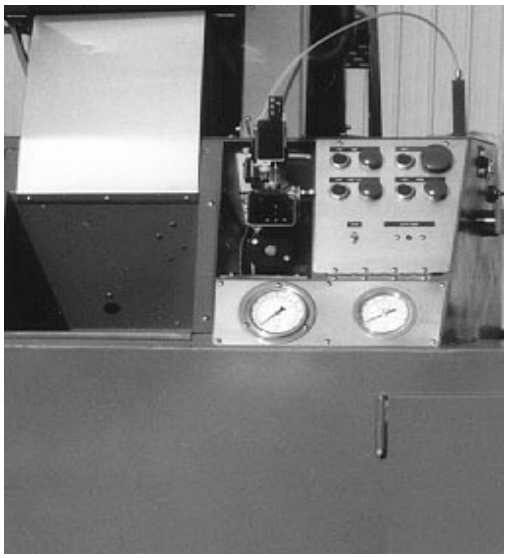
CRT Walk-around
Tandem-Flow Systems, Ltd

Many of you have heard me talk about the numerous changes Tandem-Flow Systems has made to the Continuous Roll Towel machine since we started rebuilding them nearly eight years ago. Well, we felt it was time to ***show*** them to you, with a photographic "walk around" of an overhauled machine.



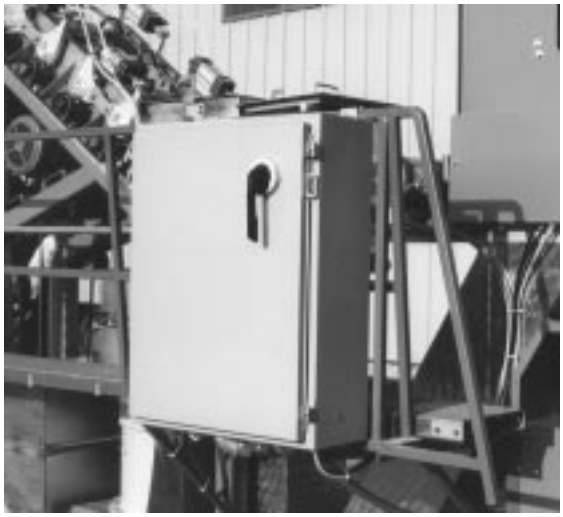
This is the new operator's station. Notice that there are some things missing... Namely, some buttons and other controls.

This is because we have moved all controls that are not needed by the operator for actually running the machine out of their way, placing them on the back of the power box. This eliminates buttons getting in the way, or wondering why the one you just pressed didn't do anything useful.

One that remains is the clutch tension adjustment, but it has been recessed, to prevent "inadvertent" changes. We left it on the front panel to be convenient for maintenance personnel while testing the tension.

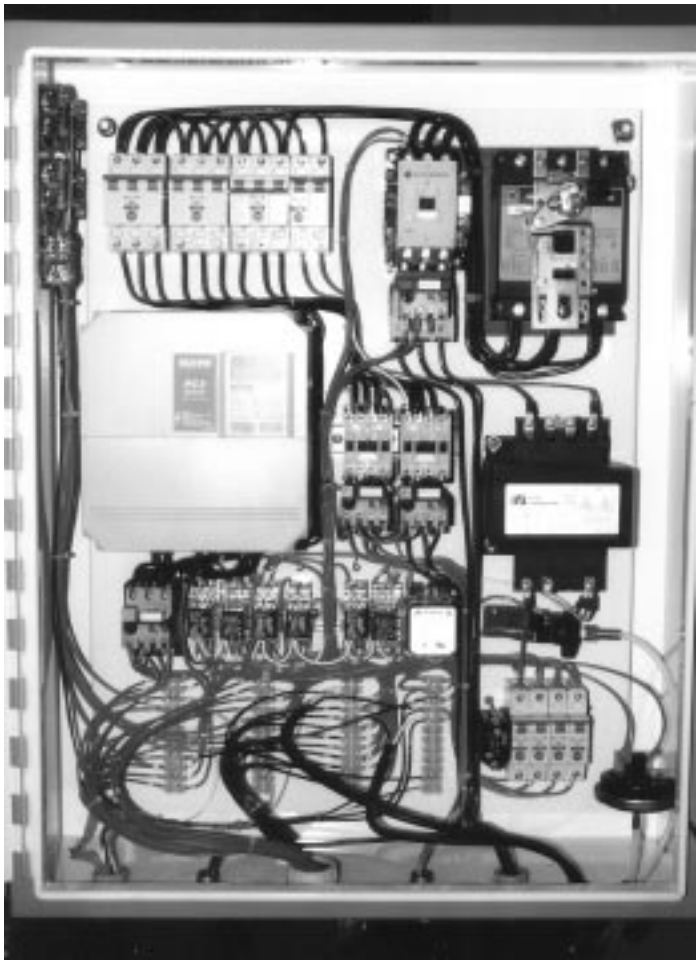
Where is the "strap" that the operator leans against to eject the towel? It's been replaced with this rugged foot switch of our design, which uses standard Micro limit switches, and a standard electric solenoid valve. We also use this switch design for the sewing machine.

That solenoid valve is housed in our air valve panel, which is mounted below the towel rewind area. This is where most of you expect to find a rat's nest of wires, commonly referred to as the power panel.



The rat's nest has been cleaned up and moved around the corner to the left, into the separate, water-resistant NEMA 4 panel shown here, mounted at a convenient working height on the cat walk.

The handle shown operates the power breaker, and serves as a lock for the panel, as well.

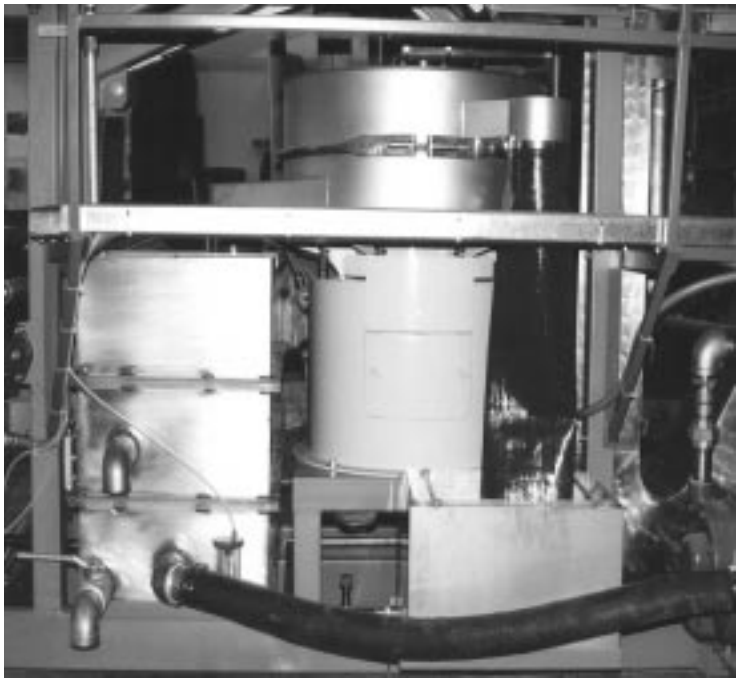


Here's what that panel looks like inside. Gone are the three starters used to start the old 30 HP Worthington-Simpson pump, replaced by a single starter. Optionally, this starter can be replaced by an energy-saving reduced-voltage "soft start" control, which mounts external to the power panel (they're huge).

Also missing is the starter for the main drive motor, replaced by a "Variable Frequency Drive", which allows us to provide a ten-second acceleration time, which reduces surge tension (and breakage) on the towels, while also allowing for setting slower speeds during operator training.

The rest of the panel is laid out with NEC compliance in mind. Note the use of Allen-Bradley starters, overloads, and circuit breakers (Square D for the main breaker), and DIN rail mounting for easy replacement of parts. This panel is designed for serviceability, and the ability to get parts locally. Yes, it costs us some potential business in replacement parts, but that wasn't as important to us as getting rid of the CRT machine's old reputation of being hard to get parts for.

Below the panel sits a Myers 20 HP, 2-stage pump. Myers pumps are made in Ohio, and parts are readily available from the factory, as well as many distributors around the country. It also uses a standard, 20 horsepower, 3-phase motor, rather than integrating the pump and motor into one assembly. This allows for quick and easy replacement in the event of a motor failure, without risking damage to the pump itself.



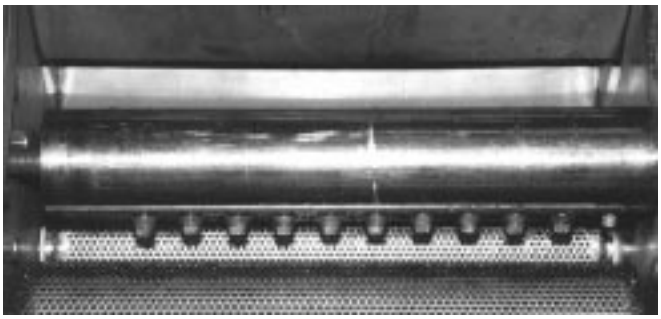
Here we see the shaker screen filter, lint collector box, and wash water tank. In older machines, the filtration of water going to the pump varied from minimal (round tank Mk.3 and 4 machines) to fair (square tank Mk. 5 with rotating-brush filter box).

When the Mk. 6 was introduced, it brought with it a Sweco shaker screen, because the new pump (manufactured by Grunfos) required much finer filtration than was possible with other systems. At 16 stages, cleaning the pump at regular intervals was **not** a pleasant job.

We use a Midwestern filter, because it is relatively inexpensive, and uses a standard motor to drive it. Most filters have special motors, with offset weights built-in, and bearings designed to **hopefully** take the side loading. The Midwestern filter moves all that out of the motor, so that the motor lasts longer, and is easier to get repaired or replaced, if needed.

The vastly superior filtration allows us to use a wash pump with a mechanical seal, rather than a leaky packing box. It also means that the spray jets stay much cleaner.

Speaking of the spray jets, here they are. We now use 20 straight spray jets, rather than the angled jets of previous machines. While there are many reasons for this, the benefits are that there is no torque trying to twist the spray header out of alignment. It also makes aiming the spray easier.



Here is something you've never seen before. It is the manual release valve for the Rinse Section Pressure Rollers. When pushed in, the rollers are lifted away from the bolster rolls; in the pulled position, the rollers are locked down to operate.

On all machines built prior to 1992, including ours, the rinse rollers are controlled by the "main air solenoid" in the cabinet. When the operator hits the

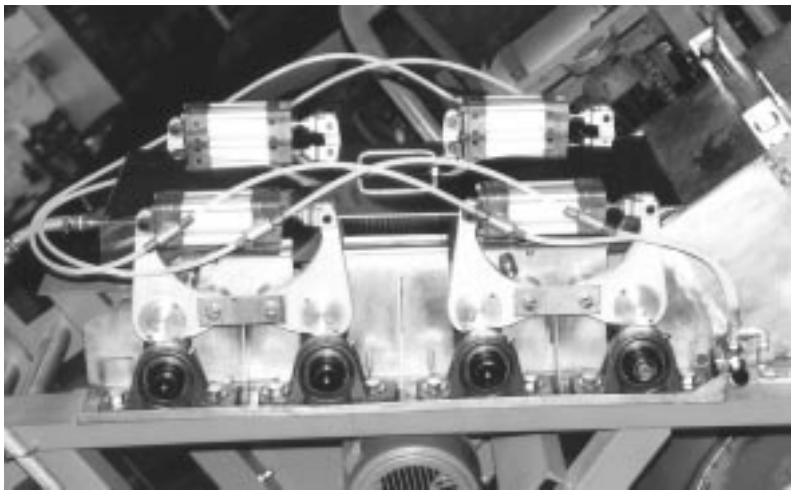
STOP button, that solenoid shuts off, and the rollers release... allowing 10 to 15 yards of wet, unextracted towel to be pulled out onto the drying drums as the machine coasts to a stop, as well as letting the guillotine to drop.

This makes it take longer to restart the machine, as the operator has to pull enough towel into the clean-side accumulator, or “stacker”, to raise the guillotine to the top, and makes for damp, soapy towels in the system, which need to be rewashed. A typical stop can take several minutes to restart.

With the new system, the rollers stay put, which keeps the wet towel off the drying drums, slows the machine to a stop faster, and does not allow the guillotine to drop. Restarting the machine is nearly instantaneous, raising operator productivity and reducing rewash.

There is also a manual release valve on the Stacker Drive, so that tension is never lost.

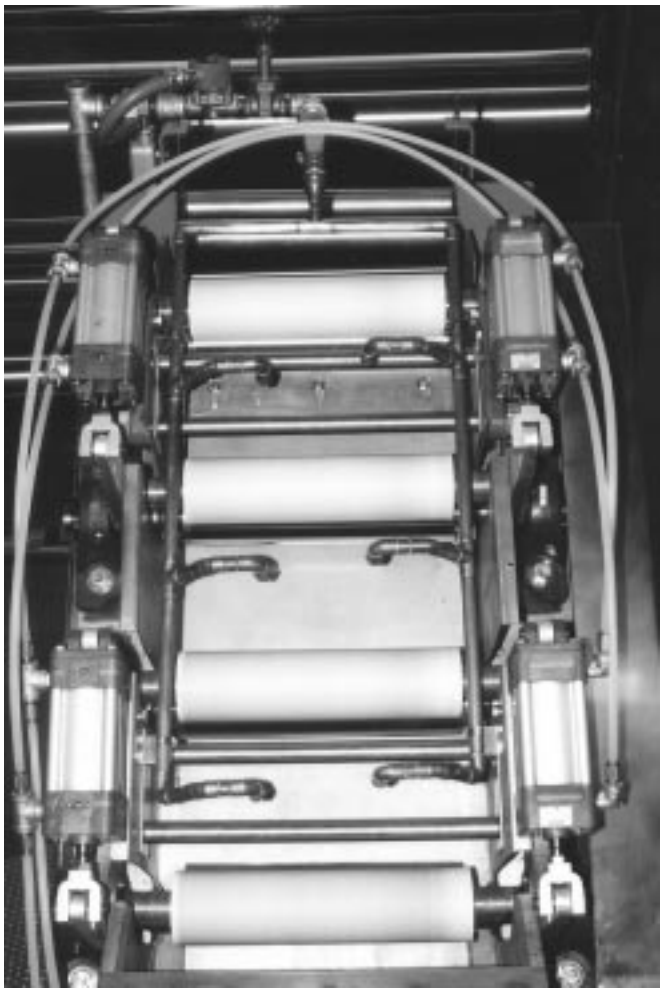
In the event of a towel break, the valves are conveniently placed to allow the operator to release the rollers, only as needed, to fix the break. And, since they’re tied, via a pressure switch, to the control panel, they can also act as additional emergency stop buttons; a simple push brings the machine to a halt.



This picture of the Rinse Section itself shows a number of changes we’ve made. In order to reduce the number of parts you have to keep on hand, we’ve changed the Roller Lever Arms (also known as “pork chops”) to use the same bearings as the long rollers of the drying section. Older machines used a variety of bearings, all unique to this section of the machine.

We still use the same seals and cover plates, of course, along with the highly reliable “white” pressure rollers we introduced over 17 years ago.

Another change, first introduced with the Mk. 5, is a “slotted” side frame. On the original Mk.3 and Mk.4, you had to remove the bearings from a roller before it could be removed. This could be a real problem, but, now, you can remove the roller with the bearings still attached, and move it to your shop bench, where you have more tools available.



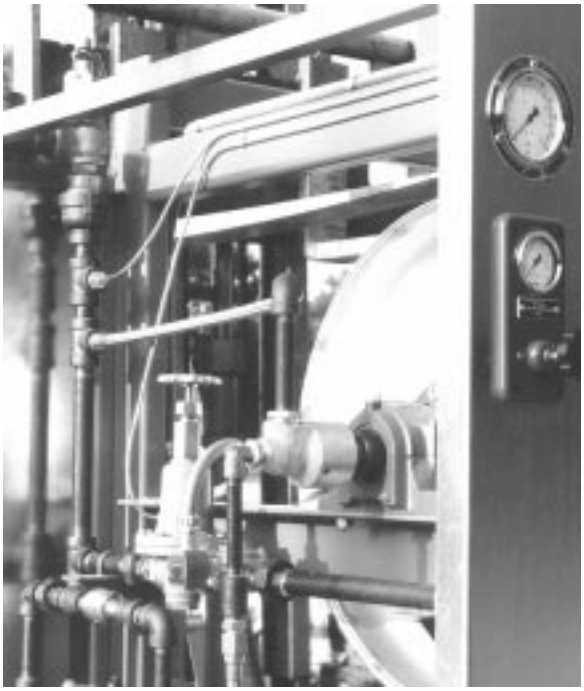
We've also added something - reinforcing bars, which eliminate the flexing and cracking of the side walls. Ever had a pressure roller pop out of its bearings, as the lever flexed outward? These bars, along with plates that go on both sides of the roller lever pivot, eliminate that problem.

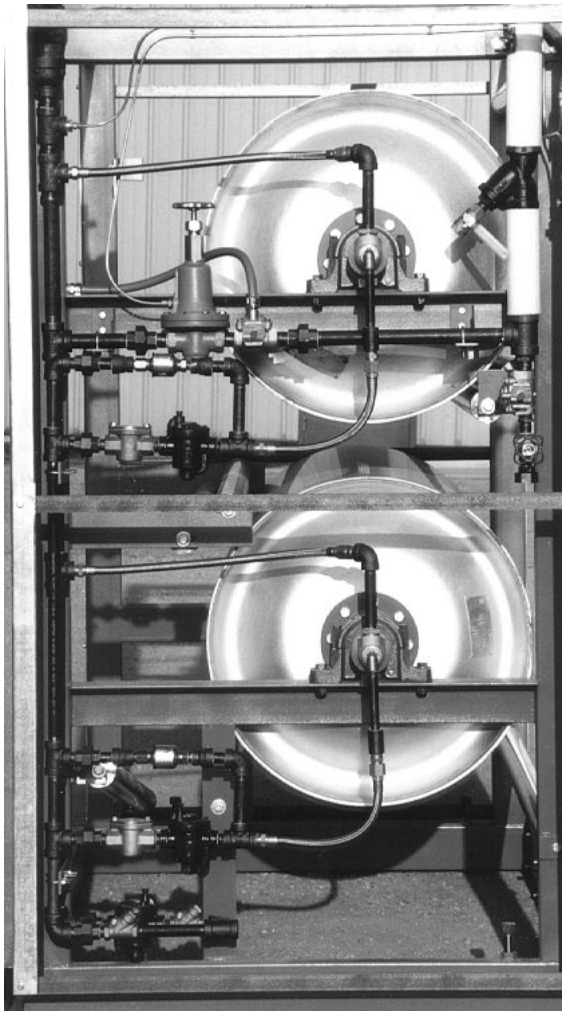
The final major change is to get rid of the gravity-feed rinse water feed, as well as some of the recycling bars. We now feed hot rinse water directly to spray jets, similar in design to the ones used in the wash section, which serve dual functions - they are sized to meter the water going into the machine, and they provide more impact to remove the soap better.

We do not have exact numbers on improvements in soap removal over the previous methods at this time, but we hope to have this information soon.

Here is our variable pressure steam regulator, which is remotely controlled by a regulator in the control panel. This allows you to set the steam pressure to match the actual drying requirements of your towels. You can account for speed changes in the machine, using the Variable Frequency Drive, or for the new 100% polyester towels now being sold by Milliken.

It has been our experience with Milliken's Visa towels that they give up their water very quickly at "normal" drum temperatures, sometimes in as little as 2 of the 5 or 6 passes a towel makes over each drum. Anything beyond that is just "cooking" the towels. Now, you can lower the steam pressure without removing the protective panels around the steam equipment.

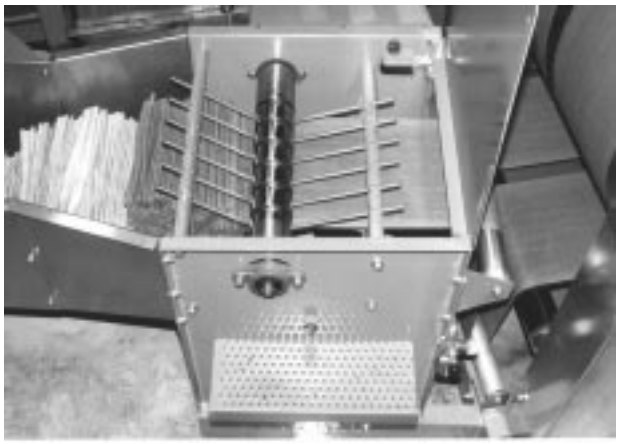


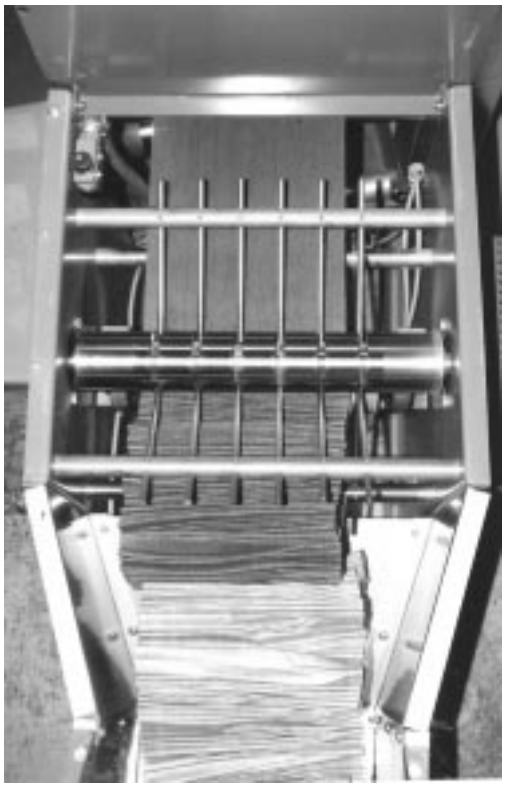


Our steam drums, while they do not look it on the outside, are significantly different from the originals. First and foremost is their ASME certification, which is increasingly important with insurance companies and some state agencies. The English-built machines were certified to English standards, which, while adequate, aren't recognized by most agencies here. Some machines were delivered with ASME-certified drums, however; those drums were built here in the U.S. by the same company that supplies drums for us.

We have also changed the rating on the drums, due to some state requirements that forbid the operation of an 80 PSI drum at 80 PSI. To get around this, our drums are built and certified for operation at 100 PSI., which we then operated at 80. This allows us to set the safety valve at the same 100 PSI that the original machine uses, and still be well within safety (and legal) limits. Our drums are also 78" wide, or 6" wider than the drums found on a Mk.4 machine. This allows an extra pass of towel over each drum, which increases the drying capacity of the machine. Extra capacity means we can run the machine faster, for more production, and still get the towels dry.

Coming off the drying drums, the towel now enters our straight-through stacker drive. Older machines use either a ramp with a carriage (Mk.3 and 4 machines), or a somewhat similar unit that uses a guillotine, and incorporates a 90-degree turn through the unit (Mk.5 and 6). The ramp/carriage units are heavy, and can cause injury if someone has their hand in the wrong place when a towel breaks. While safer, the later stacker assemblies are subject to significant jamming.





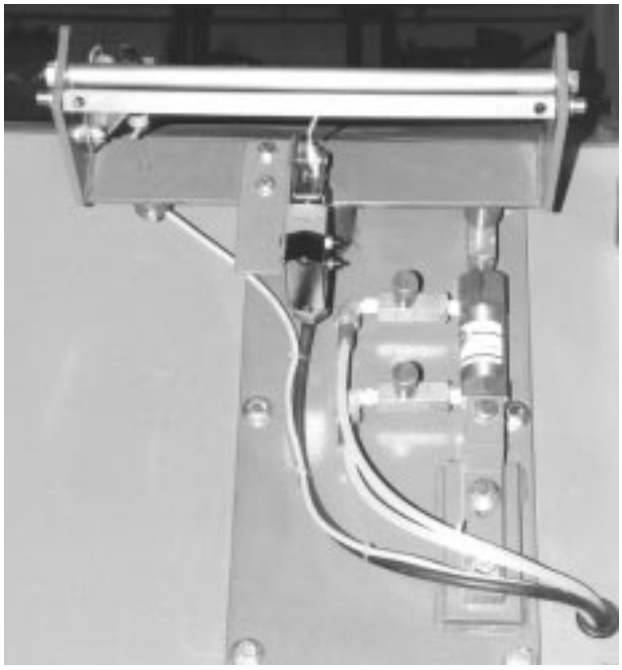
This newer unit eliminates the turn, which has reduced the incidents of stacker jamming almost completely. And, like the rinse section, there is a manual release for the pressure roller, so that tension is maintained when the machine is stopped.

As you can see in the picture on the left, the path through the stacker drive is open, and simple. The hinged cover (with safety interlock, top left) allows quick access if there is a problem, as well as for initial threading of the machine.

A single cylinder, mounted below the rollers, provides even pressure. The cylinder, grooved rubber roller, bearings and associated linkage, are identical to those used in the Dry Feed Hopper and J-Box Fill section, so you do not need to keep as large a variety of parts on hand.

Another improvement that we've made in deference to the Visa towels is our new stainless steel accumulator trough. While more expensive than the fiberglass troughs used in the past, it is stronger and more static-resistant. Visa towels have proven to be prone to static, so eliminating that charge became a priority item in 1996.

We have also simplified the towel path, to eliminate jam-ups, while providing sufficient tension to let the towel alignment assembly do its job effectively.



Moving further towards the front of the machine again, we come to the exposed wiggle-woggle cylinder and controls. This allows you better access for servicing the cylinder, or “fine tuning” the flow controls which set the speed of operation. These flow controls allow better control than the system of regulators and quick-exhaust valves used on older machines.

Replacing the trouble-plagued air sensor and diaphragm-operated valve used to detect the towel edge is a proximity optical sensor, controlling a solenoid valve. Cleaning requires only a wipe with a cloth, rather than disassembly of the valve, hoping to not damage any parts in the process.

This picture shows something new, an optical sensor for operator’s arm. We have had reports of some operators wearing long-sleeve shirts or blouses when working on the machine, which is a hazard around any rotating machinery. And one operator was injured when her sleeve got caught in a rewinding roll, twisting her wrist.

(No picture yet)

This sensor, when blocked, will disengage the clutch from the rewind mandrill. It is placed just above the diameter of a 45-yard towel, and uses a reflector mounted to the “third arm” assembly.

Looking up to the dry feed hopper, we can see the drive assembly. Where Mk.3 and 4 units had two bolster rollers, each with two cylinders, and one driven from the main drive via a **very** long chain, the new hopper assembly uses a common bolster roller, driven by the common motor. This motor also drives the rewind mandrill, through a chain and clutch drive in the operator’s console.

The next page summarizes much of what can be retrofitted to older machines.

SUMMARY OF MODIFICATIONS

Modification	Mark 3, 4, 4A	Mark 5	Mark 6
Commonality of bearings between Rinse Section Pressure Rolls and long Drying Drum Rolls, by replacing roller levers	X	X	X
Commonality of bearings and other parts between Dry Feed Hopper, J-Box Feed and Accumulator Drive by replacing DFH and AD (*NEW! DFH replacement for Mark 4/4A is now a bolt-on assembly! While cutting of the J-Box is still required, no field welding is required.*)	X	X	X
Replace 30-horsepower, 2-speed start English pump with 20-HP, single-speed start American pump with separate, coupled motor	X (Note 1)	X (Note 1)	X (Note 1)
Replace Wash Section Spray Manifolds with 20 total spray jets, 10 per manifold (*requires welding of stainless steel pipe*)	X (Note 2)	(Note 3)	(Note 3)
Modify Rinse Section for added strength and easier servicing of rollers and bearings (*requires welding of stainless steel to add gussets to Mk. 4 and 4A machines*)	X	(Note 4)	(Note 4)
Replace Steam Drums with American-made 78" ASME-rated drums, rated for 100 PSI service, allowing an extra pass over the drums, increasing drying capacity (*requires frame modification for Mk. 4/4A*)	X (Note 5)	X (Note 6)	X (Note 6)
Steam equipment replaced with U.S.-made equipment	X	X	X
Replace ramp-style clean accumulator with "straight through" Stacker Drive Assembly and "lay down" stainless steel trough, with larger capacity, lower towel tension, and lower potential for injury	X	X (Note 7)	X (Note 7)
Most electrical equipment made by Allen-Bradley, although other manufacturers may be substituted at customer's option	X	X	X
Variable-Frequency Drive to allow gentler starts, reducing tension and shock on the towel, as well as slower "training speeds".	X	X	X
Remotely-variable Steam Drum pressure regulator, for processing both cotton and polyester towels	X	X	X
Midwestern Industries shaker-screen filter to remove more lint from wash water and effluent, keeping the jets and pump clean (*requires frame modification; not generally considered "field modifiable"*)	X	X	(Note 8)

Notes:

1. 16-stage Grunfos pump used on most Mk. 6 machines. Improved filtration required for round-tank machines
2. Improved filtration required for round-tank machines
3. Mk. 5 machines use two manifolds with 11 jets per manifold. Mk. 6 machines use four manifolds with 6 jets per manifold
4. Some Mk. 5 and all Mk. 6 machines are already slotted for easy removal of rollers, but do not have reinforcement bars to prevent flexing and cracking of side walls. These do not require welding to modify.
5. Mk. 3 and some 4 machines use 72", 60 PSI, non-ASME-rated drums. Later Mk. 4 and all Mk. 4A machines raised the pressure rating to 70 PSI, but were still not ASME rated.
6. Mk. 5 and 6 use 78" drums with 80 PSI ratings, but only those machines that were ordered with U.S.-made drums have ASME ratings.
7. Mk. 5 and 6 machines have a fiberglass trough and several variations on the "stacker drive assembly" which have proven troublesome over the years.
8. Mk. 6 machines use a Sweco shaker-screen filter.