

Q – What is it?

A – BERRYSAFE AR OG (BSAR-OG) is a patented Lewis Acid-Base Adduct. The technology greatly reduces the hazardous effects of the hydrochloric acid on its own such as the fuming effects and the highly corrosive nature while providing many technical operation benefits.

Q – Is it hazardous?

A – Although there is no formal regulatory definition to the term “hazardous,” BSAR-OG can be considered “low-hazard” from a handling perspective.

NOTE: BSAR-OG is considered corrosive to eyes and eye protection is required. Ensure eyewash stations are readily available to mitigate the risk.

Q – Is a shower unit required for operations?

A – BSAR-OG is classified “non-corrosive” to dermal tissue by a 3rd party lab. An on-site shower unit may be dictated by an operational risk assessment or the operator’s safety policy. Eyewash stations are required (wear eye protection).

Q – What is the equivalent concentration of BSAR-OG to 15% hydrochloric acid (HCl)?

A - BSAR-OG is NOT HCl! When delivered to location, this is considered “100% BSAR-OG”. An acid-base titration can be performed and would result in about ~15% active material. However, BSAR-OG is a different molecule that reacts differently than just HCl by itself.

Based on case studies and results from thousands of stages pumped across multiple basins, it has been shown that 33% BSAR-OG is able to achieve similar breakdown pressures as 15% HCl.

In the Appalachian Basin, operators have replaced 7.5% HCl with 33% BSAR-OG and demonstrated more efficient breakdown pressures.

Berryman typically recommends running at least 33% BSAR-OG but can be diluted between 20% - 100% depending on temperature and application.

Q – What is the dilution amounts of water to make 15% & 7.5% HCl?

A - The typical recommendation is to dilute 1-part BSAR-OG and 2 parts water to replace 15% HCl. Depending on the temperature and application, BSAR-OG can be diluted down to 20-25% to replace 7.5% HCl.

After mixing w/ 1 part BSAR-OG and 2 parts water, a standard acid/base titration can be performed and will result in about 5% active material in BSAR-OG, which is equivalent to 15% HCl for spearhead applications.

Q – What is the “spent” pH of BSAR-OG?

A - Typically, spent pH of BSAR-OG is around 3 while the spent pH of 15% HCl is still <1.

Q – Using this product as a perf spot acid, would you recommend any other additives (iron control, surfactants, corrosion inhibitors, clay stabilizer)?

BSAR-OG comes out to location “ready to use” so additional chemistries are not typically recommended. However, due diligence testing can be performed according to RPI RP 42 to determine sludging and emulsion tendencies.

Q – Can this be stored in an unlined frac tank?

A - An acid rated tank is recommended for long term storage.

Q – Can this be hauled over the road in water transports? Any special permits required?

A - BSAR-OG is non-regulated for ground transport in the United States. No issues would be expected from transporting this product across the road in a water transport with only a few hours of exposure time, unless there’s significant amount of corrosion or rust already present in the transport, in which case the BSAR-OG will dissolve the

rust into solution which would then end up downhole. A thorough wash is recommended afterwards to remove any residual material.

Transportation regulations vary by jurisdiction/county. In Canada, Australia, and the European Union the product would be regulated by aluminum corrosion only. It is nonregulated in the USA by ground only. It is recommended to review and verify your local transportation regulations.

Q – What is the max temperature for BSAR-OG

A -230°F

Q – How does it work?

A – HCl is completely dissociated in water and therefore reacts violently on various materials such as calcite, iron, and skin. BSAR-OG has ionic bonds with the hydrogen protons within the HCl, resulting in a product that mitigates reactions with metal and skin while still reacting instantly with calcite.

Q – What will BSAR-OG dissolve?

A – In laboratory settings BSAR-OG will dissolve:

SUBSTANCE	SOLUBILITY (kg/m ³)	SOLUBILITY (PPG)
CaMg(CO ₃) ₂ (dolomite)	≈ 190	≈ 1.6
CaCO ₃ (calcium carbonate)	≈ 216	≈ 1.8
FeS (iron sulfide)	≈ 170	≈ 1.4

Q – How do you neutralize BSAR-OG?

A – BSAR-OG is neutralized in the same manner as HCl acid, by utilizing a base such as soda ash (Na₂CO₃), calcium carbonate (CaCO₃) or magnesium oxide (MgO) along with water dilution.

Q – Is BSAR-OG reactive as a concentrate?

A – BSAR-OG is fully reactive in its concentrated form. It is blended with water mainly to reduce costs, although a 90 % concentration (10 % dilution) should be considered maximum to ensure an optimal solubilizing ability. 33 to 50 % for spearhead based on deployment method. 33 % (2-parts water, 1-part BSAR-OG) for spotting with perforating guns is recommended. Alter, if required, based on real world results.

Q – Does BSAR-OG become more reactive at high temperatures?

A – Yes BSAR-OG will become more reactive as temperature increases like most chemicals (including water). Typically, the reaction rate of a chemical will double for every increase in temperature of 10°C (18°F).

Q – Does adding water to BSAR-OG alter its HSE properties?

A – Adding water to BSAR-OG simply dilutes the product and will make it somewhat safer as dilution increases.

NOTE: All 3rd party HSE testing has been completed on the concentrated product.

Q – Should BSAR-OG concentrate be added to water like HCl acid?

A – BSAR-OG has a minimal exothermic reaction with water compared to HCl, so the process of adding BSAR-OG to water or water to BSAR-OG is acceptable. Follow best practices.

Q – What is the difference in reaction rates between the BSAR-OG series and HCl?

A – BSAR-OG deployed at a 33 % blend will be effective in most all spearhead applications. Although slightly slower or less volatile than HCl, at BHT the difference is negligible.

The BSAR-OG series reacts more than 40% faster than our previous versions deployed in all spearhead applications successfully over the years with over 30,000 stages completed.



BERRYSAFE AR OG Frequently Asked Questions

Questions we consider for every new opportunity:

- What is temperature of consideration?
- What is the exposure time?
- What types of metals with the fluid be exposed to?
- What is the application? Examples include:
 - Production/scale removal?
 - Spearhead acid?
 - Matrix acidizing?
 - What type of scale is trying to be dissolved?

Before using this product, the user is advised and cautioned to make its own determination and assessment of the safety and suitability of the product for the specific use in question and is further advised against relying on the information contained herein as it may relate to any specific use or application. It is the ultimate responsibility of the user to ensure that the product is suited and the information is applicable to the user's specific application. Berryman Chemical Inc. does not make, and expressly disclaims, all warranties, including warranties of merchantability or fitness for a particular purpose, regardless of whether oral or written, express or implied, or allegedly arising from any usage of any trade or from any course of dealing in connection with the use of the information contained herein or the product itself. The user expressly assumes all risk and liability, whether based in contract, tort or otherwise, in connection with the use of the information contained herein or the product itself. Further, information contained herein is given without reference to any intellectual property issues, as well as federal, state or local laws which may be encountered in the use thereof. Such questions should be investigated by the user.