

Motorized Roller Conveyors Understood

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Very Brief and Abridged History

Roller conveyors have been around probably since the caveman. Whether conveyor rollers have been made of stone, wood, or metal; they all have followed in one form or another a relatively simple and similar means of locomotion. Ancient, old, and even brand new roller conveyors make their individual rollers turn thus moving the load from roller to roller. In almost all designs new and old, a single rotating motive power source (beast of burden, steam engine, electric motor) applies mechanical drive to a linkage (rope, leather belt, synthetic belting, chains, etc.); that makes contact with the rollers in the conveyor section. Throughout history, the dominant guiding economic principle for conveyors has been to minimize the number of rotating motive power sources for a system of conveyors because these are typically the most expensive and complex single item associated with the conveyor design.

Conveyors and the Holy Grail

Even today, a roller conveyor section follows the same basic design of utilizing a large multi-phase electric motor that attaches to a gearbox which in turn rotates a shaft that

turns a sprocket that moves a chain or pulley / belt combination that makes contact with all of the rollers in the conveyor section. This, of course, only creates basic transportation of items on the conveyor. Most conveyor system applications require that the conveyor accumulate items on its rollers; one behind the other with minimal gaps, when the discharge of the system needs to stop for a while and then re-start conveying the items when its discharge is ready to accept items again. Oh, and most people want this done without their product plowing into one another and without the conveyor rollers turning and grinding underneath their product causing damage while the conveyor is accumulating. The functionality that makes product queue up in an orderly fashion and rollers stop driving when you want to accumulate and subsequently makes the rollers start to turn when you are done accumulating is the "holy grail" of roller conveyor function and it is known as *zero pressure accumulation*. In order to make today's typical conventional roller conveyor perform as a zero pressure accumulator usually requires solenoid valves and compressed air utility hook up along with the motorized drive train to make the whole thing work. Conveyor

equipment manufacturer's have all made their own versions of zero pressure accumulation conveyor over the years, and most have perfected the technology to where it is mature and predictable...but not without its share of quirks and problems.

Hurry up and wait

Up to now, some businesses (particularly small and medium sized operations) whose logistics could use the benefits of roller conveyors; and zero pressure accumulation functionality in particular, may have shied away from purchasing a conventional conveyor system solution not necessarily because of the raw cost of the conveyor equipment; but because of the lengthy time duration of implementation and associated cost, on-going electric and compressed air utility usage, and skilled labor required for upkeep maintenance. Another key point that maybe holds back the investment in a conveyor system is that **today's business patterns evolve at ever faster rates** which makes the conveyor system you need for today's operations may not be the one you need for next year's (or the next busy season's) operations.

New technology requires control

Now, there are newer technologies being utilized to help business combat these issues. Individual conveyor rollers that utilize their own internal motors have been around for a few years, but are just now being widely considered as viable motive power for conveying systems. Although a single motorized conveyor roller cannot physically perform the same work as one of its large multi-phase electric gear motor counterparts in a conventional design; with the **right design concept**, it doesn't have to. *Motorized Roller Conveyor* sections are; generically, sections that utilize a single motorized conveyor roller that is only mechanically linked with enough free-turning (gravity type) rollers to constitute a *controllable zone* not much longer than the item to be conveyed. With the **proper control system strategy**, individual motorized roller conveyor zones can be easily assembled to make *zero pressure accumulation conveyor sub systems*, particularly for **traditional carton type handling applications**.

We all like to play with blocks

The right design concept is the key. Motorized roller conveyor sections with the **proper control system**

strategy are inherently modular, both mechanically and electrically, thus creating a **building block approach** to system design. What this means is that instead of having a single 100 ft behemoth accumulation conveyor with its associated big honkin' 5 HP 480-volt gear motor and its own air feed drop; we now can have 10 or so manageable 10 ft. modular accumulation sections that connect together. These modular sections require no air piping and their power sourcing can be as simple as plugging into a standard 120-volt household wall receptacle.

But we must be safe

As described above, our 100 ft behemoth's 5 HP 480 volt motor can be a dangerous animal if a person was to get in the way of its drive train. A stray hand, limb, or piece of clothing can lead to tragic injury if one were to get placed in the wrong space or pinch point while this conveyor is running. Also, knowledgeable electricians and/or mechanics are required to service such a beast if there is trouble. The motorized roller unit in a typical motorized roller conveyor section is powered by 24 volts DC and is **inherently safe because there are no major pinch points**. Because a motorized roller only has to provide motive power and torque to a short zone; there is not enough drive power to be dangerous to people working around the conveyor. In most designs, a person can literally grab a running motorized roller with their bare hand and make it stop with only a handshake grip.

Shhhhh...keep it down

A really great thing about motorized roller conveyor is that it is **much quieter** than conventional conveyor. Conventional conveyor usually uses chains and sprockets somewhere in its drive train, which transfers vibration to conveyor frames, supports, and rollers, thus creating noise. To make matters worse, in our 100 ft behemoth conveyor example, the big honking motor and drive train runs all of the time, so we have chain noise and vibration whether or not we are conveying or accumulating product. Motorized roller conveyor designs can typically achieve **70dB or less noise levels**.

What energy crisis?

Perhaps the greatest aspect of motorized roller conveyor operation is the fact that with the **proper control system strategy, the motorized roller conveyor only runs when it needs to**. In a typical accumulating system application, conventional conveyors run all the time whether they are accumulating product or not. In a typical motorized roller system, however, the rollers in a given section only run 10% to 50% of operational time. This can equate to an **energy savings of 30% to 70%** compared to conventional conveyors that operate continuously. What this means to the **bottom line** is a **faster return on investment**.

Plug and Play

In recent years the term "plug and play" has become ubiquitous in our language to the point that it

sometimes loses its meaning depending on the individual. Motorized roller conveyor truly brings the intended concept of plug and play to real form for conveyor system applications. With the **proper control system strategy** applied up front, a typical motorized roller conveyor section (say a 5 ft. or 10 ft long unit) is electrically pre-wired at the manufacturer prior to shipment. A typical section will utilize plug connectors at each end to allow the unit to be set in place and simply plugged into the unit in front of it and behind it to make it operational. Why is this important? Well, the small to medium sized business we talked about before can easily add or remove sections as needed to alter or re-route their conveyor path (even temporarily) as needed to accommodate their business changes. Also, with the **proper control system strategy** applied, this endeavor need not require a gaggle of engineers, programmers, or technicians to accomplish. Often time the businesses own people can make changes and modifications with minimal assistance from the original conveyor equipment or control system provider.

Spare us the maintenance cost

We talked about the energy savings and the quiet operation of motorized roller conveyor. The inherent advantages of motorized roller design bear fruit as time goes on in lower maintenance and spare parts cost. Simply by the virtue of running only as needed, motorized roller

conveyor has a **longer base equipment life**. Remember our conventional 100 ft. behemoth conveyor and the noise it makes? Well where there is noise, there is typically wear. Most all maintenance and wear items associated with conventional conveyors are part of the drive train (sprockets, chains, belt lacing, etc.). Even the most modern and efficient gear motors require regular maintenance and lubrication. Today's typical motorized roller unit utilizes sealed for life bearings; and for a given system, most all motorized roller units are interchangeable, so only one spare part is required. Conventional conveyor drive train gear motors can differ greatly in size depending on application, conveyor type, and section length resulting multiple spare parts for a given system.

Feeling stronger every day...

Most conveyor manufacturers have embraced the motorized roller conveyor concept in one form or another. As time goes on, more and more motorized roller conveyor products are being placed on the market that solve traditional material handling functions other than zero pressure accumulation. There are currently several versions of merges, transfers, and etc. on the market with more to come.

I can see clearly now...

A point that cannot be stressed too much is that the **proper control system strategy is key** to making a motorized roller conveyor system (or

a conventional conveyor system for that matter) a complete success. The conveyor equipment industry has provided (and continues to provide) the mechanical building blocks and tools to move materials, but the control system is what makes it go, slow down, speed up, and stop when it is supposed to. The proper control system for motorized roller conveyor is distributed within each conveyor section because each section only needs to know what is going on in front of it and only needs to inform the section behind it what it is doing. Just now there is available on the marketplace new control strategies that allow for **data and information handling within the control system** for motorized roller conveyor. This exciting new scheme opens the door to utilize motorized roller conveyor solutions (and all of its inherent design benefits) for **more intelligent functionality** such as **product tracking and sorting** that until now has been the sole province of conventional conveyor systems with custom control systems.

Working Smarter...

Motorized roller conveyor systems offer many advantages over traditional conventional conveyor equipment schemes. These advantages in summary are:

- Modular Design
- Faster & Easier Installation
- Safer
- Quieter
- More Energy Efficient
- Less Maintenance Cost

These advantages alone should make the decision to implement a motorized roller conveyor solution much easier particularly for the small to medium sized business operation who is sure they have a material handling problem, but is unsure of the next step.

About the Author

Pat Knapke has 17+ years experience in automated materials handling, most of which has been “in the trenches” designing and implementing conveyor control systems. He is currently the Director of Engineering for Insight Automation; the proven leader in innovative control system solutions for materials handling applications. Pat can be reached by email at pknapke@insightautomation.cc or by phone at 1-800-764-6356
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