Flume Demo Energy Concepts

SPEAKER Bob Holmes: Okay. Now that was all about streamlines. Let's talk about the other concept in Lecture 4, which is energy. Now, remember, we have three types of energy. We have potential energy. We have pressure potential energy, and we have kinetic energy. And we'll talk about that in the flume. Now, what I've got here is I've got a pitot tube. It's in the water, and you can see that right here. Now, we're gonna measure everything from our datum, which basically is the bottom of the table that the flume is setting on. And so recall that when we talked about potential energy, that was the elevation of the bed above the common datum. So the common datum is our good old tabletop here. And then we're going to have basically a measurement to the bottom of the flume itself. That's going to be our potential energy.

Now, remember the flow depth was the pressure potential. So with that, we're gonna be looking at this distance here, which is the flow depth. Now, if we get a tight shot here and we look at essentially our stream tube itself, we can see that--look here, I've got the water surface right here, but then as we get into the flow itself, you can see the stream tube rises up. This will be our kinetic energy. So the distance between the water surface and this surface inside the stream tube itself, that is our kinetic energy. Now, why is that? That's because that at this location as the water comes right into the front end of the pitot tube, it is arresting that flow. The velocity at that particular location is going to zero, and it is being converted into--inside the pitot tube, into essentially a pressure potential. So it's going from a kinetic energy here or it's going to velocities that are upstream of the flow into the pitot tube itself and it is being converted. And so what we're saying here is this distance above the water surface is our kinetic energy.

Now, essentially when we look at these things, we don't have a pitot tube to go out there in the channel. So we're gonna be measuring the velocity itself whenever we have the need to determine the kinetic energy. And when we do indirect or any kind of measurements like that, we're going to account for that kinetic energy by the flow rate. And we'll show you how to do that in subsequent lectures.