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What is the basis for selecting submerged weir & overflow weir?

Sampath Kumar R

Upstream Process Engineer at Technip

Dear Friends,

Few recent projects I have worked has submerged weir and could not find the exact reason for selecting the submerged weir.

My understanding is as follows:

When we use submerged weir, the volume of oil in separation compartment + collection compartment shall be considered for oil residence time calculation. This will result in higher oil residence time as the volume is more. Whereas, in the case of overflow weir, the oil residence time shall be considered using the oil volume available at separation compartment only and this will lead to lower residence time for the given flow rate.

Is my understanding correct? Please pen down your comments.

Thanks for your time.

Kind Regards

Sampath Kumar R

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Comments

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Rashesh Shah

Chief Process Engineer, CEng MIChemE at PetroVietnam Technical (M&C) Services Corporation

Rashesh

Yes your understanding is correct. Submerged weir provides smaller volume of the separator

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Saeid R. Mofrad

Principal Process Engineer at Petrofac (P.E.)

Top Contributor

Sampath,

I would like to have two different terminologies here.

Residence Time is retention time of each liquid phase in the separation compartment of vessel. It is the effective time available for each phase's droplets to be separated from the other one before leaving separation compartment (liquid-liquid separation criteria). Therefore, the residence time is always calculated based on the volume of liquid upstream of weir in both submerged and overflow configurations.

Holdup Time is defined as duration that vessel can supply liquid to downstream equipment, unit or plant if incoming flow is cut off. It is usually defined by Client depending on function of vessel, fluctuation of feed and sensitivity of downstream to variation of flow (5 minutes if vessel is feeding a pump, 10 minutes if feeding a fired heater, 30 minutes for surge drums supplying feed for

downstream unit, etc). This is supplied from collection compartment, separation compartment or both of them in different three phase separator configurations. For example:

- only collection compartment in overflow weir configuration (and bucket an weir)
- collection compartment + separation compartments (liquid above weir only) in submerged weir
- only separation compartment in searator with no internal or with boot (for the light liquid phase)

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Sampath

Sampath Kumar R

Upstream Process Engineer at Technip

Dear Saied,

Thanks for the detailed response. So, in submerged weir configuration, the hold up time will be more than the overflow weir for a given separator dimension, Typically, in upstream facilities, the oil from the collection compartment will go to the next stage of separator or export pumps. Such cases, maximum of 5 minutes hold up time will be adequate and most of the times overflow weir will meet this requirement, even if the collection compartment is fixed as 90% of the overall length. Inspite of that most of the vendors will go for submerged weir. I am not able to find the exact reason for this.

If the hold up time requirement is more, then there will be advantages in using submerged weir. For lesser hold up time requirement, do we have to go for a submerged weir configuration?

Kind Regards

Sampath Kumar R

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Rashesh

Rashesh Shah

Chief Process Engineer,CEng MIChemE at PetroVietnam Technical (M&C) Services Corporation

in otherway round for the specified hold up volume, you need smaller separator in the submerged weir design.

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Sampath

Sampath Kumar R

Upstream Process Engineer at Technip

Mr.Shah,

You may agree hold up time may not govern in a separator sizing when compared to gas cap area and settling compartment residence time. Most of the separators will be either gas controlling (higher gas cap area requirement) or liquid-liquid separation controlling.

Please correct me if I am wrong.

Kind Regards

Sampath Kumar R

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S M

S M Kumar

Process Design Consultant
Top Contributor

Sampath: As Saeid rightly pointed out, where HOLD-UP time governs, then a submerged weir design helps. If HOLD-UP time is not an issue and where gas flow area is negligible (as in LP Sep or Surge Vessel), as Rashesh points out, submerged weir gives a small size sep. If your calculations show otherwise in a particular case, then you can always ask the supplier to change the type

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Vagif

Vagif Gafarov

Sr. Process Engineer at KBR

I can also add from the operating experience that we had cases of the "lost" liquid in the overflow weir design (oil bucket) due to peak offtake rates and had to switch to the submerged weir by cutting its height and changing the instrument set points.

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