

Flume Demo Energy Losses

SPEAKER Bob Holmes: Okay, in this lecture, the laboratory portion of this lecture, we're going to talk about losses that are due to non-frictional components. Recall lecture 6, we talked about losses that were due to friction and we looked at how, in a real fluid, you have resistance of the flow along the channel boundary and we have losses of the--total energy decreases as you go downstream because of those losses. In this lecture, we're going to demonstrate the non-frictional losses. Okay, so basically what we've got here is we've got this pentameter on the fourth and the third. They are inside the restriction, as I've already told you, and our second pentameter is outside the restriction upstream. Now, we've already looked. In the tight shot, you've seen that the fall of the elevation between the first pentameter and the second pentameter would be due to the frictional loss between location one and location two.

Now, if we look here where the restriction begins, we've got this restriction and we'll get a tight shot on that. And you can see here that I've got this very interesting water surface profiles. I go from upstream of the restriction down through and into the actual restricted section. So you can see that drop in the water surface profile, and as we've looked at water surface profiles in this particular course, you'll be able to understand why we have the kind of water surface profile we have. But that's not part of this particular lecture. I don't wanna get in those details. The bigger thing is, is to look at the elevation drop between the total energy at this location, which is, again, the potential energy plus the pressure potential, which the pressure potential, again, is from the floor of the flume up to the water surface and then we add on to that the kinetic energy. Right there where you can see, that's about where the meniscus is on that pentameter. We look at the elevation from here and then we see how much it drops when we look at the elevation down in the downstream pentameter just inside the restriction. So that elevation drop is essentially the losses that we have due to constriction. So that would be our constriction loss. Let's go back out to a wider shot. Okay.

So if we look at this, we can see that we've got the second pentameter and the third. We look at the losses between those two are due to the constriction.

Let's talk real quickly about the losses between the third pentameter and the downstream pentameter right before it goes back out into an expansion. Any difference in elevation between

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the total energy line, which will be measured at that meniscus of the pentameter at this location and the elevation at the fourth pentameter of that meniscus, that drop would be due to again friction. We don't have any changes, expansion, or contraction yet of the channel so any kind of loss we have there are again due to friction. So to sum it up, we've got the friction loss from pentameter one to pentameter two. That's due strictly to the boundary roughness. Then we have essentially the contraction loss between pentameter two and pentameter three, and that's due only to the constriction. And then, we have again restriction loss or friction losses between pentameter three and pentameter four. That wraps this particular flume demonstration on this lecture at this point.