The benefits of Amarinth self-priming pumps over traditional self-priming pumps

technical bulletin

API 610 and self-priming pumps

Although you may see requests for an API 610 self-priming pump there is actually no such API standard and so there is no such thing as an API 610 self-priming pump. If such a request is made then an API 610 OH1 or OH2 pump must be supplied but primed using a separate priming unit.

What is a self-priming pump?

Centrifugal pumps operate on flooded suction lines or in submersible applications. The impeller is surrounded by enough process fluid to create the pressure differential and thus to pump the fluid. However, when a standard centrifugal pump encounters air, it can become air-bound. It's much harder to pump air than to pump fluid, so when the air enters the pump it won't pump the fluid until the air can be removed in some way. Furthermore, the fluid moving through the pump is used to keep it cool and lubricate moving parts and so a pump that has air in it can therefore overheat causing seal damage, leakage and possible catastrophic failure as the small amount of fluid in the casing is effectively recirculated and rapidly heated.

When a pump is started there may be air in the system. In some applications, such as lifting sea-water onto an offshore platform, a large amount of air has to be displaced in the pipework before the fluid reaches the pump. A self-priming centrifugal pump overcomes this problem, removing air from the system and ensuring the impeller chamber is full of fluid, or primed. A self-priming pump is able to prime itself when it is switched on without any other operator intervention.

Traditional self-priming pumps

With traditional self-priming pumps, during the priming cycle, air enters the pump and mixes with the fluid at the impeller (Figure 1 – first diagram). The fluid and air are discharged together by centrifugal action of the impeller into a reservoir designed as an integral part of the pump. The air naturally tends to rise, while the fluid tends to sink by gravity back down into the impeller chamber, ready to mix with more air coming in the suction line. Once all air has been evacuated and a vacuum created in the suction line, atmospheric pressure forces the fluid up into the suction line towards the impeller, and pumping begins (Figure 1 – second diagram).

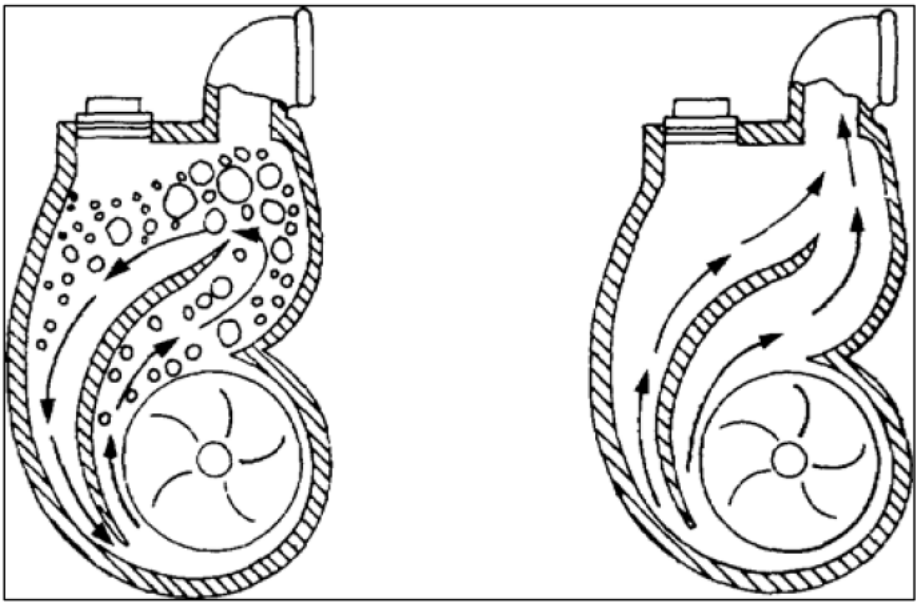

Figure 1 – Expelling air in a traditional self-priming pump

During the priming process however, the process fluid becomes heated in the pump and so this method of priming cannot be used with a volatile process fluid or in a hazardous application, such as some duties on an offshore platform. In addition, traditional self-priming pumps usually have one-way foot valve in the process fluid to minimise fluid loss from the pipework when the pump is stopped, however these can be prone to failure, particularly in environments where solids may be present such as in the oil and gas industry, causing priming issues at the pump.

Traditional self-priming pumps can never conform to API 610.

Amarinth self-priming pumps

An Amarinth self-priming pump does not require a special priming chamber and so the pump is supplied as a standard API 610 (or ISO) pump (Figure 2 - C) and a primary unit (Figure 2 - B) to create the priming action is positioned just upstream of the pump – see Figure 1.

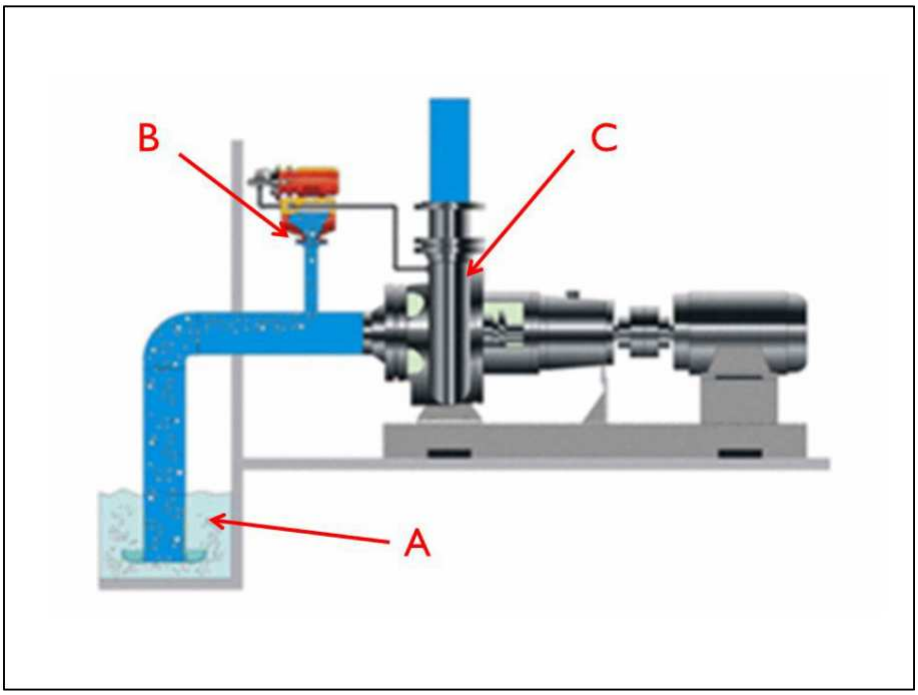

Figure 2 - Amarinth self-priming pump

When process fluid needs to be pumped (Figure 2- A), the primary unit (Figure 2 - B) first expels the air from the pipework thereby lifting the process fluid to the pump (Figure 2 - C) to prime it. The centrifugal pump (Figure 2 - C) is automatically switched on when the process fluid has fully primed the pump after which the primary unit (Figure 2 - B) is switched off.

The Amarinth primary unit uses an ejector which creates a vacuum in the pipe thereby lifting the process fluid to the pump. The primary unit ejector exploits the venturi effect by using air or process fluid and so has very few parts to fail or overheat. There is also no need to have a foot valve in the system as the primary unit is always capable of lifting the process fluid to the pump regardless of the air in the system and the pump will only start when properly primed. However, a one-way foot valve can be used if desired to hold the process fluid in the inlet pipe when the pump is switched off in order that the primary unit (Figure 2 - B) has less air to expel and so speed up the start-up of the centrifugal pump (Figure 2 - C).

The maximum lift for an Amarinth self-priming pump is 7m (to the primary unit) and the only utilities required are air or fresh water for the ejector and electrical supply for the primary unit, pump, instrumentation and controls.

Summary

The following table summarises the benefits and operating parameters of Amarinth self-priming pumps against those of traditional self-priming pumps.

Amarinth self-priming pump	Traditional self-priming pump
The pump meets API 610 standards by using a separate self-priming unit upstream of the API 610 pump	The pump with its integral self-priming chamber does not meet API 610 standards
Can be used in hazardous applications	Caution must be exercised in hazardous applications
Can be used with a volatile process fluid as no heating of the fluid happens during priming	Can only be used with a non-volatile process fluid as it will be heated during priming
Pump does not start until primary unit has fully primed it and so the pump can never run dry	Pump starts immediately and if it doesn't prime correctly can run dry
No external flaps or valves are necessary in the process fluid to become jammed by solids	Foot valve required which may jam or fail when solids present in the process fluid
Maximum lift 7m	Maximum lift 7m
In addition to an electrical supply, air or water utilities are required for the ejector	No additional utilities required other than an electrical supply