Holy Grail

A conveyor systems manufacturer seems to have the answer to many a mine manager's wish list. By **Noel Dyson**

Want a conveyor that can negotiate tight turns and rough terrain, while keeping its contents enclosed? Want one that can carry material up grades approaching 80 degrees? Want a conveyor flexible enough to "slew" at its offloading point and act as its own stacker? What about one that allows maintenance people to change the idlers while the conveyor is running at full speed and does not require specialised skills to maintain the belting?

Put those attributes together and that is what Western Australian company Innovative Conveying Systems International has developed.

This new take on the venerable conveyor is no overnight success though. ICSI managing director Michael Pietsch and his son Dror, who is the company's business development manager, have spent the past 10 years developing the system.

Michael Pietsch said there were other conveying systems that could do some of what ICSI's system could do but he was yet to come across one that had all of the benefits the ICSI system was offering.

The ICSI system has been patented in the majority of the industrial world, including Australia, South Africa, China and the US.

The Pietsch family started off funding the system's development themselves but they have been joined by overseas investors along the way. Pietsch did not rule out floating ICSI down the track.

The company began marketing its product in December and has already started drawing interest from both mining and other bulk handling industry specialists. Pietsch said ICSI was not interested in taking on the conventional conveyor market but was instead going after the niche market of conveying

FLEXIBILITY

- Conveyor system is capable of handling turns with a radius of 5m and grades of up to 80 degrees and can slew to act as its own stacker.
- Modular design of the belt means that it can be changed relatively easily, without the need for specialist skills such as belt splicers.
- Product has been 10 years in the making.
- Company is aiming for the niche market of difficult conveyor jobs where conventional technology cannot cope.

jobs that had proved too difficult for existing technology.

Wrapped up

One of the secrets to the ICSI system's success comes from wrapping the conveyor belt into a loop. The conveyor "hangs" from specially made "j" sections that pull the belt into a teardrop shape for much of its travel. This brings the benefit of enclosing whatever is being transported, removing the need for external structures to be built around the belt to stop dust escaping.

It also helps to reach the 80-degree elevation. Bringing the contents of the belt together helps generate bridging, which stops the material being transported falling back down the belt.

Pietsch said the system could handle up to 80 degrees for aggregate and larger material and had managed to move finer materials such as wheat on slopes of up to 45 degrees. He said building baffles onto the inside of the belt would allow the system to move finer substances such as wheat up elevations approaching 80 degrees.

The corrugated belt design is another factor behind the system. The corrugations allow the belt to "flex", which in turn allows it to handle tight turns as well as holding the material better than a smooth belt. Pietsch said flex in the belt was geometric, rather than elastomeric. In simple terms it relies on the fact that the belt is longer when it is straightened out than when it is corrugated. It also means the belt itself does not stretch.

This flexibility allows the conveyor system to slew at its end, and, essentially, act as its own stacker. It also gives it the ability to handle curves with a radius of about 5m, much tighter than conventional conveyors.

The belt itself only takes the weight of the load but not the tensile load. Instead of running over rollers as a traditional conveyor system would the ICSI system is suspended from a number of idlers on "j" sections. These "j" sections take tensile load.

This "hanging" arrangement also means the conveyor can be tucked away into unobtrusive positions. For example, in an underground environment it could be suspended from the roof of a drive or along one of the drive walls.

Maintenance of the conveyor system has also been simplified. ICSI has designed its belting to come in modules that can be easily changed, removing the need for skilled workers such as belt splicers. ICSI is also finalising the design of a system that allows idlers to be changed while the conveyor is operating.

The conveyor system is moved by a series of drives that ICSI has developed itself. Instead of big motors at the end of the conveyor belt, ICSI plumps for a series of drives along the conveyor system.

Pietsch said this multiple drive system helped reduce the stress on the belt. "Because of the multiple drives, a 10km belt does not need to be any stronger than a 100m belt," he said. "There are no cumulative forces building up."

The robustness of the design also means that the conveyor could be mobile. In a tunnelling application, for example, a 100m length of ICSI conveyor could be used to follow a road header, taking the spoil from it and discharging it further back down the tunnel, removing the need for trucks to be brought up behind the road header.

Haulage hope

The Pietsch family started on its conveyor quest to try and find an alternative to haul trucks in open pits. One of the problems with using conveyors in an open pit is that the angle the system would have to negotiate would be too steep for existing conveyor systems. An alternative is to step the conveyor up the haul road, which involves various transfer points and lots of belt.

Alas, the openpit application may be some way off yet. The main problem lies in trying to get rocks of up to one cubic metre in size (and mine rocks rarely present as cubes) properly aligned with the conveying system.

A prototype of the ICSI conveyor operating at an 80-degree angle.

Above left: ICSI managing director Michael Pietsch and a working version of the system. Note how the belt opens out to discharge. Above right: The conveyor system is capable of handling turns with a 5m radius.

Such a rock, Pietsch said, would weigh up to three tonnes but that would not be a problem for the belt, providing it could be properly aligned with the conveyor.

The systems ICSI has at the moment can handle particles up to about 300mm in size.

"We see our system being used mostly in the post-crushing stage," Pietsch said.

One of the fascinating things about the ICSI development is that the Pietschs are not conveyor folk. Pietsch was a contract miner running companies such as Hardrill and also mined some small deposits his family owned.

He said the development of the conveyor system had grown from that understanding of what miners want.

"The breakthrough for us was when we decided that each attribute was complementary to the others rather than detrimental to the others," Pietsch said.

That breakthrough was developed by a proof-of-concept conveyor that Dror Pietsch made by hand.

Since those early days the company has built up a strong team of research and development people who are tackling some real conceptual development problems referred to them by large companies.

"We are also working with Dr Craig Wheeler of the University of Newcastle's TUNRA bulk handling research division conducting various studies to maximise the benefits offered by the technology," Pietsch said.

ICSI recently completed a study with the Melbourne office of consultant AMC to investigate the economics of fitting the ICSI system into existing declines where the use of underground truck fleet is getting marginal due to depth.

Pietsch said the final report was due to be released soon but the preliminary indications were very positive. AMM