



# CMC

## CARBOXYMETHYL CELLULOSE

### GUIDELINES FOR PROPER DISSOLUTION

CP Kelco products are derived from natural, renewable raw materials, and we strive to preserve nature's functionality through minimizing chemical modification. CP Kelco grades of sodium carboxymethyl cellulose (CMC) are highly-purified, cold water-soluble polymers derived from cellulose. These products are a versatile, cost-effective way to add viscosity. CP Kelco offers a wide range of viscosity grades, with resulting flow properties ranging from nearly-Newtonian to pseudoplastic (shear-thinning). Depending on the grade, they can have either thixotropic or non-thixotropic rheology.

#### *Hydration Basics*

The principle of hydrating CMC is to wet and disperse all particles in water as quickly as possible without making lumps or fish eyes before the viscosity starts to develop. If this is accomplished, the particles will easily hydrate. If not, hydration will be slow and processing times and the possibility of inconsistent products will increase.

#### *Factors affecting dissolution:*

**Dispersion:** A good dispersion rate is one that allows for slow enough addition to ensure no lump formation. There are several techniques that can be used to physically separate the gum particles in makedown systems, ensuring a good dispersion:

- Dry dispersants can include sweeteners, starches and maltodextrins, dairy powders and spices. Prepare a premix of other dry ingredients first.
- Liquid dispersants can include oil, alcohol, propylene glycol and glycerin. The gums can be slurried in these ingredients much like corn starch in cold water when making gravy. The slurry is then added to the water and the gums will hydrate quickly without lumping.
- Air can also be used as a dispersant. An eductor funnel relies on the vacuum created by flowing water to pull the particles into the liquid. This technique works well with free-flowing powders.
- CMC is available in a wide range of particle sizes. Products such as granular mesh products or agglomerated products have good dispersion properties and can be used in situations where one of the other techniques is not possible.

**Mixing speed:** The higher the shear of the mixer, the faster the gums will hydrate. There are some limiting factors with mixing though. Guidelines for mixing equipment:

- Ideally, the mixer will create a vortex without exposing the mixing blades.
- Care should be used when hydrating CMC in high shear mixers as viscosity degradation can occur with excessive mixing. In production, time parameters should be set to ensure consistent viscosity.
- Depending upon mixing conditions, 15-60 minutes should be adequate to achieve full dissolution.

**Water:** The hydration of these ingredients can be influenced by the water in your formulation.

- Dissolution time can be accelerated by using hot water (max. 158°F/70°C)
- Or by pre-wetting the CMC with a non-solvent like alcohol or acetone.
- Salts generally slow down hydration of gums. It is recommend they not be used as dispersants and be added into the product after the gums are hydrated. If you can't control where the salt is added in the process, contact your CP Kelco technical representative to discuss possible options.
- Acids will also slow down the hydration of gums. Add the acids after the gums are hydrated. Add the acid using adequate stirring at a slow rate in order to minimize the potential of a local pH drop. (A pH drop may convert the CMC to a 'water insoluble' material).
- In general sweeteners are well tolerated by CMC. If you are working high solids systems over 60°Brix, a fine mesh product is preferred to ensure proper hydration.

VISCOSITY IS MEASURED WITH BROOKFIELD LVT VISCOMETER		
Range in mPa's	Spindle	R.P.M.
1-100	1	60
100-500	2	60
500-2,000	3	60
2,000-4,000	3	30
4,000-20,000	4	30
>20,000	4	12

If any other ingredient have to be added to the aqueous solution, CMC should be added first. When high concentrations of electrolytes (salts, acids) are used, CMC should first be dissolved in pure water and then the other components added to the solution.

