



SOLIDCITRIC- FREQUENTLY ASKED QUESTIONS

1) How much time can I save by using SolidCitric?

It depends - poor answer, we know. The severity of the lime scaling affects the time one will save, but in reality, the most important factor is whether you have other things you would rather be doing with the ROV instead of acid cleaning.

The best answer we can give you is that you must look at your past operations and determine how much time you typically spend on acid cleaning. Assuming that you have other things to do with your operational time then *please consider nearly all the time you have spent on acid cleaning today as time you would have saved by using our product.*

We have heard that our clients have saved 12 hours in some instances, other times 6 hours. It really varies on a case-to-case basis, as stated earlier above. However, imagine 12 hours saved with a stuck valve on for instance a rig at a million dollar day rate; your shareholders should love that!



2) How long should I allow the acid to work?

We like to say, "Let it work as long as possible". At a very minimum, it should be allowed to work for 2-4 hours.

Very important point follows: It would be very sad the moment a vessel, rig or ROV has a hold-up in operations because they are waiting for our product to work. This defies the entire winning purpose with our product. We believe that with good operational planning the acid can work for a long time if it is put to work as early as possible after arriving in field.

An Example:

A Client installed our product at Field A before continuing to Field B. When they later returned to do work at Field A everything they needed cleaned was finished.

Another example:

Install our product as the first point on the list during an as-found survey. Later on, once this is complete, then for instance valves that are to be operated during a commissioning sequence will have been cleaned and will less likely require high breakout torque values.



3) How fast does the SolidCitric acid dissolve?

This mainly depends on three factors.

1) *The enclosed volume of water that can be saturated with acid.* If this volume is small and there is little loss to the environment, then the acid will stop dissolving once the enclosed volume has reached full saturation.

2) *The ambient water temperature.* Like sugar, it dissolves faster in warm water than in cold water.

3) *The water depth.* Greater depth means greater hydrostatic pressure. A Polycarbonate tube that is open in one end encloses our acid. Due to this, it dissolves at an initially steady rate. However, external water pressure will create “channels” into the solid crystalline grains and hence increase the area exposed to water. Greater water depth will accelerate the dissolving rate.

An operational example: In the North Sea, at typically 200m water depth, *our 6 kg acid cartridge will dissolve in approximately 2-3 hours if allowed to dissolve into an unlimited volume.* Our 12 kg acid cartridge will dissolve in approximately 4-6 hours under the same conditions.

Important note:

Tests in our workshop revealed that the pH value in the entrapped water around the asset interface drops rapidly just a few minutes after the acid starts dissolving. In other words, *the water does not need to be fully saturated before the treatment becomes effective.*



4) What about HSE? Is it safe and environmentally friendly?

Yes. SolidCitric is manufactured from 100% citric acid that is even approved for human consumption, although not recommended in larger quantities.

Citric acid has been used for subsea acid cleaning purposes for decades. It is listed as a “green” PLONOR chemical with the relevant authorities, both in Norway and abroad. We have a SolidCitric MSDS as well as HOCNF and CEFAS* documentation available upon request. It can be used subsea without any limitations.

**SolidCitric is registered in CEFAS as number 28132 and it is classified as a group E & PLONOR product.*

5) What is the depth rating for SolidCitric?

To date, we do not know if there are any limitations. We know that our clients use it at more than 1000 meters water depth without any problems. The important thing is that one does not remove the protection cap before the installation of the cartridge is imminent. Waving the cartridge around in the ROV manipulator without the protection cap will lead to a “wash out” of some of the SolidCitric acid; this is an unnecessary loss that should be avoided.

6) Still don't understand. What's so special about SolidCitric vs. using regular Citric acid?

Just regard our SolidCitric cartridge to be the equivalent of a dish washing tablet. It's a homogenous solid which dissolves slowly in water. No moving parts, just chemistry in action.

It's also fully autonomous and it negates the need for a subsea compensator (i.e. spring-loaded tank) or hoses from the deck of a rig or vessel. Any ROV crew will confirm that our product is nothing but a pleasure to work with.



7) How do I proceed if I want to use your SolidCitric products for my project?

First, please check our website and see if we already have an adapter for your particular interface in our portfolio. If we don't – no worries – get in touch with us, send us a drawing and we will do the following:

- ✓ Design an adapter which will fit your interface and send you a drawing along with a quote. If it is a common interface (i.e. likely to be requested by someone else in the future) then we are happy to rent it to you. If it is highly unusual then you will need to buy it as it will not add any value to our rental pool.
- ✓ If you after receiving a quote would like to proceed then we will start manufacturing the adapter which you require. In addition to designing, we also manufacture* most parts ourselves, in-house. This ensures that we maintain the consistently good quality and fast delivery time which our customers require.

** We currently own and operate the following CNC machines;*

- 3-axis Multicam Apex router
- 4-axis mill/turn lathe (Haas ST-30Y)
- 3-axis vertical mill (Okuma Genos 560Ve)

8) What exactly is this “adapter” that you keep mentioning?

Our SolidCitric cartridge releases a steady trickle of acid which is negatively buoyant in seawater and for it to work we deliver “adapters” which directs the acid to the exact location where you want to clean. These adapters are also designed to minimize the volume which requires saturation and minimize leakage/loss to the ambient seawater on the outside. Reference is made to our animation on our website.