Retrofit of an Operating Healthcare Facility

Revamping your present laundry may obviate the need to build a new one, thereby saving you time and money

By Gerard O'Neill

How often have you thought to yourself (as an operator) that, "I need ***more room***? bet the thought crosses your mind all of the time. How often have you thought to yourself, "I need to build a ***new facility*** but I can't afford it." (especially with today's construction costs). The average cost of a building (laundry friendly) is about $90-$120 per sq. ft. Add to that, cost of land, equipment & laundry fit out, etc. I bet that thought crosses your mind a lot also.

Well, how about looking internally (FIRST) and evaluating the idea of retrofitting your existing facility and modernizing or upgrading it to allow for that future growth? (You know, that account that you wish you could bid on, but are unsure that your existing facility can handle it.) Does this sound like a "common sense" approach to you? I should hope so. Let me tell you the story of a recent project we, American Laundry Systems (ALS), did in the last six months that went through some interesting exercises.

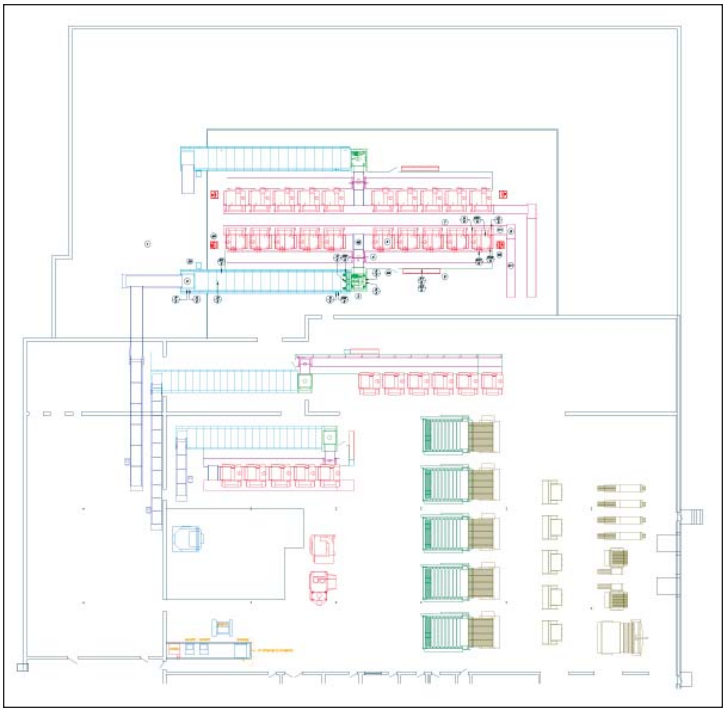
Shared Hospital Services (SHS) a co-op healthcare laundry located in Portsmouth, VA, called us to help them plan a NEW building extension and installation of a NEW batch tunnel washing system all to be housed in this NEW building. The building (28,000 square feet) was to be added to the existing building (see proposed drawing/layout at right) and would incorporate the new equipment detailed below.

Some other information which was included as part of the reasoning behind the proposed expansion was that the existing tunnel systems were 20+ years old and the annual expense of keeping these in good running condition was exorbitant to say the least.

ALS contacted the client (SHS) and agreed to do a "Plant Survey" prior to undertaking this exciting project. Upon a "peeling back of the onion layers" we found that the customer didn't really ***need*** a ***new*** building or an expansion at all, but did need to ***"fix what they had"*** in the existing plant. There was more then enough room to accomplish this "retrofit/expansion" and we also found the ***"hole"*** that would allow our team to keep the customer running with no loss of production. The information below is the result of the study for this facility:

Business Challenge:

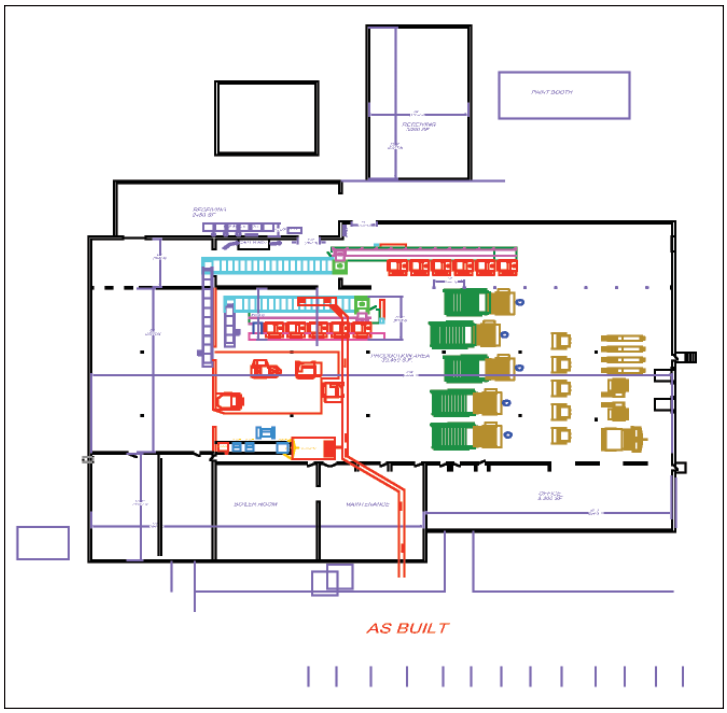
The business challenges that SHS has in consideration are focused on how to efficiently process all laundering requirements with an anticipated growth that over a 5-8 year period could result in an annual increase in production to 25 million lbs. per year. *(current production was in the region of 15 million lbs. per year.)* **Some of the challenges that exist include:**



Shown above is a proposed plan for reconfiguring a laundry plant. The new design is intended to improve efficiency and throughput by maximizing productive use of all available square footage.

- Maintaining the current 5-day, single-shift work week; ultimately, being able to continue, efficiently, managing the labor impact of the laundry.
- Accommodating for the future growth that is projected from current and future co-op members' current and future expansions of facilities, i.e. additions of more bed wings, onsite clinics, satellite clinics, etc.
- What are the current and long-term financial effects of building a new, "right sized" plant (which will accommodate the anticipated growth) versus rehabilitating the current facility with the correct infrastructure requirements to accommodate the anticipated growth?

- Are there any limitations or outside forces that could hinder or affect the focus of the business? And if there are, what can be done to limit their impact?



The plant's old layout (shown above) wasn't geared to accommodate anticipated growth over 5-8 years that would include a boost in processing from 15 million to 25 million lbs. per year.

Service Requirements and Physical Condition:

Summary : The overall state and suitability of the following infrastructure support systems were evaluated for achieving efficient operation of current production goals, accommodating the future anticipated growth and overall material condition and readiness:

Mechanical Room Equipment:

Compressed Air: A single, water cooled, Gardener-Denver 150 HP air compressor provides low pressure compressed air at approximately 690 cfm @ 115 psig.

- Water Softeners: No water softening equipment is currently utilized.

- Cold water storage is contained in two (2) 108-inch fiberglass by 156-inch high carbon steel tanks and is supplied by a well, via a 48-inch fiberglass by 126-inch long surge tank. There is a 6-inch city water supply line reduced to 4 inches for use, if well water is not available.

- Hot water storage is contained in a 108-inch fiberglass by 156-inch high fiberglass tank, with approximately 6,000 gallons usable volume. The hot water tank is outfitted with an external steam bundle, which is not utilized sized at 18"f x 48"L. Hot water is pumped from the hot water storage with a single 25 HP process pump, via a 6-inch supply line. A spare 25 HP pump is piped for standby for either cold or hot water delivery. Hot water is supplied to the conventional washers only.

- Cold water storage is contained in a 96-inch fiberglass by 132-inch high fiberglass tank, with approximately 4,000 gallons usable volume. Hot water is pumped from the hot water storage with a single 25 HP process pump, via a 6" supply line. Cold water is supplied to the conventional and tunnel washers.

- 10-inch wastewater heat recovery, shell and tube heat exchanger that is inoperable

- Steam is supplied to the plant from two (2) 600 BHP Cleaver-Brooks, 4-pass boilers. The boilers supply steam as a single source, with the offline boiler as a backup. The boilers are supplied with dual fire burners. Natural gas is the predominant fuel supply for the boiler. The boilers supply steam to the five (5) ironer lines, the two (2) 18 pocket tunnel washers and the conventional washers, one (1) of the conventional wash room dryer and the building unit heate

The existing plant's mechanical room was rife innefficiencies, including a boiler that operated at only 25-40% of full load, an inoperative wastewater heat recovery system and steam unit heaters that required complex maintenance.

Mechanical Room Capacity Summary: The water system is oversized for the current full machine capacity, providing the machines were in good repair. The current process water support system was designed for open pocket machines, as seen by the volume of hot and cold water that is stored. For future needs, the tempered water storage system, need only store about 4,000 gallons of tempered water and the hot water storage need only store about 1,500 to 2,000 gallons of water given the orientation of two future batch tunnel washers and a few conventional washers. The hot water steam heat exchanger needs for future requirements needs only a heat exchanger with approximately 1/3 the heat transfer square footage. The current steam consumption, at cold start-up, given 60°F average cold water temperature and 170°F maximum washing temperature is approximately 6,033 lbs. steam/hr for water heating and 5,800 lbs/hr for ironing and drying; this equates to approximately 340 BHP. With building heating, a single 400 BHP boiler could carry the steam generation load for cold startup.

Steam generation, given the above conditions is about 240 BHP. Future needs for steam generation at cold start-up would equate to approximately 8,800 lbs. steam per hour for water heating and 7,000

lbs. steam per hour (457 BHP), should it be decided that it is necessary to install two (2) additional ironers in the future and have all natural-gas fired dryers and building unit heaters.

Currently, the operational inefficiencies that exist in the mechanical room equipment are as follows:

- The online boiler operates at 25%-40% full load, depending on surge steam demands. The boilers have been adjusted so they do not cycle on or off, during low steam demand periods. A pair of 250 BHP boilers would ultimately be the "right sized" boilers for future steam demands.
- The wastewater heat recovery system is inoperable and at current water heating load, approximately 39% of the energy used for water heating load is not being recovered properly.
- The delivery of water can be satisfied with 15 HP pumps, vs. 25 HP pumps. The electrical difference is for operation of the two different pumps is that the consumption of the larger pumps is approximately 58% more than is required.
- Because the steam bundle is not being used, when conventional washers call for steam, the overall percentage of live steam injection is increased by approximately 11%.
- Steam unit heaters require more complex maintenance to keep them operating properly.
- Boiler stack temperature is approximately 360°F and there is recoverable approximately 1.1 million BTU leaving with the boiler flue gas.
- The tube count of the 10-inch wastewater heat recovery system is such that if the heat recovery equipment operated, as intended, at average flows, the flow through the tubes would be less than optimal and therefore cause an increased fouling rate. In order to counteract this, the heat recovery would need to be operated in parallel flow versus counter-flow, 2/3 more throughout the course of the day, thereby decreasing the overall efficiency of the heat exchanger.
- The boiler feed tank is not insulated.

Other notes of concern about the mechanical room equipment:

- The fiberglass cold water storage tank is leaking.
- The cold water, well surge tank in the boiler room has been patched numerous times and eventually will need to be replaced.
- There is a constant stream of flash steam leaving the boiler feed tank vent.
- Removal of the existing wastewater heat-recovery system and process water system to install a properly sized system is highly recommended.
- Monitoring equipment such as gauges and thermometers are missing and inoperable from the water system equipment.
- About 15 feet of insulation is missing off a 3-inch steam line. With the mechanical room air temperature acclimating to about 130°F in the overhead where the steam line is located, this loss is equivalent to approximately 10,110 Btu/hr.

A steady loss of flash steam (see stack above) from the boiler feed tank posed another costly problem for plant operators.

Production Area Summary:

The overall material condition of production equipment ranges from good to poor. Conventional washers range from 2 years to 20+ years old. Dryers for the conventional washers are all approximately 20+ years old. The two tunnel washers with the appropriate dryers are 20+ years old. Specific equipment items that are in poor condition that directly affect the utilities efficiency of the plant are:

- Visual inspection of building unit heaters shows that the heaters are extremely soiled with lint and heat transfer surfaces are impacted.
- No. 2 batch tunnel washer leaks water from the seals, resulting in approximately 15 to 25 gpm flows from the worst seal. This range of water pouring out of the tunnel washer amounts to about 8% of the water heating requirement or approximately 482 lbs. of steam per hour. This steaming requirement could maintain another flatwork ironer.

Water leaking from the seals under one of the tunnel washers cost the laundry operator 15-25 gpm from the worst seal.

The following notes reference the overall material condition of the orientation and utilities delivery system in the production area:

- There is no physical separation between the soil and clean side of

the laundry. Exposure to bloodborne pathogens is addressed in OSHA Technical Manual - Section VI, Chapter 2.

■ The following table indicates the areas of steam and or condensate piping in the processing and finishing area that is not insulated, with the corresponding heat loss per hour that is attributed to each:

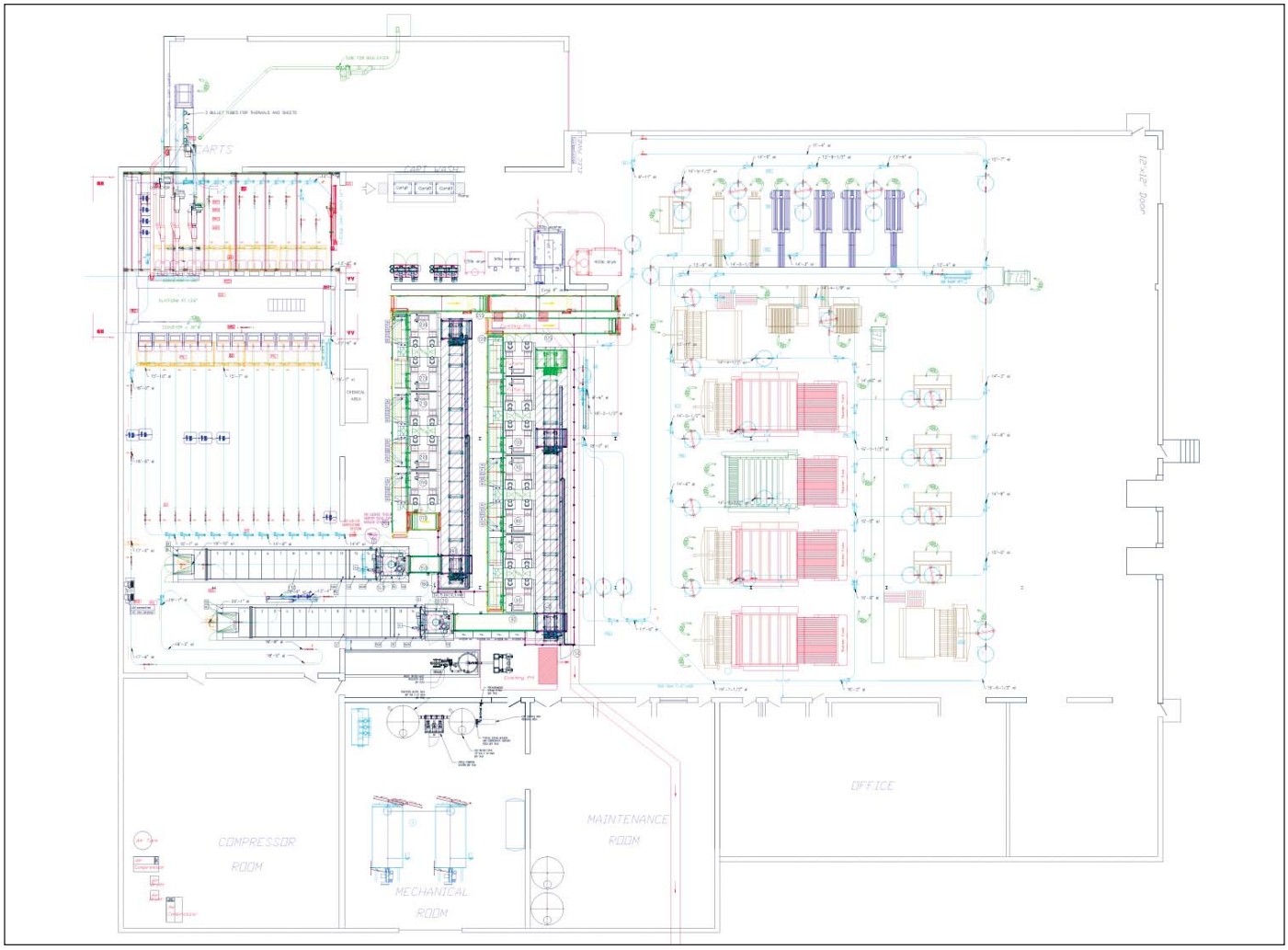
Location of Deficiency	Size of Pipe (in)	Length of Pipe (ft)	D°F between Pipe and Ambient	Heat Loss (Btu/Hr)
Near Washex	3/4	27	275	7182
Near Milnors	3/4	41	275	10906
Near Lavatec	1 1/2	30	275	13410
Ironer #4 (Stm)	2	60	275	33000
Ironer #4 (con)	1 1/2	60	275	26820
Near Lavatec	2	21	275	11550
Near #2 Tunnel	2	30	275	16500
Near #1 Tunnel	3	50	275	38900
Headers	4	50	275	48900
			Total for Processing Area:	207,168

So the information above shows us that the existing facility was in need of upgrading on the "energy" side and also on the equipment/production side. Our analysis showed that the customer could indeed handle his future growth projections and all within the confines of the existing building. (Note: Find the HOLE! It's the simplest yet most effective method for an existing plant retrofit!) Where is the HOLE you say? Look at the existing equipment drawing, the HOLE is on the soil sort side of the building page WEST!

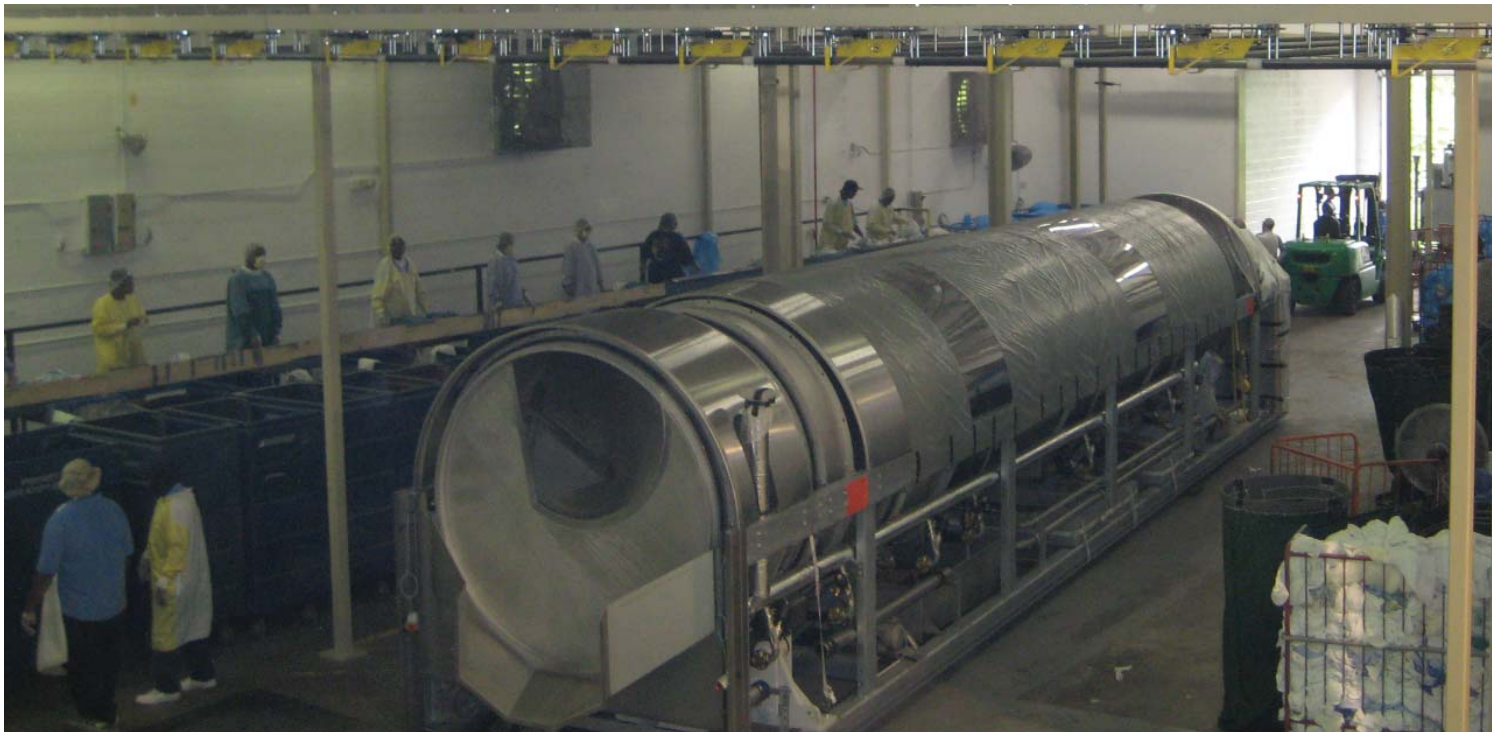
OK, so far we have determined that the equipment is antiquated, inefficent and—in some cases—way oversized. We have also determined that the existing building can not only handle their current poundage but also the future growth (keeping the single shift) but we have also determined during our survey that we can probably eliminate 12-14 FTEs from the payroll with some automation and re-arranging of the plant work flow.

Here's how we accomplished that.

From the ***"New Layout/As Built"*** diagram above you can see the finished product.



The diagram above shows the new plant layout, which included a number of upgrades, including the replacement of the old boiler system with two new Hurst modulating boilers with dual fuel systems (gas and oil) at 250 BHP each; new energy-efficient stack work on the boilers, and two new Kannegiesser 75 kg. tunnel washers.



The plant redesign effort cleared room in what was the soil sort area for a new tunnel and overhead real system. This move represented a triumph for the improved use of space, i.e., the designers worked with the operator to find the 'hole' that they needed to realign the wash aisle for improved efficiency and added capacity for growth.

- In the boiler room the older 600BHP boilers were replaced with (2) NEW Hurst modulating burner, dual fuel (gas & oil) models (250BHP).

- The process water system was completely demolished, redesigned and replaced with a new process water system including water tanks, pump package, plate & frame heat exchanger, condensate heat exchanger, etc., essentially pre-heating the incoming water from 60°F to 130°F for ***free***!

- New energy-efficient stack work was placed on the boilers.

The air compressors were removed from the HOT boiler room and placed in a cooler location with outside air cooling the fans in the vicinity.

- Using the ***"hole"*** concept, a ***new*** automated QI monorail soil sort with Automation Dynamics vacuum sort stations for the heavier goods was also incorporated into this plan and a soil classified system was installed in the existing "soil sort area" (see room on left of drawing on pg. 45).

- (2) ***New*** Kannegiesser 75kg tunnel systems were installed in the bottom half of the soil room with the dryers installed in the ***"old"*** conventional washroom area.

- The existing conventional washroom was removed and relocated to North side of the conventional washroom with the older dryers being sold as scrap. (1) existing Lavatec 450 lb. open pocket was kept in the plant along with (1) conventional dryer.

- The (2) ***"old"*** Lavatec tunnel systems were removed one at a time as the ***new*** Kannegiesser 75kg tunnel systems were installed one at a time.

Note: This allowed the customer to keep working and there was no interruption in production.

- The 5th ironer was removed and sold (creating a HOLE) for the blanket folder & small piece folders to be relocated. This also allowed for the customer to rearrange his finishing department and gave him the much needed room for a larger makeup area!

A view of the new boiler room infrastructure, which includes a new process water system with water tanks, a pump package and a plate-and-frame heat exchager.

A view of a new intake and exhaust duct system for dryers in the plant

A look at the plant's two new Kannegiesser tunnel washers with an automated loading system that has largely eliminated the use of carts on the wash floor.

Note: Removal of the 5th ironer was made possible by increasing the "size & pressure" of the steam lines feeding the existing ironer area. This allowed us to run the remaining 4 ironers hotter and faster!

- A ***new*** automated "Clean Side" monorail was installed, picking up the goods from the dryer discharge conveyors and delivering them to the various clean finishing areas!
- A ***new*** cart washer was also built and installed in the "New Conven-tional" washroom area. This allowed for the soiled carts to be cleaned and then placed in the clean side of the plant for pack out!
- The entire facility was repainted and NEW modern T5 lighting installed to replace the older sodium high bay fixtures.

Summary:

The budget for the entire "Retrofit" was $7.25 million. The project was completed "*Under Budget*" for $6.55 million!

1. New equipment:

(2) New (75kg) tunnel washing systems (Kannegiesser).

(2) New auto monorail systems (clean & soil) (QI & Automation Dynamics).

(1) New process water system (TEA).

(2) New steam/boiler systems (HURST).

(4) New small piece folders & small pony washers (Braun & Cissel).

(1) New cart washer (SHS/ALS designed and built).

(4) New sloped/drop tables to help feed ironers (ALS designed and built).

New gas and water meters for accurate measurement of utilities.

2. Complete retrofit/replacement of aging and failing infrastructure:

New electrical distribution panels and breakers.

New steam and return system (properly sized & pressurized).

New air line loop throughout the facility (properly sized & pressurized).

New hot and tempered water system (pumps, piping, properly sized, etc.).

New lighting system (T5 energy efficient).

New paint and facelift for facility.

(5) New exhaust fans (30,000 CFM) for employee comfort.

Misc: new overhead doors, pits and trenches, etc.

Results:

Modern & efficient infrastructure realizing (35%-40% reduction in utilities.).

Smoother & more efficient work flow, ***no carts***! Automated delivery of goods.

40%-50% growth factor within the confines of the ***"existing facility."***

Another ***very happy*** customer! TR

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