Fire Fighting Foams & Equipment

Fomtec Technical Advice
FTA No. 130

What do we mean with HIDDEN GUM and what are the consequences

It is a well-known fact that addition of polysaccharides (also known as gums) enhances the fire performance on SFFF:s firefighting foam concentrates. The higher concentration of polysaccharides, the better performance. The drawback is that the viscosity of the foam concentrate will increase. The reason for viscosity increase is that the polysaccharide is hydrated and stretch out in the liquid. As they stretch out, they will touch and hinder each other from free movement and that will in turn result in a viscosity increase. A comparison is a person that want so move from one side of a room to another when it is fully crowded. That will take some time to reach the other side when having to cruise between all people in the room. In an empty room, moving to the other side will be fast and easy.

However, by performing some tricks to the formulation, the gums can be suppressed not to evolve high viscosity. They are kept in a semi-stable situation where they are not fully hydrated, meaning that they don't stretch out to its full capacity and hence, don't yield in a dramatically increase in viscosity. However, when the conditions are changed, by increase or decrease in temperature, addition of water, evaporation, or likewise. At such instants, the polysaccharide may start to stretch out further and causes the formulation to move from its semi-stable condition to an unfavourable situation. When this happens, two unwanted situations can appear:

- The formulation can separate into two phases, resulting in a gum drop-out
- An increase in viscosity of the concentrate

Neither of these situations are desirable since it will affect the fire performance of the foam concentrate. In the former case, the foam concentrate will be completely useless and in the latter case the proportioning of the concentrate will fail.

Unfortunately, a lot of high performing SFFF:s on the market has taken this route to overload the products with gum to enhance their fire performance. This is referred to here as HIDDEN GUM. These products have, at least on short terms, stability when subjecting them to elevated temperature. On the other hand, they are obviously not long-term stable, since a viscosity increase can be noted on these products when measured at reception and a year later. Another issue with these products is that they increase dramatically in viscosity when subjected to water addition. The figure below shows how some products with hidden gum behaves when subjected to water addition. The viscosity on the y-axis is normalized or relative, meaning that when viscosity is higher than 1, it is an increase and when it is less than 1 it is a decrease from its initial state without any water addition.

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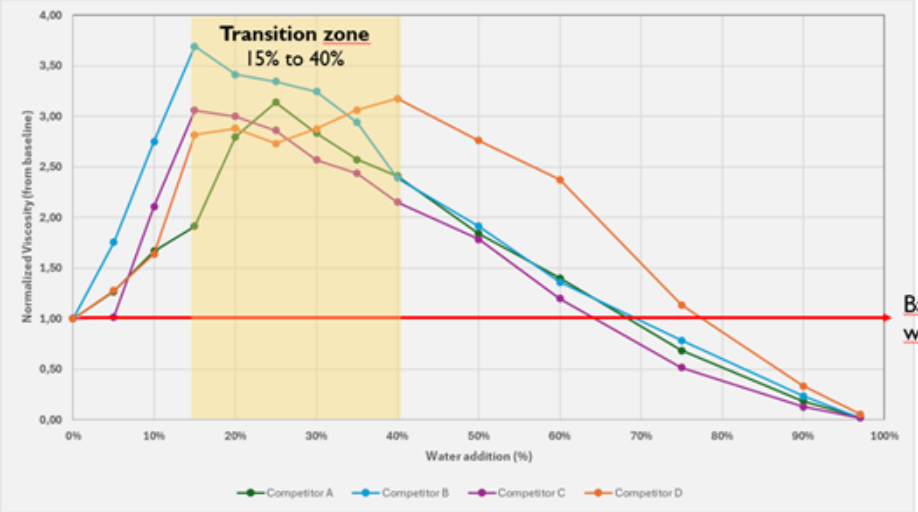
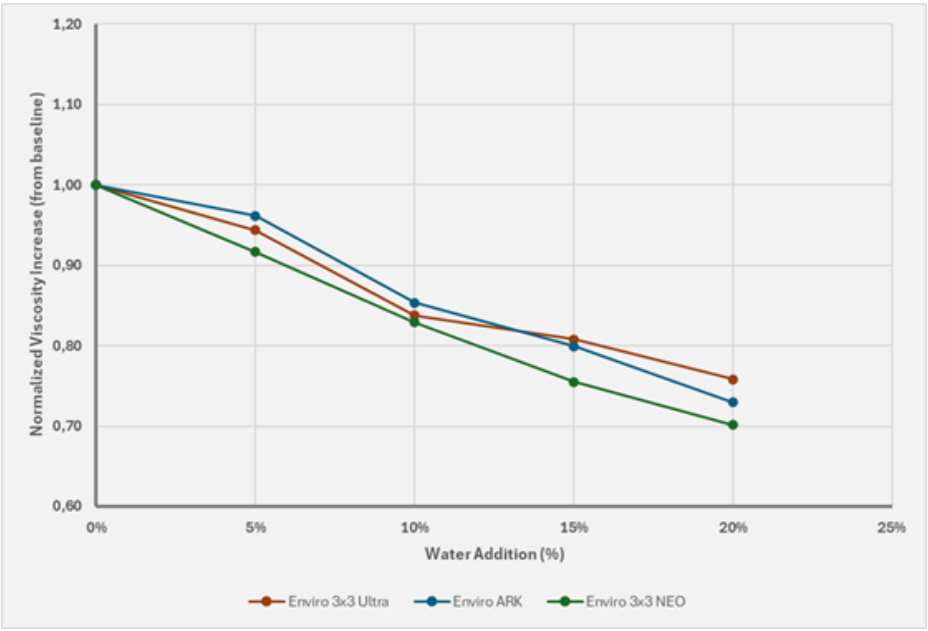


As seen, the viscosity for these foam concentrates increase when water is added. The peak in viscosity is at 3,1 to 3,7 times higher than its original state and is at around 15% to 40% addition of water. It is notably that the original viscosity is reached after 65% to 75% water addition before it starts to decrease below that.

Fomtec's approach is to formulate foam concentrates without hidden gum technology, due to all risks associated with that. The goal is to have foam concentrates that decrease in viscosity with water addition. This is also what is expected from real life situation where accurate proportioning is essential. The figure below shows the viscosity behaviour of Enviro 3x3 Ultra, Enviro ARK and Enviro 3x3 NEO. All having excellent fire performances in their field.



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