

How to turn 18,000 boxes into an 1,800 lb bale in one hour.



QVC engineers at Corporate Engineering and Balemaster and AES worked together closely to arrive at the right layout, the right sizing and the right orientation for the balers in the warehouse.

Balemaster and AES worked with QVC's engineers to help them understand how best to specify a baler for optimum performance. In most applications balers are typically specified on the basis of volume – how much material can they accommodate and bale in an hour. But in the Warehouse & Distribution business, a baler must be sized differently – after all, how much content is there in an empty box?

In most baler applications, such as commercial printing, the refuse mate-

rial, called the intake is all similarly sized – at least in the vertical dimension. But regardless of size, the intake typically has no rigid characteristics to speak of. Therefore, there is nothing about the content of the waste stream itself that prevents it from behaving predictably. In a non-warehouse venue, the density of the pre-baler intake might be an efficient 1 – 3 lbs per cubic foot.

Conversely, in a warehouse environment dominated by rigid boxes, full of air, the pre-baler hopper density can be as inefficient as 1/4 lb per cubic foot.

THE PROBLEM AT ROCKY MOUNT solved by THE EXPERIENCE AT LANCASTER:

At QVC's Rocky Mount, NC 1,800,000 sq ft facility where boxes of random size flow to the baler fast, and where housekeeping is an imperative, volume means very little and handling the unpredictable flow means everything. Projecting flow accurately is predicated on the nesting factor and peak volume. QVC discovered that calculating average flow serves no purpose. Necessarily then, and although it might strike some as counter-intuitive, the maximum or peak volume is the number to which the baler selection must be pegged.

Then comes the issue of redundancy. QVC's Lancaster, PA facility had

experienced more than one costly baler breakdown. That experience led the specification team to seek a baler supplier with the resources and experience to provide a solution built to fit the needs of the facility. This wasn't going to be a case of buy a cheap baler, install it someplace outside near the loading dock and try to forget about it. There's a commonplace adage among those who buy compactors and cheap balers that goes: "Hammer to fit. Paint to match." QVC had tested that route in Lancaster and wasn't about to risk a similar solution at Rocky Mount. There was too much at stake at the 1,800,000 square foot, state of the art showcase facility.

Not only was the previous baler at Lancaster sized to accommodate average volume (and therefore undersized) but the unexpected demand at peak loads caused unacceptable logistics problems deeper in the organization. The QVC engineers calculated that the installed cost of two balers would be more than offset by the projected life-cycle costs of the right solution.

What's more, any inability to handle flow, when you know it's coming the same time every year, is simply unforgivable. And any bump in the installed cost would be further offset by not just reducing (but totally eliminating) the back-pressure on the picking and filling infrastructure specifically and the general warehouse functionality generally.



TAKING THE ENTERPRISE VIEW, A DIRECT-TO-CONSUMER DISTRIBUTION CENTER IS A LIVING THING:

Think of the warehouse as a dynamic entity – a living organism. Clearly, any loss of capacity to handle the waste stream ultimately backs up where it shouldn't and cause operating problems. QVC reasoned that there were plenty of problems that needed solving of the random and unpredictable variety in the true added value/customer service portion of their business. So why invite more stress and possibly compromise the customer experience by something as purely mechanical and potentially easy to solve as adequate and properly sized baler capacity. If ever there was one small thing that impacted the entire enterprise – the baler in a Direct-to-Consumer warehouse situation could be it.

DEALING WITH THE NESTING INSTINCT:

In the Warehouse & Distribution business environment, the baler sees different box sizes and box configura-

tions. And depending on how they fall into the hopper from the conveyor the baler must deal with cavities and pockets caused by refuse and waste (boxes) with different dimensions in multiple planes. All of them falling in random sequence to form unpredictable box nesting results. The larger the boxes – the larger the nesting factor. The smaller the boxes, the smaller the nesting factor. The larger the nesting factor (say 50%) and you have to calculate a lot of air. And obviously, with a smaller nesting factor (say 25%) you have to accommodate more material.

A baler cannot be successfully sized on the basis of volume or average flow – unless when the seasonal highs occur and the baler sees peak flow – boxes backing up on the conveyor and falling to the floor at the hopper is an acceptable operating condition. Which of course is not the case at QVC where cleanliness is part of the customer satisfaction solution.

But there's a further baler specification dichotomy – as the engineers at QVC discovered. Although the baler necessarily must be sized to accommodate peak flow conditions, operationally, it must be equipped to make bales at

both peak and less than peak flow conditions. When peak flow does occur, the baler is cycling frequently and the ram is more or less continuous in operation. Operationally, the baler hopper should be recharging at the same time as the bale is being made and tied off automatically.

DEALING WITH UNINTENDED ENERGY COSTS:

Horsepower means different things to different industries. But in the context of baler operations it refers to the energy driving the hydraulics on the baler. More specifically it typically refers to baler cycling speed. Technically, hydraulic systems have suffered from a near-universal shortcoming, namely, low energy efficiency. Systems that use fixed-displacement pumps are sized to meet peak loads and pressure demands. Variable-displacement pumps are sometimes used to improve efficiency by modulating output flow to meet changing requirements.

In order to provide additional energy efficiency, Balemaster took the concept of reduced hydraulic demand to adjust for reduced baler demand to

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a more precise level. Balemaster provided a "Dual Motor/Dual Pump" solution. Simply put, instead of one 50 Hp motor/pump hydraulic power unit, each baler was equipped with 2 25Hp power units. The "Dual Motor/Dual Pump" concept allows QVC to operate each baler at half-speed during seasonal lulls. When optimum design speed is called for, the dual power units work in parallel to provide unimpeded maximum performance. The dual unit design has the further advantage of providing an additional layer of redundancy – should one of the motors or pumps fail for any reason.

WHY BALERS and NOT COMPACTORS

When QVC's engineering staff began to investigate baler options, they assumed it would be a fairly straightforward specification – not unlike the compactors originally installed at the Rocky Mount, NC facility. (see COMPACTOR SIDEBAR). And compactors have their place – but perhaps not in a 1,800,000 square foot warehouse. Prior to the installation of the four Balemaster balers at Rocky Mount, 4, 4-cubic yard compactors had been in place. There were two stations, and originally a single compactor at each station. Another compactor was eventually installed at each station. The dual compactors at each station saw a shuttle conveyor running between the two to accommodate the load. It turned out to be a less than ideal solution according to Peter Angstedt.

A compactor, by its nature, is a small capacity solution. Compactors, for all their strengths in some applications aren't really designed to effec-

tively handle the volume of rigid boxes that the QVC distribution center was generating. Although QVC's corporate and onsite engineering staff weren't the ones to specify the original waste disposal concept when the facility was first built, they soon saw that the misapplication of the compactors was having a counterproductive impact on unrecoverable overhead site costs, such as:

- The containers onsite came with a rental fee.
- The compacted weight per cubic foot of volume was comparatively inefficient. (compactors = 6:1 and bales = 28:1)
- Therefore the cost of waste transport by volume was unacceptably high.
- And so shredders were installed ahead of the compactors to reduce the boxes to a uniform size.
- The shredders added measurably to the energy burden. And added significantly to the dust present in the Distribution Center, which added to the burden on the plant air filtration equipment.
- The containers that were in place to accept the shredded and compacted material had to be "Dropped & Swapped" regularly. Obviously, more frequently during peak seasonal periods. This process, whenever it occurred requires between 15 and 25 minutes.
- During this "Drop & Swap" phase, the conveyors, shredders and compactors could not produce transportable waste. The equipment therefore was:
 - a) Engaged and operating but not producing and therefore totally inefficient, or
 - b)

Disengaged, only to be re-engaged 15-25 minutes later from a dead stop several times a day, demanding still more power and potentially accelerating maintenance requirements.

- The above sequence of events (and costs) was happening several times per day, more during peak loads, at 4 stations in the facility. And each container leaving the facility was accompanied by a "pull" charge.
- Unless inclement weather delayed, or worse, prevented timely removal during the wintery holiday periods – causing back-pressure to build up deeper in the distribution center itself.
- These above costs were compounded by remote baling fees imposed on the facility in order to get the waste into a density and format that recycled paper mills would accept.
- And finally, the recycle revenue per ton that the facility could have realized if it had been doing its own recycling, was being shared with the local hauler.

By some estimates, the combined impact of all this on the bottom line, was in the neighborhood of \$200,000 per year, or \$10.00 per square foot under roof. These were largely avoidable costs and unacceptably high. Peter Angstedt, QVC's Facilities Manager, was soon convinced that an alternative approach was required. And that the solution needed to be a first-class one, consistent with the rest

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of the Rocky Mount facility. He found such a resource in Balemaster.

WHY BALEMASTER WAS THE PREFERRED SOLUTION.

Located in Crown Point, IN and with many warehouse and distribution installations to its credit, Balemaster together with equipment integrator, Advanced Equipment in Philadelphia, PA provided the solution that Angstedt sought.

QVC found an innovative solution in the Balemaster technology for the following reasons:

- Efficient hydraulics
- An innovative dual motor, dual pump technology (1/2 speed capability)
- A low-dust design
- Horizontal vs vertical
- Robust Automation
- Rugged construction concepts adapted from recycling balers
- The most reliable automatic wire tie design they could find

