reversed so that the solvent in the supply cylinder is pressurized and can feed the solvent metering cylinders as required. Under normal conditions, the solvent metering cylinders will dispense prescribed amounts of solvent into the plenum of the cloth unit they serve, for application to the wash-up cloth. Under these conditions, the volume of solvent dispensed onto the cloth is governed by movement of the solvent metering cylinder. However, even if a component were to fail, (such as the solvent metering cylinder seal) the maximum amount of solvent which could be dispensed is limited to the safe amount contained in the solvent supply cylinder. Thus, in the worst case, the rate at which solvent can be transported to the dryer is predictable and the dryer exhaust rate can be preadjusted as necessary to provide for safe operation.

Wash Cycle

The control system makes it possible to select a wide variety of wash-up parameters such as type of wash-up fluid and number of cloth advances. However, experience has shown that a single combination is usually adequate for a given press in a given pressroom. Thus, prior to a wash-up, generally the operator need only use the selector switches at the control station to turn off the units serving any printing towers that are not in use. A typical wash-up cycle would proceed automatically upon operator initiation and would consist of the following steps:

Step 1 - Squirt an accurately controlled volume of solvent onto the cloth. On a 38 inch press, the volume used is about 25 cc (0.88 ounces of solvent and 10 cc (0.35 ounces) of water.

Step 2 - Advance cloth so that wetted area is on pressure pad.

(At this point in the cycle, the ink form rollers are automatically lifted and the ink ductor roller is silenced.)

Step 3 - Place cloth on impression by applying compressed air to the pressure pad.

Step 4 - Retract pressure pad and advance cloth unit until a fresh area has been moved into position.

In subsequent steps, a second volume of fluid is applied to the cloth and the cloth is advanced further for a total of nine increments. At the end of the cycle, the form rollers are automatically put back on the plate and the ink ductor is reactivated.

System Performance and History

As of May 1, 1982, two commercial web presses in the United States had been equipped with automatic blanket cleaning systems while a third system was awaiting installation on a 4-color commercial press in Europe. The first system was installed on a 5-color Harris Model M1000 perfecting web press in July of 1981. From the very onset, actual system performance exceeded expectations in that wash-up of the entire press was carried out in twenty seconds with a loss of signatures of between 250 and 350. A second system was installed on a 4-color Harris Model M850 press in April of 1982 and wash-up performance was similar. That is, the actual wash-up operation required twenty-one seconds at a web speed of 1200 feet per minute.

The number of signatures lost during the actual wash-up was less than 250 while an additional 75 signatures were lost during color recovery. Thus, the total number of signatures lost as a result of the wash-up operation was less than 350. Furthermore, it is expected that this figure will be reduced by optimizing the wash-up program. This compares with our survey conclusion that the average signature loss during a manual wash-up is anywhere from 1,000 to 2,000. As for the amount and type of wash-up fluid used, a mixture of solvent and water was found to work best. During a typical wash-up, two volumes of fluid are applied to the cloth: at the beginning of the cycle and part way through. Each application consists of 25 cc of solvent and 10 cc of water. Thus, on a 5-color press, the total solvent consumption during a single wash would amount to 500 cc or just a little over one pint of solvent. In contrast, it was estimated that about 1/2 gallon (or four times the amount) of solvent is used during a manual wash-up. The amount of cloth required for an automatic wash-up is about five inches per blanket. Since a fresh roll of cloth contains ten yards, each roll of cloth is good for about seventy wash-ups. Additional detail on how the performance of the automatic system compares with manual wash-ups is given in Table I.

One other very significant result obtained from tests run on the first installation is that it was possible to wash blankets with the automatic system, using only water as the wash-up fluid. That is, the automatic system described above allows so little wash-up fluid to reach the web that wash-ups with water are possible without risk of breaking the web. This could have important implications for users of nonheatset web presses because, by and large, these presses require water blanket wash-ups, which cannot be done on the fly at present.

Table I Comparison of Automatic and Manual Blanket Cleaning Operations on a Five Color 38 Inch Commercial Web Press

Item	Manual Wash-up	Automatic Wash-up
Press Speed (impression/hr)	30,000	30,000
Number Wash-ups/ 24 hr. day	12	12
Wash-up Time (minutes)		
Per Wash-up	5	0.5
Per Day	60	6
Paper Waste (signatures)		
Per Wash-up	1,500	250
Per Day	18,000	3,000
Wash-up Cloth Usage	(cloths)	(rolls)
Per Wash-up	10	1/7
Per Day	120	1.7
Solvent Usage		
Per Wash-up (ounces)	60	16.9
Per Day (gallons)	5.6	1.6

Conclusions

The automatic blanket cleaning system described in this paper has been used successfully on two different heatset web offset press installations to date (May, 1982). The performance achieved in wash-ups under printing conditions indicates that such systems can be used to achieve significant improvements in productivity by reducing lost press time and wasted signatures attributable to blanket cleaning. Depending on specific plant conditions, it is estimated that these savings can amount to as much as one hour of press time and 15,000 signatures per day for three shift operation.

So far, the system has only been used on presses on which ink piling has been the major contaminant on the blankets. However, tests run during the development program have indicated that the system is capable of washing up solely with water without incurring web breaks. Thus, it is quite possible that the system will also find use on nonheatset web offset presses, where linting is the major blanket piling problem.

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