Building a Cooler Conveyor

USING VIBRATION TO MOVE MATERIAL VERTICALLY

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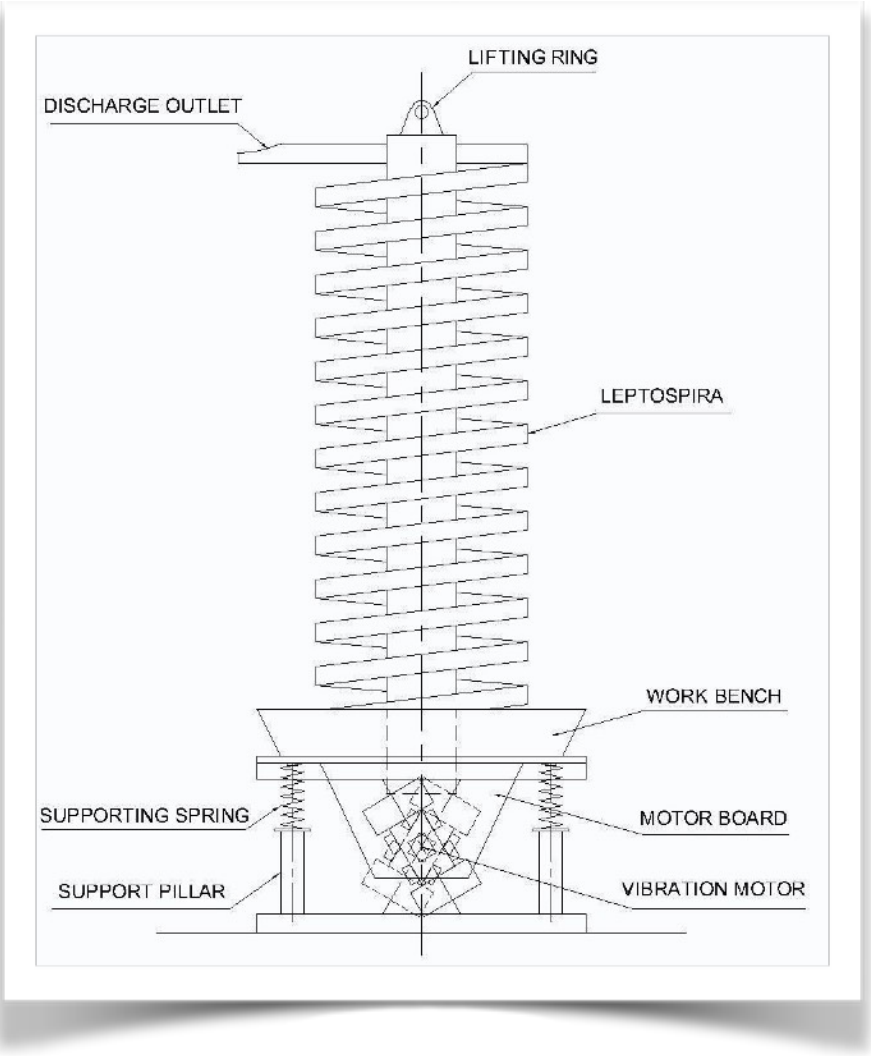
Spiral Conveyors:
Using vibration to move material vertically

While at the JÖST factory I noticed a rather strange object. It looked like a miniature circular parking lot. When I asked what it is, I was told it is a spiral conveyor.

The spiral conveyor is a special type of vibratory conveyor that transports the product vertically. The motors are attached opposing each other so the horizontal component of the force cancels and the vertical component of the force adds. Hence the material moves up the spiral as the conveyor vibrates. The vibrating spiral conveyor has conveyor surface which is a rising helicoid trough or a

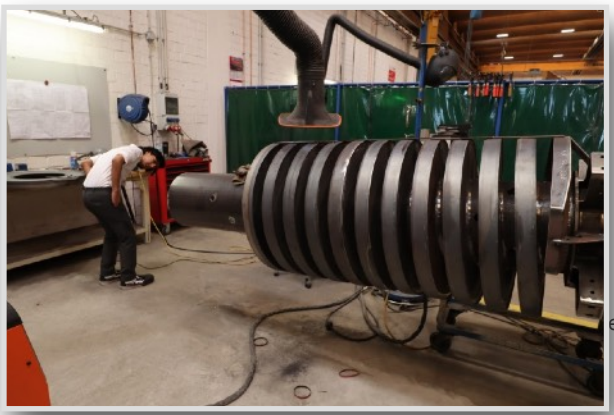
spiral with a constant pitch.
The trough width is set by the difference between the helicoid external and internal diameter. Since the spiral is inclined upwards the material also moves upwards.



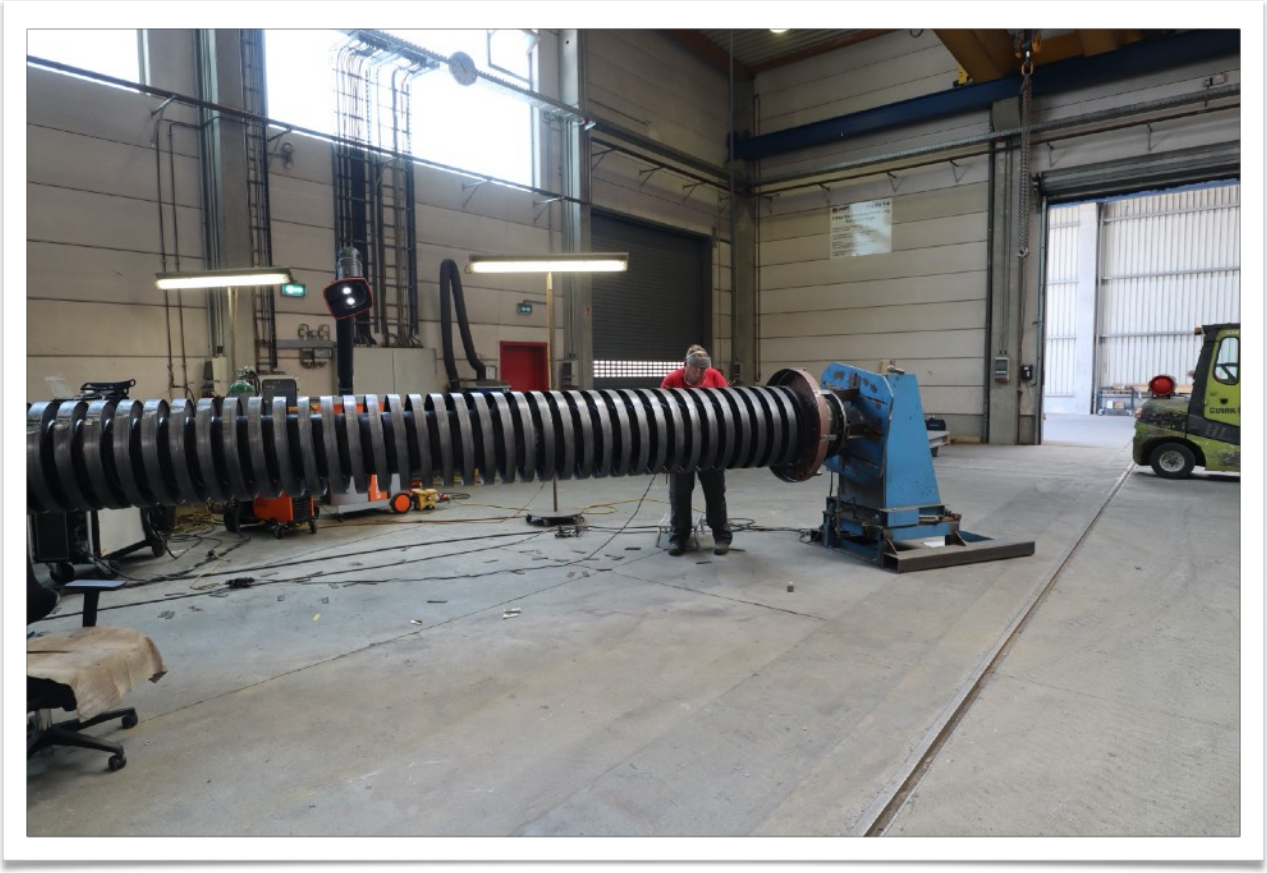
Unbalance motors are attached in diametrical opposite positions and at a certain angle either at the bottom or at the top of the spiral. The vibrations from the motors "force" the material in the spiral to move in an upward direction by means of an oscillating thrusting movement, controlled in frequency and amplitude by the vibration from the motors.

The long helical pattern of spiral conveyors trough makes it ideal for cooling or heating because the materials are on the spiral conveyor for a long time. Hence spiral conveyors often designed so that they can heat cold material or cool hot material as they move upwards.

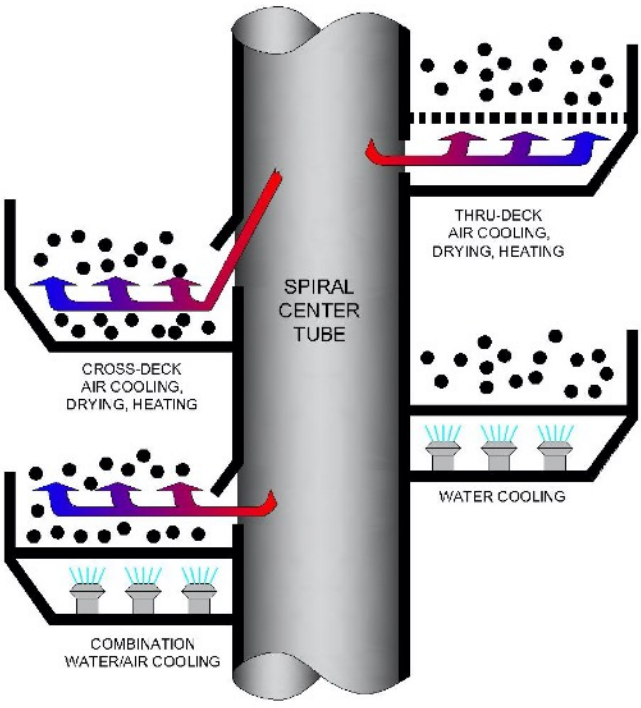
Walking through the JÖST factory I found a spiral conveyor that had forced air cooling. Cool air is forced through the tunnel and exits via several small holes at each layer of the spiral. The cool air flows over the hot material and cools it.



To better understand spiral conveyors, and how they are built, Konrad told me that he would introduce me to **Halil Tatar** who was going to be assembling a spiral conveyor the next day. Konrad and I found Halil making a huge spiral conveyor all by himself. Konrad laughed "*In JÖST we have teams for most products but for spiral conveyors Halil is a one man team*"

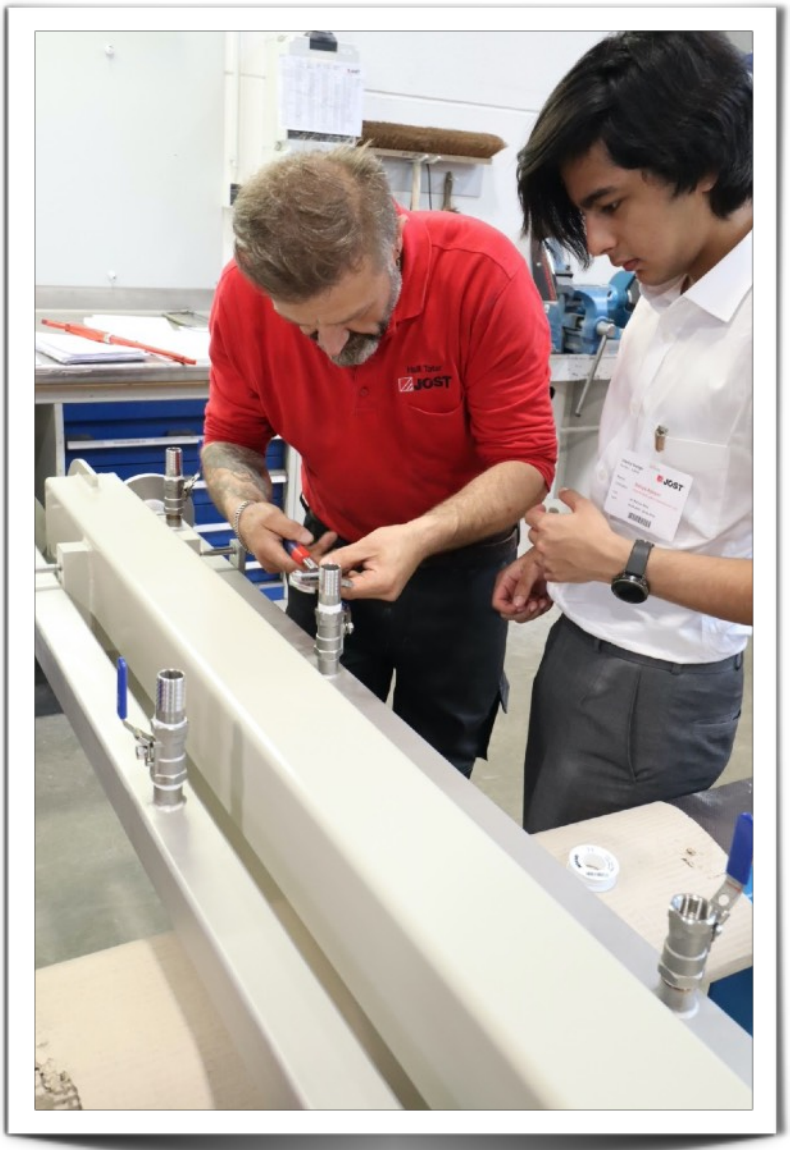


Halil was a very kind man and a good teacher. He told me that tomorrow he was going to be assembling a water cooling system for a spiral cooler-conveyor. The next day Halil took me to another part of the JÖST factory where I began to assist him in assembling the water cooling spine of another smaller spiral conveyor.



Functionally a water cooling spine is a long tube that is internally divided into 2 sections. The first was to carry cool

water to the inlets and the second section was to carry hot water out from the outlets.



This particular cooling tower was for a conveyor that was 6 meters tall. It had 9 inlets and 9 outlets. It also had one extra outlet that was used to release the pressure of any steam created if the water got too hot.

Halil first showed me how to attach the inlet valves to the cooling tower. He also shared a few secrets on making sure that the valves do not unscrew themselves due to pressure from the water or steam. I am sorry but I cannot share any of Halil's secrets here.

After Halil showed me about 3 valves then he let me do the other 16 valves by myself. It was not difficult work as long as one took each step in the process and did not skip steps. I had to be pay particular attention to neatness especially while winding the Teflon tape around the valves.




It took a full day to finish this water cooling tower. The seal of each inlet and outlet had to be *checked f*or leaks so while it was not particularly difficult it was slow and tedious.

The next day Halil took me to the factory where the 6 meter spiral conveyor had already been fabricated and assembled. But there was no room there to attach the water cooling spine in this factory. So Halil and I walked around all of the factory sheds in JÖST to find one that had enough space to accommodate both the water cooling spine and the spiral conveyor. Finally Halil found a shed that had some space and he asked one of his colleagues to bring the conveyor and cooling tower spine on a fork lift to this new factory shed. I was amazed at this moving operation. The pictures below do not do enough justice to the scale of the operation.

Moving the water cooling spine and spiral conveyor to the new factory shed

Attaching the water cooling spine to the spiral conveyor: Lots of plumbing

I did not know yet, but I was soon going to be doing a lot of plumbing work. Part of this would be while standing 6 meters high on a platform.

The Germans really think of everything. The water cooling spine had a matching **L** bracket that would attach it to the spiral conveyor. We first had to align both the water cooling spine and the spiral conveyor for this **L** bracket.

For this Halil welded a 1 meter long **L** shaped steel rod to two steel plates embedded in the floor. **How convenient?** I told you these Germans think of everything. Even their factory floors are designed to permit quick assembly. **When will Indians catch up with German thinking and engineering, I wondered?**

Since I was helping Halil in the process of aligning the water cooling spine and spiral conveyor, I could not take a picture before the **L** was welded but managed to take one after we had attached the first water inlet pipe between the water cooling spine and the spiral conveyor.

We now had to measure, cut and attach 17 more pipes between the inlets and the outlets. Each inlet and outlet pipe needed 2 hose clamps. These clamps make sure the hoses are really tight

on the valves so we used special hexagon head screws and drivers with a wide angle to get maximum torque.

We then started cutting the hoses into the lengths we needed. I measured that for each inlet we needed a 700mm hose and for each outlet a 1 meter hose. The hose was quite stiff so we needed both of us to hold and cut the hose.


I got an idea that Halil liked. Measure one piece of each length and cut all the hoses using these two samples lengths. This was a lot easier than measuring each time.

After we cut all the hoses, Halil left me to attach the 6 lower hoses to the inlets and outlets of the spiral conveyor. I guess after I did the entire inlet and outlet connections on the water cooling spine, Halil was confident that I would do the work diligently. Suddenly Frank showed up to see how we were doing. Frank is in charge of the whole factory and had come to check on our progress.

After we attached the lower 6 hoses, Halil took me up on a scissor lift platform to the top of the 6 meter tall spiral conveyor.

There we started attached the hoses from the top. It was a lot more difficult working on the platform as the platform was on wheels and moved quite a bit. After we attached 4 hoses Halil would lower the platform so that we could work on the next 4 hoses. This process continued till we finished all 18 hoses.

Each inlet (except the bottom 3) supplied cold water to 3 layers of the spiral conveyor. The water was looped back via 2 rubber **U** shaped rubber hoses that Halil had already attached to the spiral conveyor. Similarly each outlet would remove water from 3 levels in the spiral conveyor. The bottom 3 inlets only supplied water for 2 levels as the material would be very hot initially and would need to be cooled faster.

It was 3 days of hard work. Each day when I went back to my hotel my legs felt like rubber. I was on my feet 10 hours a day and wearing heavy steel toe shoes given to me by JÖST to protect my toes. Additionally Germany had a heat wave while I was there and on the second day the temperature in the shop was 42 deg. C.

Under these conditions working while wearing the red protective JÖST jacket was very tough. I do not envy Halil one bit as he has been doing this work for 24 years.

At the end of these 4 days, 1 day of testing and 3 days building this water cooled spiral conveyor I felt I had accomplished a lot. **I would never have done so much in so little time in India.**

My day however was not done. I now had to go back to my hotel, pick up my bags and take the evening train to Dusseldorf to visit the JÖST stall at the GIFA/METEC fair the next day.

The same evening, I was back at the Munster train station for another train ride to Dusseldorf. It would be another 75 minutes before I got to Dusseldorf.