

The STEP-XB CHILL allows for heating of the water to be kept to an absolute minimum which results in cost savings. Typical borate crosslink systems require water temperatures of approximately 30°C to work effectively and increases substantially during winter months to mitigate problems. STEP-XB CHILL works at significantly lower water temperatures than most borates. In fact, the crosslinked gel needs a downhole slurry temperature of only 7°C to work effectively. Slurry temperature is used to account for the cooling of the water when the proppant is added, which in the winter can significantly impact the water temperature. To calculate water temperature, ambient temperature is used as well as the concentration of the top proppant stage. Therefore, -30°C proppant at 1000 kg/m³ top stage loading only requires a water temperature above 14°C for ideal conditions to be met.

STEP-XB CHILL has excellent shear and downhole temperature stability with the ability to work at a bottom hole temperature of 100°C, although with changes to the crosslinker loadings that upper limit can be exceeded. STEP-XB CHILL can be used at a 2.4 L/m³ or 3.0 L/m³ gellant loading. Hydration time of the powdered guar should be five minutes for ideal conditions to be met.

Properties:

- Crosslinks with low water temperature to save on heating costs
- High pH delayed crosslinked system
- Ideal for a large range of temperatures
- Fluid rheology is optimizable
- N₂ can be used to energize the system

Physical Data:

Properties	
Appearance	Yellow liquid
Odour	Slight
pH	8.5 -9.5
Vortex Closure	30 seconds
Crosslink Time	1.5-2.5 min

Technical Data:

Table 1: Cooldown of Frac Fluid with 1000kg/m³ Proppant Various Temperatures

Ambient Sand Temperature °C	-30	-25	-15	-5	4
Minimum Water Temperature °C	14	13	11	9	7
Sand Loading kg/m³	1000	1000	1000	1000	1000
Slurry Temperature °C	7	7	7	7	7

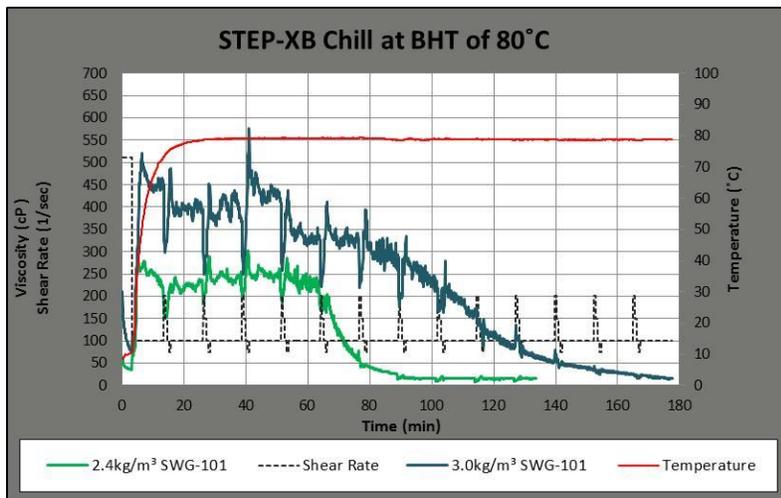


Figure 1: System rheology and breaks at various gel loadings at 80°C