

# SANDWICH BELT CONVEYOR PRIMER

## SNAKE AND GPS

**Location:** World wide

**Challenge:** Common misconceptions regarding sandwich belt systems in the market.

**Solution:** Provide education and information on the top to the market.

**Scope:** N/A

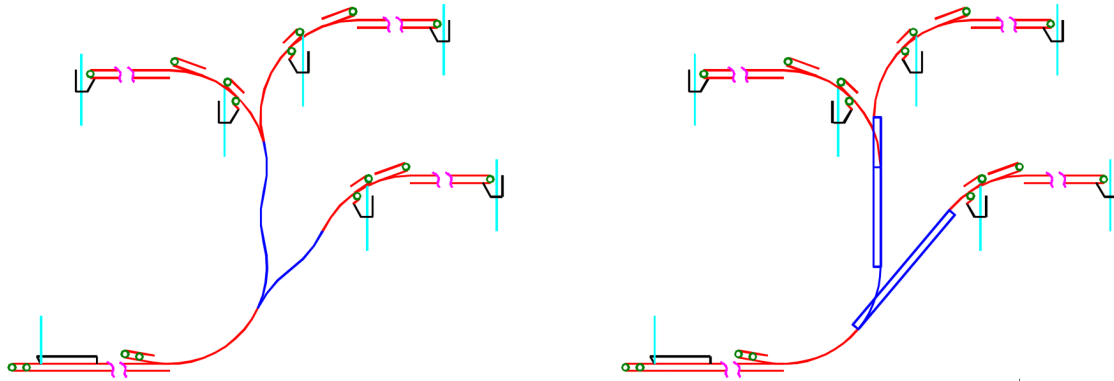


Figure 1: Snake (left) and GPS (right) with difference highlighted in blue

The modern sandwich belt high angle conveyor technology was developed in the period between 1979 and 1981 by DSI founder, Joseph A. Dos Santos, building off the Loop Belt concept. The initial development was the Snake Sandwich Conveyor, which exploits the inherent belt tension to hug the conveyed material between two smooth surfaced belts, thus elevating it at any angle. This system was entered into patent pending, but a full patent was never sought.

When the concept was tabled by its original sponsor company, Mr. Dos Santos was invited to another company, where he developed an alternative design to the Snake to avoid any patent violation. This system uses applied pressing mechanisms to hug the belts together. The pressing mechanisms consist of a fully articulating idler roll set pressed onto the top belt by a spring with a known force. This design achieves the same end as the Snake, and contains the same characteristics of the Snake design at its entrance and exit, but the pressing mechanism design has a straight path through the elevating portion, whereas the Snake's path curves back and forth, hence the name.

This development came out of in-depth study of all high angle conveying methods, particularly from 1951, when a cover belt was first added at a bucket-wheel excavator (BWE) boom belt in order to increase the conveying angle, thus the BWE cutting height. Through the early 1970s, Loop Belts, (true sandwich belt systems) were used prolifically at self-unloading bulk carrier ships of the North American Great Lakes. The comprehensive and unified theory was published in t1982 in the landmark writing "Evolution of Sandwich Belt High Angle Conveyors" by Dos



Santos and Frizzell. This writing first developed the rules for success; particularly continuity of hugging without lapse even at the smallest scale then presented concepts that adhered to the rules while using conventional conveyor equipment including smooth surfaced rubber belts that could be continuously scraped clean. This writing first presented the Snake Sandwich as well as the mechanically pressed sandwich belt high angle conveyors. Deemed the preferred system, the Snake Sandwich Belt was submitted for patent in 1981 with J.A. Dos Santos as inventor. This work was not pursued further at Dos Santos' employer.

In 1982, Mr. Dos Santos was invited to develop the technology at another company. With the Snake Sandwich High Angle Conveyor now in patent pending status at his previous employer Dos Santos turned this detailed development efforts towards the mechanically pressed sandwich belt system. This became the HAC. It was submitted for patent in 1983, with J. A. Dos Santos as inventor.

Conforming to the comprehensive and unified theory both systems achieve a continuous hugging of the bulk material without lapse in order to develop the internal friction that makes high angle conveying possible. Inspired by the Loop Belt, the Snake exploits the inherent belt tension through a series of alternating convex curves that induce the required radial pressure. The GPS applies a hugging pressure on to the belt through spring loaded fully equalized pressing rolls. Figure 1 shows the consequential difference in the high angle conveying profiles.

Both systems described above were invented by J.A. Dos Santos and he is the author on both of their patents. Both styles have been offered by DSI for many years. However, at the founding of DSI, the patent on the pressing mechanism style system belonged to Mr. Dos Santos' former employer, so the original Snake design became the DSI flagship. As this served as a point of distinction, DSI promoted the Snake as a positive alternative to the pressing mechanism system. In the subsequent years, a number of DSI Snakes were sold throughout the world, and the Dos Santos name gained association with the Snake brand in the market. In 2002, when the pressing mechanism patent expired, DSI quietly added the Gently Pressed Sandwich (GPS) system into its offerings, but continued to promote and sell the Snake design more prominently.

A key project in 2009 was initially quoted as a Snake, but the client asked if "all those curves" were necessary on such a long system. The GPS was offered, and an order was placed to supply the equipment. Unfortunately, due to geologic concerns along the sandwich belt conveyor path, the project never came to fruition. Since then, DSI has offered the GPS more liberally, particularly for longer systems, and in IPCC (in-pit crushing and conveying) applications where it is advantageous to follow the existing grade.

It is important to clarify that DSI not only offers both the Snake and the GPS systems, but we are the world's foremost experts in both. The knowledge of J.A. Dos Santos resides solely at DSI and with its expert staff. Competitors may promote themselves as the developer of these concepts, but one needs to look no further than the patent filings to see the source of the expertise.

As new projects arise, DSI stands prepared to offer customers the system that is best for their application.