

# Cleaning and Conditioning

## Forming and Press Sections



*Improve paper machine efficiency and productivity by optimizing forming and press section cleaning and conditioning systems.*

# Forming Fabrics

Kadant provides cleaning and conditioning systems for paper machines, filtration systems, fourdrinier formation systems, vacuum control equipment, and a variety of consumable products for the paper industry.

Whether you produce fine papers, newsprint, tissue, corrugated, kraft, linerboard, or specialties from virgin or recycled furnish, Kadant can help you achieve a higher quality product.

## Forming Section Showers

Essential components of an effective cleaning and conditioning system for the forming section of paper machines, showers of varying design deliver water and/or specialized solutions at specific locations. To supplement the following descriptions, refer to the charts and illustrations within this brochure. Each shower application is identified with a different number.

### Headbox Shower – Shower 1

A swing shower is used for atmospheric or open type headboxes, its nozzle pipe rotates 180°. A pressurized or closed headbox uses a shower rotating 360° and is furnished with mounts and seals at each end. A special application utilizing low-pressure fan nozzles, this shower thoroughly cleans the inner headbox, preventing fiber build-up and knocking down foam on the pond.

### Breast Roll Shower – Shower 2

Located on the outside of the forming fabric and directed toward the center of the breast roll, this shower fills the void volume of the fabric to retard drainage immediately following the headbox slice. Using white water prevents process thermal and pH shock.

### Headbox Apron Shower – Shower 3

This shower, located on the headbox outside the forming fabric, directs water to the underside of the headbox. Its application minimizes stock build-up on the headbox apron, eliminating “drop offs” that could cause wire damage and paper defects.

### Dandy Roll Shower – Shower 4

The dandy roll requires an oscillating needle jet shower usually on an extended header. Whenever possible, it is mounted inside the dandy roll with nozzles spraying upward toward the headbox. The extended header positions the nozzles close to the roll surface and is most effective in keeping the face clean and fiber free.

### Dandy Roll Air Knife Shower – Shower 5

This stationary air knife, located inside the dandy roll, is used to remove fiber and water from the dandy roll cover.

### Lump Breaker Roll Shower – Shower 6

To eliminate sheet stealing and fiber picking, this is a low volume stationary fan shower designed to keep the lump breaker roll clean and moist.

### Couch Roll Shower – Shower 7

To keep the couch roll functioning most efficiently and to minimize corrosion, an oscillating high-pressure shower is located outside the roll with needle jet nozzles directed at the centerline. High-pressure water jets penetrate and scour holes and countersinks.

### Flooded Nip Shower – Shower 8

This shower was developed for use with multi-layer fabrics where conventional knock-off showers prove inadequate. It is stationary with the water spray directed into the nip between the turning roll and fabric. Depending on machine speed, fabric style, water volume, and pressure, it is effectively used for sheet separation prior to a conventional knock-off shower or alone as the sole knock-off shower. This shower can also be used for effective fabric cleaning.

The following formula can be used to calculate the volume of water required for this shower.

RUNNING VOID VOLUME	
$\text{RVV (gallons per minute)} = \frac{C \times W \times S \times V}{19.25}$	Where C = Caliper of Fabric (inches/mm) W = Fabric Width (inches/m) S = Fabric Speed (fpm/mpm) V = Fabric Void Factor (use 0.6)
$\text{RVV (liters per minute)} = C \times W \times S \times V$	

### Trim Knock-Off Shower – Shower 9

Trim knock-off showers are short showers located on each side of the forming table. Each usually contains three or four nozzles run continuously to separate the trimmed portion of the sheet from the fabric. These showers may not be required if the flooded nip shower or conventional sheet knock-off shower is run continuously.

### Conventional Sheet Knock-Off Shower – Shower 10

This is a stationary high-volume shower located after the couch or turning roll and before the first wire return roll. If a sheet break occurs, it will remove the sheet and direct it into the couch pit. When operated continuously, the end nozzles provide the trim knock-off function. When sheet knock-off is treated as a separate function, individual trim or deckle showers are required.

### Inside High-Pressure Shower – Shower 11

This shower's purpose is to maintain the void volume of the forming fabric, keeping it clean and free of contamination. It is a high-pressure, machine-speed-synchronized oscillating shower located 3 to 4 inches (75 to 100 mm) from the fabric. Generally, it is run only intermittently as required.

### Sheet Side High-Pressure Shower – Shower 12

While the inside shower eliminates void volume contamination, this shower removes fibers, fines, and stickies from the sheet side fabric surface. It is most effective located 6 to 10 inches (150 to 255 mm) from the fabric, angled into the run 15° to 20° either directed at the fabric near the roll or at the fabric on the inside roll. Generally, this machine-speed-synchronized shower is run continuously.

### Inside Wire Return Roll Shower – Shower 13

Inside wire return roll showers should be mounted above the centerline of the roll. These stationary fan showers provide water to suspend contaminants transferred from the forming fabric to the roll where they are easily removed by a doctor. The film of water also provides lubrication between the doctor blade and the roll.

### Outside Wash Roll Shower – Shower 14

These wire return roll showers clean the fabric and lubricate the doctor blade. They are most effective when installed inside the fabric slightly ahead of where the forming fabric and roll converge. They are designed to supply a larger volume of water than Shower 12. The larger volume partially fills the fabric void volume and is removed by the vacuum created as the forming fabric and roll diverge. The evacuated water carries contaminants to the smoother surface of the roll which are removed by the doctor.

### Open or Grooved Roll Shower – Shower 15

This is a special shower common only to a specific type of top former. It is important to provide an oscillating shower to keep the roll cover clean. Generally mounted 3 to 5 inches (75 to 125 mm) from the roll surface, the shower is operated continuously. It is important to provide a spray shield or pan to prevent shower water from rewetting the forming fabric. If a grooved roll is used inside the top wire, it should be doctored (see doctor B on page 5).

### Mist Elimination Systems – Shower ME

Applied to both high-speed, top-wire formers and machines running recycled fiber, mist elimination systems combine high-pressure and vacuum augmented mist and contamination removal from both sides of the fabric. The mist elimination system increases runnability by improving wet end hygiene and providing a safer work environment.

### Forming Fabric Cleaning System – M-clean

The M-clean™ forming fabric cleaning system traverses on a beam across the width of the tissue machine forming fabric. Intensified (high-pressure) water flows with the objective of imparting enough energy to remove contaminants that are adhered to the fabric. The M-clean forming fabric cleaning system is an efficient and effective tool for removing stickies thereby minimizing down time to chemically or manually wash the fabric. Water can also be saved with the use of full width HP showers.

### FLOODED NIP KNOCK-OFF FLOW

KO (gallons per minute) = RVV (gallons per minute) x SF

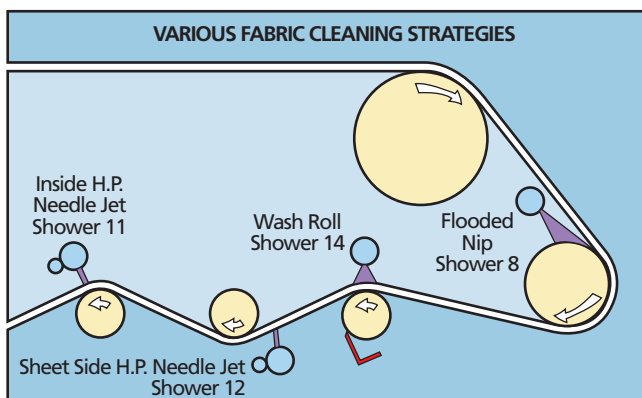
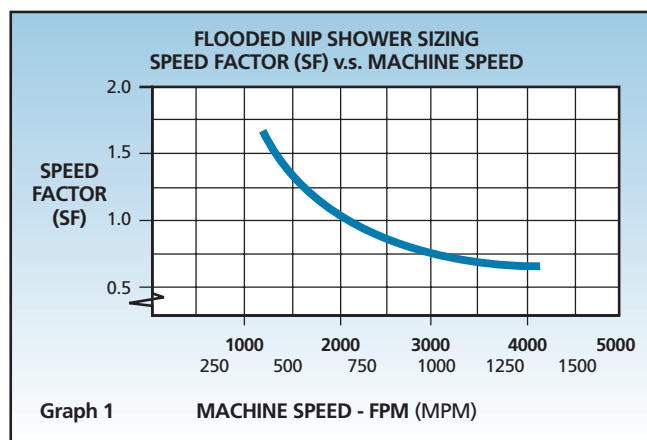
KO (liters per minute) = RVV (liters per minute) x SF

Where SF = Speed Factor from Graph 1

### FLOODED NIP FABRIC CLEANING FLOW

FC (gallons per minute) = RVV (gallons per minute) x 1.1

FC (liters per minute) = RVV (liters per minute) x 1.1



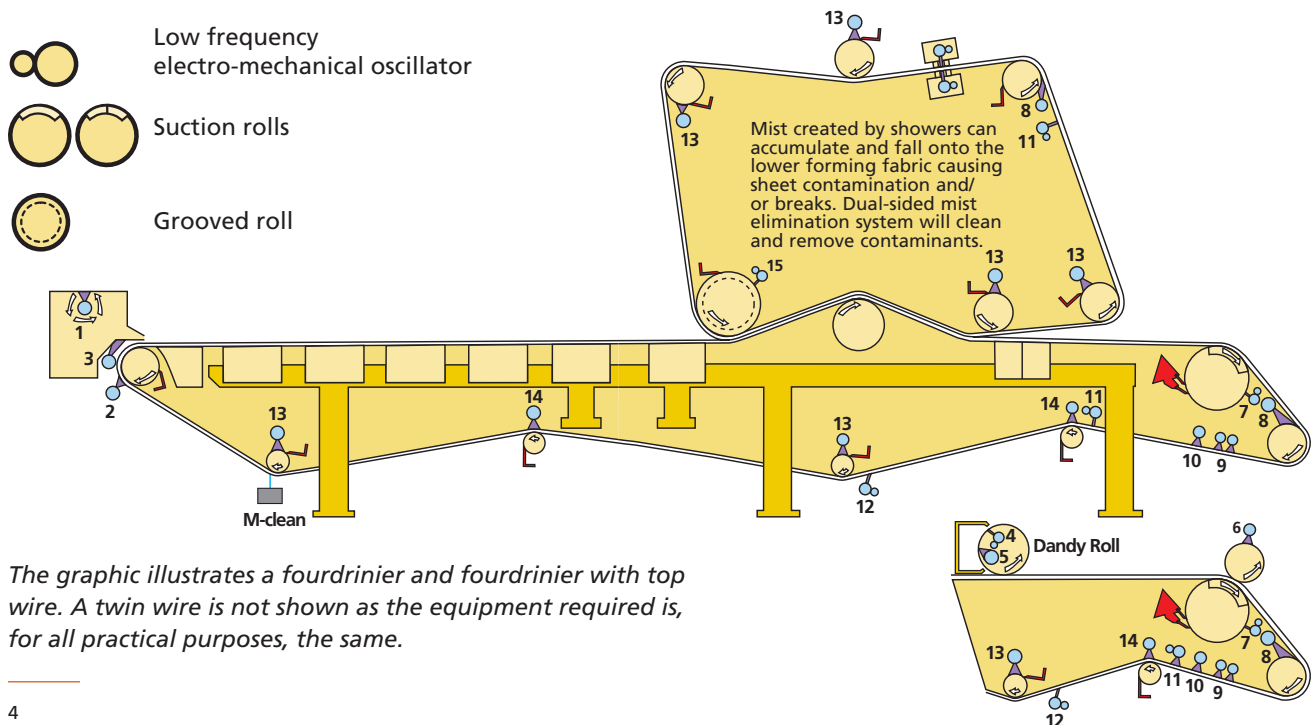
Contact Kadant to obtain detailed recommendations for your specific operating conditions.



# Shower Applications

## Forming Section Showers

Shower Location	Application	Function	Shower Type	Nozzle Spacing in (mm)	Operating Pressure psi (MPa)	Flow GPM/in (LPM/cm)
1	Headbox	Foam Killing and Prevention of Stock Build-up	Rotary or Swing Nozzle	10" – 20" (255–510 mm)	20 – 40 psi (0.14 – 0.27 MPa)	0.075 – 0.204 (0.111 – 0.303)
2	Breast Roll	Fill Void Volume of Forming Fabric	Stationary Fan Nozzle	6" (150 mm)	30 – 40 psi (0.20–0.27 MPa)	0.167 – 0.197 (0.248 – 0.293)
3	Headbox Apron	Cleaning	Stationary Fan Nozzle	6" (150 mm)	30 – 40 psi (0.20 – 0.27 MPa)	0.120 – 0.133 (0.178 – 0.198)
4	Dandy Roll	Cleaning	Oscillating Needle Jet	1 1/2" (37.5 mm)	100 – 200 psi (0.69 – 1.4 MPa)	0.13 – 0.290 (0.19 – 0.433)
5	Dandy Roll Air Knife	Cleaning Dewatering	Air Knife	Continuous Slot	Varies by Application	Varies by Application
6	Lump Breaker Roll	Cleaning	Stationary Fan Nozzle	6" – 12" (150–300 mm)	20 – 30 psi (0.14 – 0.20 MPa)	0.0285 – 0.0428 (0.042 – 0.064)
7	Couch Roll	Cleaning	Oscillating Needle Jet	3" (75 mm)	350 – 700 psi (2.4 – 4.8 MPa)	0.18 – 0.250 (0.27 – 0.373)
8	Flooded Nip	Sheet Knock-Off and Cleaning Multi-Layer Fabrics	Stationary Fan Nozzle	3" (75 mm)	80 – 150 psi (0.55 – 1.0 MPa)	Calculate Running Void Volume
9	Trim Knock-Off	Trim Knock-Off	Stationary Fan Nozzle	3" (75 mm)	100 – 250 psi (0.69 – 1.7 MPa)	1.09 – 1.77 (1.6 – 2.63)
10	Conventional Sheet Knock-Off	Sheet Knock-Off for Single Layer Fabrics	Stationary Fan Nozzle	3" (75 mm)	200 – 350 psi (1.4 – 2.4 MPa)	0.75 – 1.77 (1.12 – 2.628)
11	Inside High-Pressure	Fabric Cleaning	Oscillating (Low Frequency) Needle Jet	3" (75 mm)	200 – 450 psi (1.4 – 3.1 MPa)	0.135 – 0.238 (0.20 – 0.355)
12	Sheet Side High-Pressure	Fabric Cleaning	Oscillating (Low Frequency) Needle Jet	3" (75 mm)	200 – 450 psi (1.4 – 3.1 MPa)	0.135 – 0.238 (0.20 – 0.355)
13	Inside Wire Return Roll	Doctor Blade Lubrication	Stationary Fan Nozzle	6" – 8" (150 – 200 mm)	30 – 40 psi (0.20 – 0.27 MPa)	0.15 – 0.163 (0.223 – 0.242)
14	Outside Wash Roll	Wash Roll Cleaning and Lubrication	Stationary Fan Nozzle	6" (150 mm)	40 – 60 psi (0.27 – 0.41 MPa)	0.5 – 1.0 (0.74 – 1.48)
15	Grooved Roll (if machine is so equipped)	Cleaning	Oscillating Needle Jet	3" (75 mm)	150 – 350 psi (1.0 – 2.4 MPa)	0.145 – 0.212 (0.216 – 0.316)

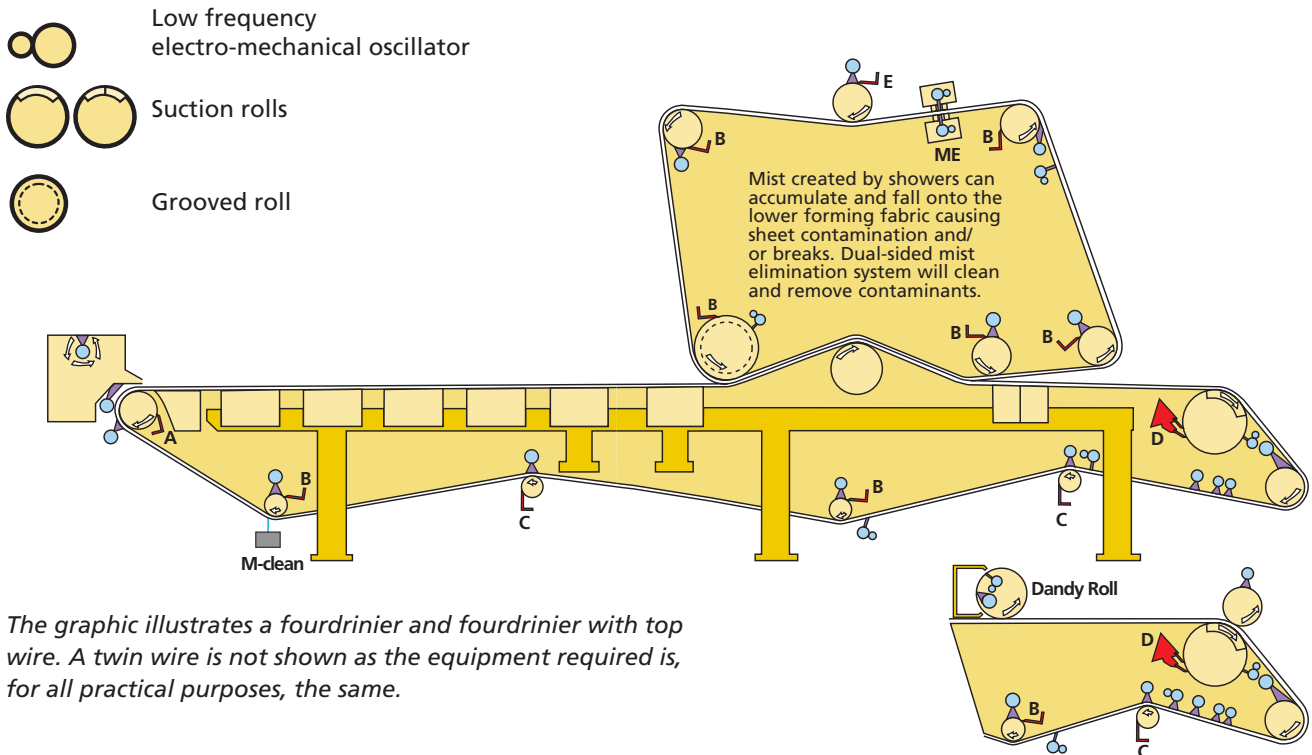


The graphic illustrates a fourdrinier and fourdrinier with top wire. A twin wire is not shown as the equipment required is, for all practical purposes, the same.

## Forming Section Doctors

Doctor Location	Application	Function	Blade Material	Oscillation	Recommended Options
A	Breast Roll	Roll Cleaning	PolyCarb™, Polyflex™, SofTex™ blades	Optional	Removable Holder
B	Inside Wire Return Roll	Roll Cleaning	PlusTek C™, Polyflex™, SofTex™ blades	Optional	Removable Holder, Water Collection Pan
C	Outside Wire Return Roll	Roll Cleaning Sheet Removal	PlusTek C™, Polyflex™, SofTex™ blades	Optional	Removable Holder
D	Couch Roll	Water Removal, Reduce Sheet Rewetting	Polyflex™, SofTex™ blades	Optional	Removable Holder, AirSet™ Blade Holder
E	Top Wire Outside Wire Return Roll	Roll Cleaning	PlusTek C™, Polyflex™, SofTex™ blades	Optional	Removable Holder, Water Collection Pan

Key	Application	Slot Size	Gap	Vacuum Required
ME	Top Wire Mist Elimination Vacuum Box	1" – 2" (25 – 50 mm)	0.375" – 0.50" (9.5 – 13 mm)	7 – 10 CFM/sq" (0.030 – 0.044 m³/cm²) @ 5 – 10" H₂O (125 – 250 mm H₂O)



The graphic illustrates a fourdrinier and fourdrinier with top wire. A twin wire is not shown as the equipment required is, for all practical purposes, the same.

# Press Fabrics

To maintain optimum performance, today's high-speed papermaking machines call for engineered cleaning and conditioning systems. Shower equipment is only part of the solution. Efficient dewatering and vacuum dewatering systems must be given equal consideration.

The importance of an effective cleaning and conditioning system cannot be overemphasized. Correct choices and applications significantly improve fabric life and production efficiency while lowering production costs. Ultimately, the greatest benefit is more uniform and consistent product quality. To supplement the following descriptions, refer to the illustrations and charts presented within this brochure. Each shower application is identified with a number.

## Flooding Shower – Shower 1

This shower is a fan type shower used for wetting and chemical application. It is recommended that this shower be located as close to the press nip and as far away from the felt suction pipe as possible, thereby providing the longest dwell. By locating this shower on the inside of the press fabric and directed into the nip of a roll, the resultant hydraulic force causes the water and chemical to penetrate into the base of the press fabric. Where the press design or mechanical limitations prevent locating the shower in this position, it may be installed on the face side.

The total volume of water applied to a press fabric for cleaning and conditioning varies from press section to press section. Since the volume of the high-pressure shower and lube shower is constant, they are added together and then subtracted from a calculated value. This represents the flow for which the flooding shower should be designed. The appropriate press section flow factors are shown at right.

## Inside High-Pressure Shower – Shower 2

This shower is an oscillating high-pressure needle jet shower located on the inside of the press fabric. This shower is used on an intermittent basis for the purpose of keeping the void volume of the press fabric open as the fabric approaches the end of its operating life.

## Sheet Side High-Pressure Shower – Shower 3

This shower is an oscillating high-pressure needle jet shower mounted on the sheet side of the press fabric. It is recommended that this shower be operated on a continuous basis to remove contaminants from the surface of the press fabric and to fluff up the face side bat.

## Uhle Pipe Shower – Shower 4

This shower is a fan type shower that provides water lubrication between the press fabric and the wear surface of the felt suction pipes. Also, the layer of water provides a seal between the felt suction pipe and the fabric resulting in more uniform CD distribution of vacuum.

## Doctor Lube Shower - Shower 5

This shower is a stationary fan shower designed to provide water to suspend contaminants transferred from the press fabric to the roll where they are removed by a doctor. The film of water also provides lubrication between the doctor blade and roll.

## Suction Roll Shower - Shower 6

To keep suction rolls functioning efficiently and to minimize corrosion, an oscillating high-pressure shower is located outside the roll with the needle jet nozzles directed at the centerline. The high-pressure water jets penetrate and scour holes and countersinks.

## Grooved Roll Shower – Shower 7

Below 1400 fpm (425 mpm), this shower is a stationary fan type shower used to remove water from the grooves of the roll. The design and location of this shower must be precise in that the fan pattern functions as a doctor blade. The manufacturer's installation instructions and special alignment gauges must be used when installing and aligning this shower. Above 1400 fpm (425 mpm), centrifugal force is sufficient to purge water from the grooves of a grooved roll. Therefore, above this speed an oscillating high-pressure shower with alternating needle jet and fan nozzles are used to keep the grooves free from contaminants.

The recommended total shower water applied for cleaning press fabrics is as follows:

### 1st Press:

0.1 lb. of water per lb. of fabric  
(0.1 gm of water per gm of fabric)

### 2nd Press:

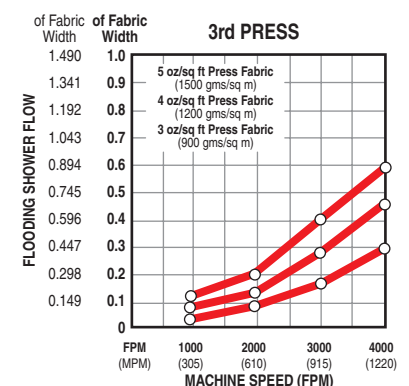
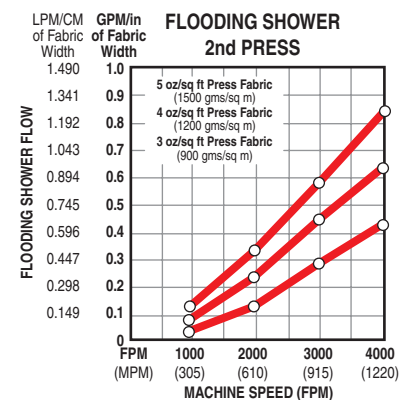
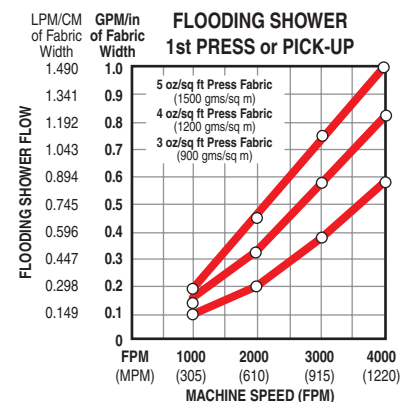
0.08 lb. of water per lb. of fabric  
(0.08 gm of water per gm of fabric)

### 3rd Press:

0.06 lb. of water per lb. of fabric  
(0.06 gm of water per gm of fabric)

Flooding Shower Volume = Total volume  
- HP Shower Volume - Lube Shower Volume

The graphs below illustrate typical flooding shower flow volumes calculated using the above formula.



### Traversing High-Pressure Shower – Shower 8

This traversing shower is available with multiple nozzles for continuous or streak cleaning. The header, onto which the nozzles are mounted, traverses the machine rather than using a multi-jet shower, which spans the complete width of the fabric. Comparatively, the traversing shower applies a fraction of the water to the process. Because of this lesser amount of water, hydraulic crushing is less likely to occur in the highly loaded nip common to third and fourth presses. Cleaning is not compromised as the fabrics typically used are designed relatively “open” and, to some degree, are self-cleaning.

### A Special Note – Moisture Profile Management

Moisture profile management refers to techniques that ensure the most uniform distribution possible of water applied to fabrics from showers. When installed and operating, a fan shower should be located so that the fan sprays do not overlap one another by more than 1/8” to 1/4” (3 to 6 mm).

Ensuring the proper location of the shower, as explained above, is important. However, studies have shown that all fan type showers distribute water non-uniformly, despite how accurately installed and positioned. Table 1 illustrates the degree of non-uniform water distribution from a full-width, stationary multi-nozzle fan shower. This non-uniform distribution of water causes moisture streaks in both the press fabric and sheet.

Table 2 illustrates the same shower when oscillated rather than being stationary. The improvement will be reflected in the moisture profile of the press fabric and sheet.

As a result, it is a standard practice to oscillate all showers in a press section. This includes not only the high-pressure cleaning showers, but also the flooding and lubricating showers.

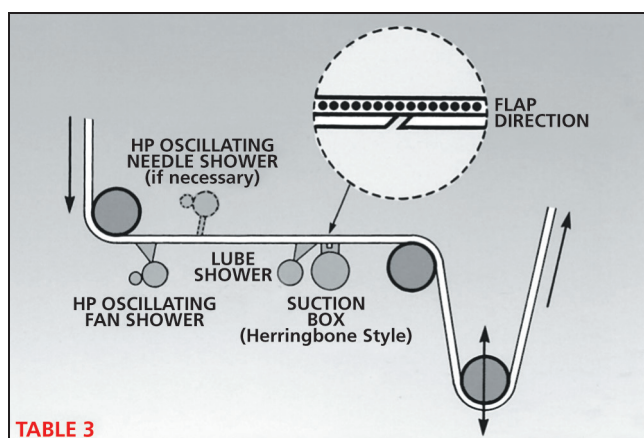
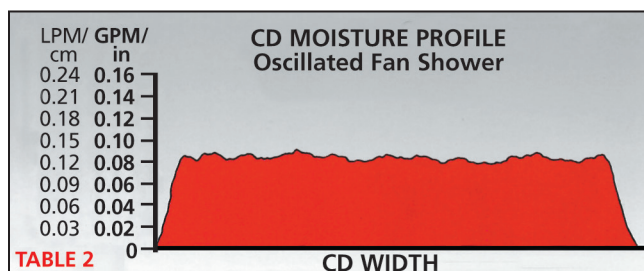
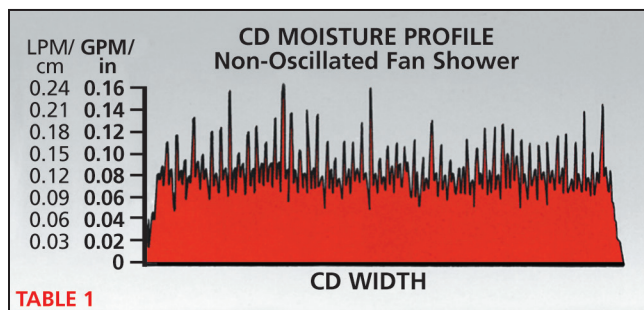
### On-Machine Seamed Press Fabrics

This style of press fabric is designed to be seamed on the press itself rather than being shipped to the mill seamless. A flap is incorporated into this style of fabric to protect the seam from marking the sheet and causing vibration. The seam is more fragile than the rest of the fabric. Therefore, as shown in Table 3, the face side cleaning shower can be an oscillating fan type rather than a needle jet type. Because these fabrics are relatively open, the fan nozzles provide adequate cleaning while maintaining the integrity of the flap.

A second consideration relative to OMS press fabrics is the style of cover on the felt suction box. Straight slotted covers are parallel to the flap, and draw the flap into the slot. To prevent this, it is recommended that a herringbone style cover be used rather than straight slots. When making this conversion, it is important to ensure the herringbone cover provides a uniform open area equal to the slotted cover it is replacing.

### Press Fabric Dewatering Systems

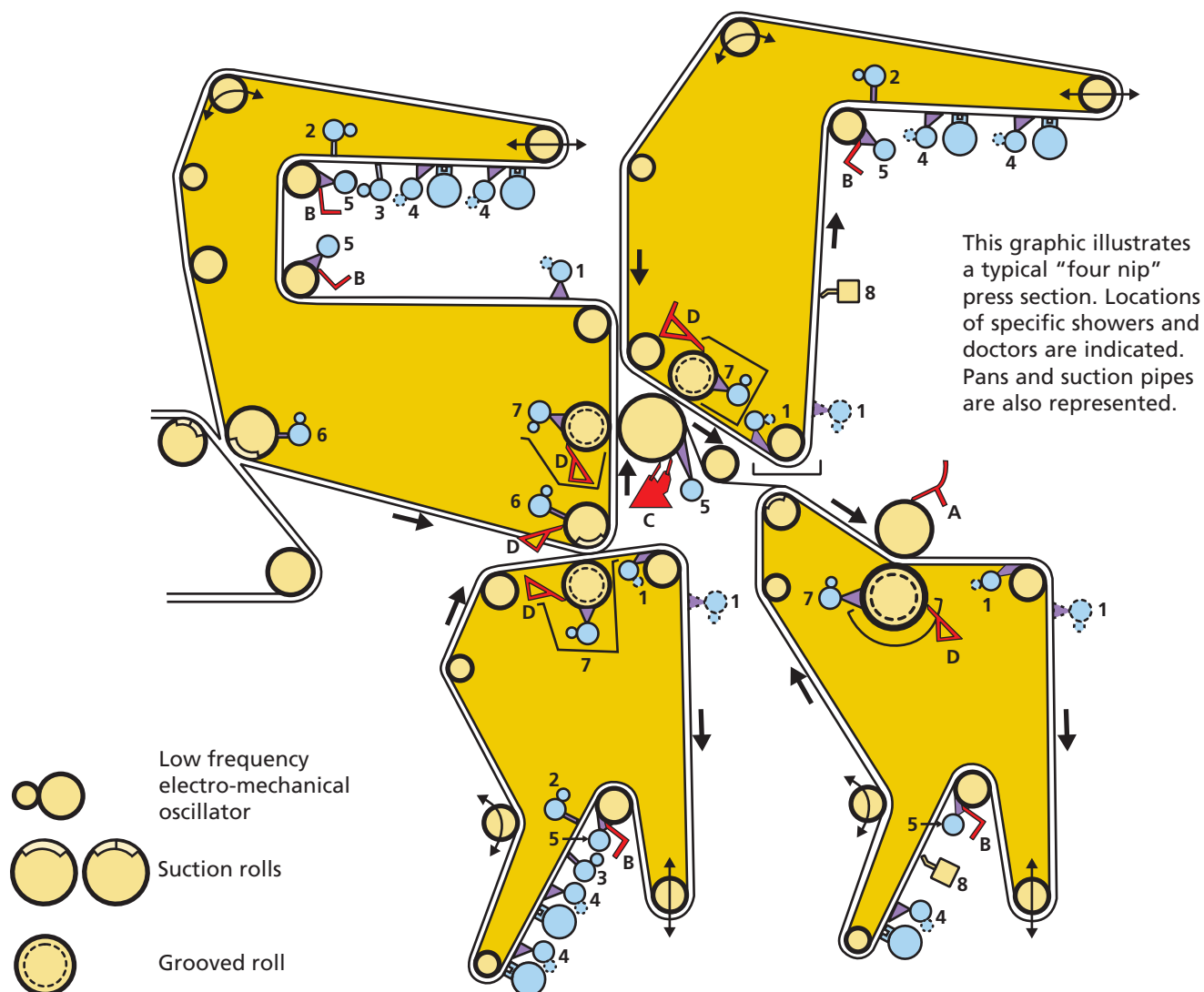
Cleaning and conditioning is a system. Part of this system is a properly designed dewatering assembly, vacuum pump, liquid air separator, and associated piping.



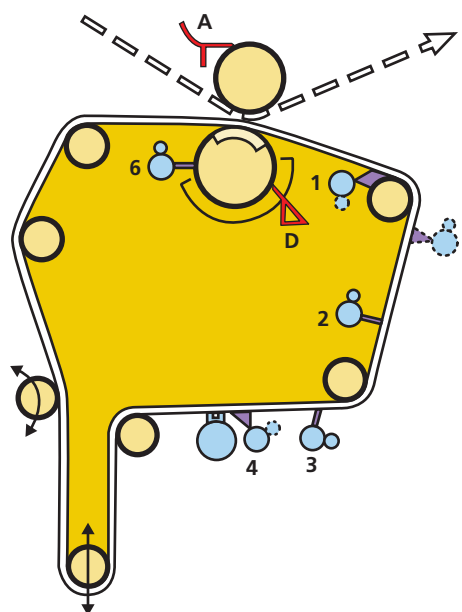
Too often, factors in terms of cfm per square inch of felt suction pipe open area are used to determine vacuum requirements. This is not accurate because the vacuum pump capacity and dewatering assembly must be designed based on the press fabric permeability, the fabric weight, the amount of water applied by the showers, and the machine speed.

In view of this, the vacuum dewatering assembly and vacuum pump should be sized for each specific application. Commonly used for this purpose are the DeCrosta equations. Kadant can offer valuable assistance when sizing press section fabric dewatering systems.

# Shower Applications



This graphic illustrates a "straight through" press section. Locations of specific showers and doctors are indicated. Pans and suction boxes are also represented.





## Press Section Showers

Shower Location	Application	Function	Shower Type	Oscillation	Nozzle Spacing	Operating Pressure	Flow GPM/in. LPM/cm
1	Flooding	Felt Wetting Chemical Application	Fan	Optional	3 – 6 in. 75 – 150 mm	40 – 60 psi 0.3 – 0.4 MPa	Must be Calculated. See Text.
2	Inside High Pressure	Void Volume Cleaning	Needle Jet	Yes	6 in. 150 mm	200 – 350 psi 1.4 – 2.4 MPa	0.083 – 0.106 0.124 – 0.158
3	Sheet Side High Pressure	Sheet Side Cleaning	Needle Jet	Yes	6 in. 150 mm	150 – 300 psi 1.0 – 2.0 MPa	0.073 – 0.099 0.108 – 0.148
4	Uhle Pipe Lube	Wear Surface Lubrication and Sealing	Fan	Recommended	6 – 8 in. 150 – 200 mm	20 – 30 psi 0.15 – 0.2 MPa	0.05 – 0.07 0.075 – 0.104
5	Doctor Lube	Doctor Blade Lubrication	Fan	No	6 – 8 in. 150 – 200 mm	30 – 40 psi 0.2 – 0.3 MPa	0.05 – 0.07 0.075 – 0.104
6	Suction Roll	Cleaning	Needle Jet	Yes	3 in. 75 mm	350 – 500 psi 2.4 – 3.4 MPa	0.212 – 0.250 0.316 – 0.373
7	Grooved Roll Below 1400 FPM 425 mpm	Remove Water from Grooves	Fan	No	3 in. 75 mm	60 – 80 psi 0.4 – 0.6 MPa	0.49 – 0.56 0.73 – 0.83
	Grooved Roll Above 1400 FPM 425 mpm	Clean Grooves	Needle/Fan	Yes	3 in. 75 mm	200 – 500 psi 1.4 – 3.4 MPa	0.167 – 0.250 0.248 – 0.373
8	M-Clean Traversing High-Pressure Shower	Cleaning	Needle Jet/ Narrow Fan	Nozzle Header Traverses	1.5 in. 37 mm	150 – 300 psi 1.0 – 2.0 MPa	0.5 – 1.5 GPM 2 – 6 LPM Total Flow

## Press Section Doctors

Doctor Location	Application	Function	Blade Material	Oscillation	Recommended Options
A	Top Press Roll	Sheet Removal/Roll Cleaning and Conditioning	Abrasitek™, Grafgrit™, Graflex™, nPak™ C+, PressTek™ Plus, SynTek™ C, Ultra™ C blades	Yes	Water Collection, Removable Holder, Roll Conditioning Pad
B	Face Side Felt Roll	Roll Cleaning	Graflex, nPak C+, SynTek C, Ultra C blades	Optional	Water Collection
C	Center Press Roll	Sheet Removal/Roll Cleaning and Conditioning	Abrasitek, Grafgrit, Graflex, nPak C+, PressTek Plus, SynTek C, Ultra C blades	Yes	Removable Holder, Pivot Bracket, Roll Conditioning Pad
D	Grooved/Suction Roll	Water Removal/Roll Cleaning	Polyflex	No	AirSet™ Blade Holder, Water and Mist Collection



# Press Section Chemical Cleaning

## A Cleaning Strategy for Recycled Fiber

The increased use of recycled fiber results in greater amounts of contaminant getting into the process. Because of their nature, these contaminants are more difficult to remove than contaminants associated with virgin fiber. Therefore, it is important to adopt a cleaning strategy that involves all components discussed in this document. All cleaning and conditioning systems must be used on a continuous basis starting when the press fabric is new.

In addition, when running recycled fiber, it is important to include chemicals in the cleaning and conditioning strategy. Different chemicals are available for different types of contaminants and cleaning problems. Caution must be exercised in choosing a chemical to prevent an unfavorable reaction with other chemicals in the process.

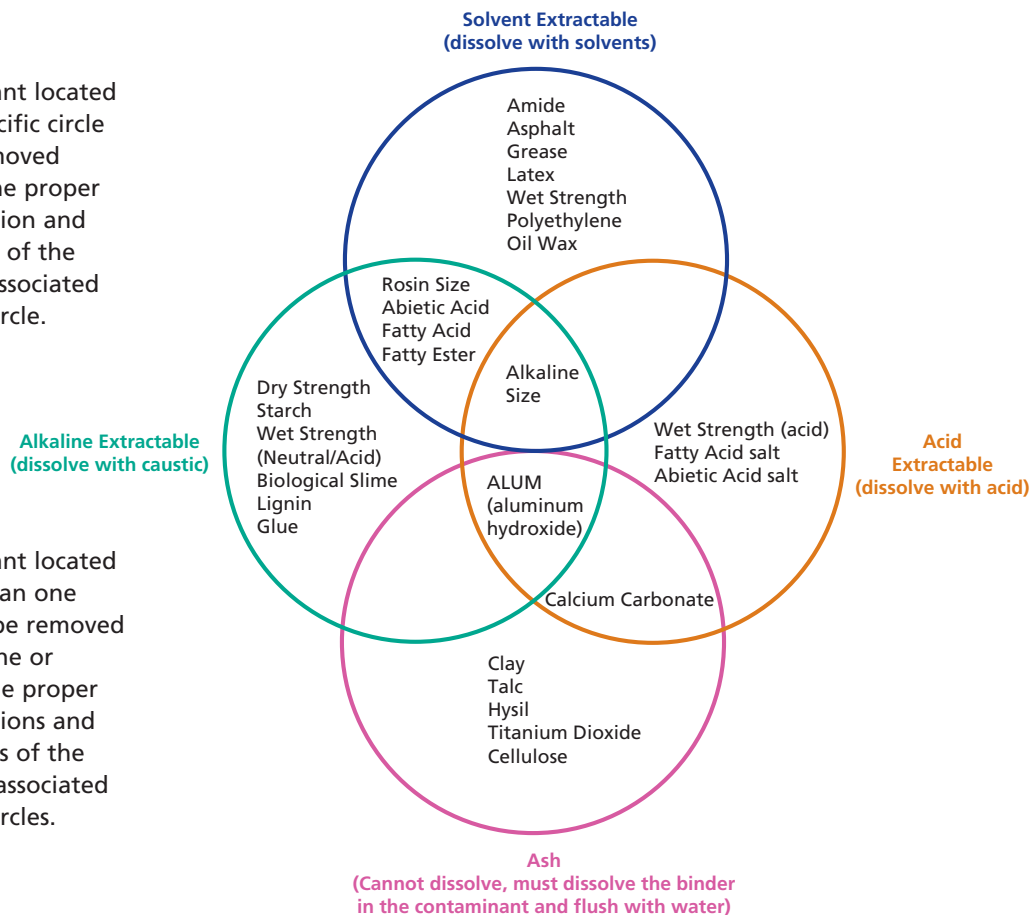
## Developing A Chemical Felt Cleaning Strategy

1. Identify the contaminants that need to be removed or prevented from building up
  - Understand chemicals and contaminants coming into the system
  - Obtain used fabric analysis to determine contaminants
  - Determine if prevention or removal is best strategy
2. Refer to contaminant removal circles for chemical selections
  - Work with chemical suppliers to develop concentrations and dwell times required
3. Select proper chemical showers and location
  - Engineered full coverage and uniform coverage is a must (oscillation may be necessary)
  - Locate shower to allow chemical to penetrate fabrics (roll/felt nips) and provide maximum dwell time
  - Identify which side of fabric contaminants are concentrated and adjust strategy accordingly

## Chemical Selection Sheet for Contaminant Removal

1. Contaminant located in one specific circle can be removed utilizing the proper concentration and dwell time of the chemical associated with the circle.

2. Contaminant located in more than one circle can be removed utilizing one or more of the proper concentrations and dwell times of the chemicals associated with the circles.



# White Water vs. Fresh Water

Environmental concerns, energy savings potential, and the desire to improve efficiency are reasons why many paper mills today are using recycled white water for all showers in the forming section. Despite these benefits, there are some issues which should be considered.

Shower nozzle plugging can be detrimental. To minimize plugging, the shower system must be designed to use recycled white water. The illustration below shows the components that typically constitute a correctly designed and applied white water system.

The RotoFlex™ resource recovery strainer initially separates fiber and contaminants from the water supply.

A white water tank collects the filtered accept water and must include a sludge removal drain. The pump suction outlet must be located well above the bottom of the tank.

Pipe runs should be designed to avoid dead spots or pockets. Minimum flow velocity should be 9 to 10 feet (2.7 to 3 meters) per second. Bleed valves installed at the end of each shower pipe will maintain this minimum velocity in the piping and the shower. Flush valves should be located prior to in-line filters, permitting all pipes to be flushed before start-up and after machine shut-downs.

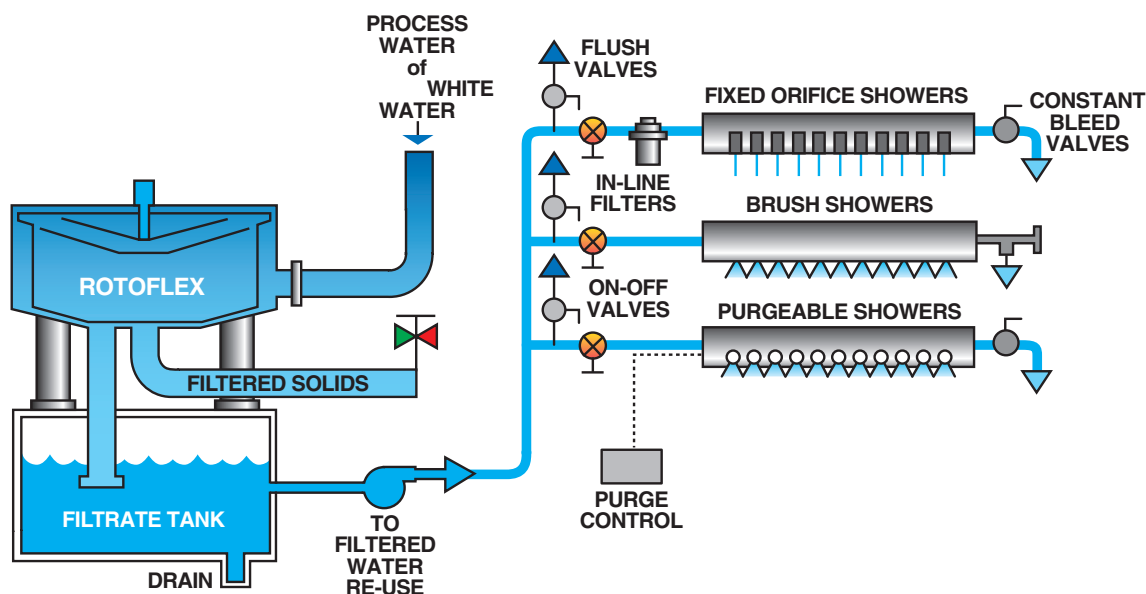
Kadant Solutions in-line filters will protect shower nozzles from blocking due to pipe scale and fiber flocs.

## Shower Water Quality

Solids Loading PPM (Mg/L)	Application of Water Strained with 100 Mesh per inch (40 per CM) Mesh Screen
0 – 50	Equivalent to filtered fresh water.
50 – 75	Usable in 0.040" (1 mm) and larger fixed orifice nozzles with minimal problems.
75 – 100	Usable in 0.055" (1.4 mm) and larger fixed orifice nozzles with minimal problems.
100 – 200	Usable in 0.125" (3 mm) and larger fixed orifice nozzles with minimal problems.
200 – 500	Brush type shower recommended.
500 – Up	Purgeable showers recommended.

Close attention to these details is important. It is equally important to analyze the quality of the accept water when selecting shower hardware. The chart shown above provides guidelines relative to solids loading versus shower type and style.

With cleaner water, fixed orifice nozzles can sometimes be used without blockage problems. As solids loading increases, it is necessary to select a shower with nozzles that can be cleaned while running. Brush or purgeable showers provide on-the-run nozzle cleaning features.

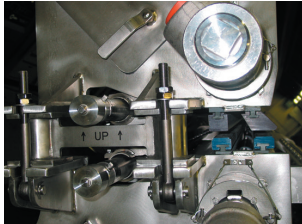


# Cleaning Products



## Shower and Oscillator Systems

Shower systems provide the essential components of an effective cleaning and conditioning system for today's paper machine fabrics. Moisture profile management, properly balancing shower pressure and flow dynamics as well as effective and efficient cleaning is critical to maximize tissue machine performance.



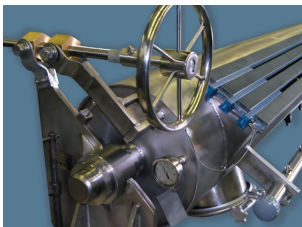
## Mist Elimination Systems

A newer development is the application of mist elimination technology on high-speed modern paper machines. Effectively applying mist elimination systems will reduce wet end breaks, positively impact overall machine hygiene, improve safety, and minimize mist that can adversely affect machine room infrastructure.



## M-Clean Cleaning Systems

The high-pressure cleaner is a modular cleaning system for packaging, paper, tissue, and towel machine forming, press, and dryer fabrics. It combines high-pressure cleaning with an effective evacuation system and air knife system.



## Felt Cleaning Assemblies

Water removal and moisture profile management require an in-depth understanding of modern press fabric designs, vacuum systems, and showering. Kadant Solutions will properly size and apply vacuum in the most energy efficient method to optimize press fabric performance.



## VersaTrim™ Systems

Clean and precise trimming is essential to operate high-efficiency and high-speed paper machines. The VersaTrim system provides an easily adjustable and accurate trim squirt system. Also available is a skid-mounted pump system and filters for nozzle protection.



## Auto-Brush Rotators

The auto-brush rotator provides the operator with a remote method to actuate the internal brush on a shower to clean clogged nozzles and not put any workers at risk. Simple, effective, and safe.



## Doctor Systems

Kadant is recognized as a leader in doctor technology with a product range that includes doctor blades, blade holders, and complete doctor systems for paper and tissue making. Our solutions include patented technology developed for cleaning and conditioning roll surfaces and dewatering couch and suction rolls.