

Innovative Conveying System (ICS) readied for commercialisation

Over the last 10-years, the WA-based Innovative Conveying Systems International (ICSI) has developed its own novel variant on the pouch or enclosed conveyor theme. ABHR editor Charles Macdonald spoke to the company's managing director Michael Pietsch about the patented technology and its initial commercialisation.

The Innovative Conveying System (ICS) is a patented materials handling technology applicable to a broad swathe of industries. These include high capacity applications in areas such as mining, bulk handling and ship-loading, as well as smaller capacity industrial applications in areas such as fertilizer, plastics and food.

The technology is currently entering its initial commercialisation stage with an emphasis on the smaller civil and industrial sectors where the particles to be conveyed are no larger than 300mm. This encompasses a wide range of products, including powders, sands, grains, rock aggregate, woodchips and tunnelling spoils.

While commercialisation of the ICS in major bulk mining applications will follow at a later date, it was this sector that sparked the concept of the ICS in the first place.

In the 1990's Michael Pietsch was a mining man with a business in drill and blast and contract mining. Involvement in hard rock gold mines, with cut-backs every six months or a year, exposed the limitations of traditional, fixed infrastructure conveyors, sparking Michael's quest for a better alternative.

"I wanted to develop a continuous system that would be more flexible and user friendly than conventional conveyors," he said. "It started as a mining tool, to carry large rocks, and maintain very high angles around horizontal and vertical bends. By a process of elimination, it had to be suspended and hug material to induce bridging.

"For immediate commercialisation we're carefully managing our ambitions, concentrating on smaller particles. Big rocks and large tonnage capabilities are being developed for the future."

ICSI is also, at this stage, pitching the ICS at applications not best served by traditional conveyors.

"We're not looking at traditional conveyor applications like a one kilometre straight run" said Michael. "Conventional conveyors are very efficient in these circumstances and so much work has gone into improving them.



The Innovative Conveying System is an enclosed conveyor that uses a patented corrugated belt to allow flexibility in both the horizontal and vertical directions. The belt is supported on custom designed idler assemblies.



The Innovative Conveying System can be mounted on a variety of custom built brackets. The load and return strands can be side by side, one on top of the other or can follow completely independent paths. This configuration was developed for mounting on the side of mining declines or to the wall of a tunnel.

“We’re looking for applications where we can solve problems that are either too difficult or impractical for current technology.”

The ICS belongs to the well-established class of enclosed conveyors, but, according to Michael Pietsch, is unique in its architecture and capabilities due to three key components: a unique corrugated enclosed belt; a modular frame system; and an in-line drive system.

The most distinctive components of the ICS are the belt edge section and the body of the belt, which forms a closed shape in the cross section. The corrugations are inherent in the geometry of the belt and grant it the ability to follow a complex path involving marked changes of direction in both the horizontal and vertical planes. The belt can also be filled to a point just below the apex, boosting the amount of material the ICS can carry and enhancing its high-angle capability.

The patented suspension system, whereby the belt edges hang on a series of idlers, enables the ICS to cope with uneven ground and rough set-up. The ICS belt forms an enclosed cross section (roughly approximating the profile of a teardrop) when in its carrying position. When viewed in cross section, the edges of the suspended belt take the form of an upside-down “J” — hence ICSI’s description of it as the “J Section.” The continuous hook portion of this profile sits over the idler wheel on each side and the effect is of the belt “hanging” from the frame.

A consequence of this architecture is that there is great flexibility in the design of the frame, with its function simply to provide a structure on which to suspend the belt. In long distance, fixed-path applications the frame can be constructed of long, stationary sections that are attached to pylons sunk into



The conveyor uses multiple drives to distribute the loads along the length of the system. These drive units can be easily repaired or replaced when necessary.



One of the in house test units that is used for both testing and for demonstration purposes. This system feeds its own load hopper without using any transfer points, allowing the system to keep recycling the material.

the ground. For short applications demanding mobility — such as in ship loading or stockpiling — the frame can be mounted on wheels.

Whatever the combination of frames and regardless of the curves and angles composing the path of the system, the ICS eliminates the need for any transfer points.

A series of in-line drive units liberates the system from the high tensile stresses of conventional systems, resulting in a relaxed system that can move while operating. The number of drive units dedicated to a system is at the discretion of the system designer. Applications involving a significant lift from the origin to the destination will call for more drive units than those in horizontal environments.

Generally, a system built around a 250mm diameter (800mm cross-section) belt will call for drives of about 10 to 15 kw capacity each, while a system employing a 1300 mm diameter (4m cross-section) belt will require drives of about 250 kw each. Drive components are fairly standard and constitute a caterpillar drive and electric motor, coupled with a gearbox, mounted at the desired point on the frame.

The ICS is modular in nature. This applies to the belt, which can be constructed in segments from six metres to thirty metres in length, and can be easily joined by a non-expert to form a continuous loop. The result, says ICSI, is a system, including those of considerable length, that can be transported to any location accessible by a standard truck. The modularity also enables trouble-free extension and contraction of systems.

In terms of materials to be conveyed, the belt can be filled to approximately 90% of its interior volume and can carry any solid material that can fit into the cavity. The size of the belt is matched to the task at hand. A typical high volume surface mining belt will be around 1.3 metres in diameter, enabling it to carry large rocks of up to one metre in any of the dimensions. At

the other end of the scale, and more pertinent to current commercialization, a civil and industrial application may require a belt of 250mm diameter.

Of course, another critical determinant of belt size is the required tonnage per hour of material movement, a function of belt cross section and belt speed. As the ICS can be filled almost to its apex, even smaller sizes can convey at healthy rates. For example, a 250mm system travelling at a comparatively leisurely 1.5 metres a second can move around 300 tonnes per hour (based on material with a bulk density of 1.5 tonnes per cubic metre). More generally, a speed of 2.5 metres per second would enable a 250mm system to transport material at around 480 tonnes per hour.

“The main point is that the ICS can handle a wide variety of materials,” said Mr Pietsch. “The fully enclosed characteristic of the belt renders it highly suitable for transporting very fine powders.”

In operation, the ICS's inline drives are the primary driver of its ability to negotiate tight curves, removing the high tensile forces inherent in traditional, end-driven systems. Also aiding this turning ability is the inherent corrugations which provide flexibility based on geometry and not elasticity.

It is the corrugations that also allow the ICS to operate at steep angles of up to 80 degrees, with the belt's bridging eliminating any tendency for material to slide or roll back down the belt.

In development terms ICSI has, so far, built three systems for testing various aspects of the concept. The firm currently has two operational

conveying units at its premises which are used for test and demonstration purposes. These units are of 250mm and 350mm diameter (measured in a closed pipe configuration) and range to 60 metres in length.

The larger system has been configured in a full circle with a radius of five metres, discharging material into its own feed hopper without the need for any intermediate transfer points. It is operating at 450 tph in this configuration but is capable of conveying in excess of 1,200 tph of material with a bulk density of 1,600 kg per cubic metre running at three metres per second.

Separately, ICSI is currently developing a 700 mm diameter (2.2m cross-section) belt for a 2,000 tph grain application at 2.5 metres per second.



The modular nature of the system means that a combination of fixed and mobile frames can be used to achieve the desired path. Addition of extra frames and belt can be done very swiftly without the need for highly trained personnel.



“We’re looking for applications where we can solve problems that are either too difficult or impractical for current (conveyor) technology,” said Michael Pietsch, managing director and original inventor of the Innovative Conveying System.

“After a decade of development, we went out to market with our system in January 2007 and the response has been very positive,” said Mr Pietsch.

The company’s marketing push has seen development of a ‘baby belt’ of 125 mm diameter for industries requiring a dust free, high angle and very small radius capability, for powders, concentrates, granules and aggregates to 60 mm.

“While small in size, this system is still capable of conveying capacities of up to 100 tph for the heavier materials running at two metres per second,” said Mr Pietsch. “The first of these systems has been sold to a local fertilizer manufacturing company which has decided to replace its current conveyor due to dust and spillage issues which necessitate daily cleanups.

“In addition, the firm’s plant must receive material running along the length of the oven discharge chute and then forming a composite turn of 90 degrees horizontal and about 25 degrees vertical, within a radius of less than a metre, to take the material up to the screen assembly.”

In this application, although the product temperature is around

80 degrees celsius the tonnage required is just four tonnes per hour. This means that the belt will run at only 0.25 metres per second which will assist the product to cool and harden up before being discharged onto the screen. According to ICSI, the cradling effect on the material and the gentle motion of the system, which dispenses with the need for rollers under the belt, virtually eliminates product degradation.

This ‘baby system’ is due for installation at the fertilizer manufacturer in July 2007. Similar sized systems will have application in other sectors like food, where they may potentially find favour in place of pneumatic systems.

“Other larger installations are currently being negotiated with numerous clients, including major companies for which we are currently preparing concept layouts and costing,” explained Mr Pietsch. “We expect some of these projects to be signed up within the next two or three months.”

Elsewhere, ICSI has recently been awarded patents for the ICS in India, China and the Philippines, these coming on top of the firm’s numerous existing patents, including one for the USA.

ICSI, with 15 employees, operates under an unlisted public company structure from modern premises of about 3,000 square metres in Kewdale in WA.

“We enjoy strong financial support via equity investments from our major shareholders, which include Australian and overseas companies, none of which are involved in or connected with the conveying industry,” said Mr Pietsch. “This enviable backing allows us to adopt longer term R&D and marketing strategies, rather than be preoccupied with short term thinking and survival issues. It also allows us to prioritise the important rather than the urgent.”

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The in house test unit negotiating a radius of five metres through 270 degrees.

ASBSH visit to ICS International's Kewdale premises

On May 1st a group of around twenty members of the Western Australian branch of the Australian Society for Bulk Solids Handling (ASBSH) met at the Kewdale premises of Innovative Conveying Systems International (ICSI).

There, they viewed a working demonstration of the latest version of ICSI's unique conveying system. In addition, ICSI's managing director, Michael Pietsch, conducted a tour of the factory and the component testing equipment.

The WA technical convener of the ASBSH, David Beckley, told ABHR that, "he was very impressed with the high quality construction of the new conveyor and also the innovative technical solutions that have been developed for this groundbreaking form of belt conveying." David added that comments from the other visitors ranged from "very impressive" to "I want one".

"ICSI's warm hospitality extended to drinks and light refreshments that rounded off a very interesting and informative evening," said David. ■

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Michael Pietsch explains technical aspects of the Innovative Conveying System to members of the Australian Society for Bulk Solids Handling (ASBSH).



ASBSH members watching a demonstration showing rapid idler replacement while the system is running.