



Food Solutions

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## Solutions Designed for Vegetarian Products and Meat Analogues

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More and more consumers are seeking alternative sources of proteins in order to reduce their meat consumption or meet their religious, ethics or health related concerns. Vegetarian and vegan products are a growing trend due to health, animal welfare and sustainability concerns. Furthermore, many manufacturers are increasingly looking for ways to remove egg products from their recipes to reduce costs and avoid seasonal fluctuation in egg quality.

Derived from plants and completely free of any animal-sourced content, our METHOCEL™ product family can mimic the structural functionality of meat and eggs. This allows food manufacturers to create world class, free-from or reduced meat and egg foods that satisfy the dietary needs and health concerns of consumers without compromising taste, look, or feel. The entire METHOCEL™ product family is suitable for vegetarian and vegan.

## METHOCEL™ in Vegetarian Products

Properties	Benefits
<ul style="list-style-type: none"> <li>Thermal gelling: METHOCEL™ solutions will gel at hot temperatures. This gel is reversible, meaning that when it cools down, it returns to a viscous solution.</li> <li>METHOCEL™ SuperGel (METHOCEL™ SG A7C, SG A16M and MX): higher gel strength at hot temperature compared to regular methylcellulose</li> </ul>	<ul style="list-style-type: none"> <li>Excellent hot structure for great bite as well as stability</li> <li>During thermal gelling some water is released, carrying flavors and leading to a juicy bite, succulent mouthfeel at high temperatures</li> </ul>
<ul style="list-style-type: none"> <li>Longer lasting gel of METHOCEL™ Bind 092 and 112</li> </ul>	<ul style="list-style-type: none"> <li>Improved stability at colder temperature</li> </ul>
<ul style="list-style-type: none"> <li>Viscosity at cold and ambient temperatures</li> </ul>	<ul style="list-style-type: none"> <li>Helps form patty shapes</li> <li>Good water retention capacity</li> <li>Freeze/thaw stability + heat stability + time stability during storage</li> <li>Easy to incorporate into vegetarian preparations</li> </ul>

# Binding Ability of METHOCEL™ in Different Vegetarian Applications

Whatever the matrix used for your vegetarian patties or sausages, METHOCEL™ products will be able to help:

- Forming and maintaining shape
- Providing hot and cold (depending on METHOCEL™ grade) texture, binding and bite
- Retaining moisture and offering juiciness during eating

Here are a few examples of applications that can be made with METHOCEL™. In the recipes below, METHOCEL™ MX was used most of the time but we have a whole range of METHOCEL™ to adapt and comply with your processing conditions and end product desired characteristics.

Nut and Vegetable Based Vegetarian Patties	
Ingredients	%
Chilled coarsely chopped peanuts	23.7
Frozen finely chopped blanched carrots	18.8
Ice water	10.0
Finely chopped fried and chilled onions	9.9
Frozen green peas	9.9
Chilled sweet corn	9.9
Chilled coarsely chopped hazelnuts	7.9
Chilled coarsely chopped almonds	7.9
Cajun spice mix <sup>1</sup>	1.0
METHOCEL™ SG A16M	1.0
<b>TOTAL</b>	<b>100</b>

<sup>1</sup> Cajun herb & spice blend (salt, chili pepper, cumin, red bell pepper, black and white pepper, cayenne pepper, garlic powder, coriander, fennel seed...), Schwartz

Legume and Vegetable Based Vegetarian Patties	
Ingredients	%
Cooked and chilled smashed up chickpea OR green lentils	39.9
Frozen finely chopped blanched carrots	20.0
Frozen spinach	16.0
Chilled sweet corn	10.0
Finely chopped fried and chilled onions	8.0
Sugar beet fiber <sup>1</sup>	3.1
BBQ spice mix <sup>2</sup>	2.0
METHOCEL™ MX	1.0
<b>TOTAL</b>	<b>100</b>

<sup>1</sup> Fibrex 610, Nordic Sugar

<sup>2</sup> BBQ herb & spice blend (dried onions, salt, chili powder, cumin, garlic, brown sugar, coriander, paprika, mustard flour, parsley...), Schwartz



Control without METHOCEL™



METHOCEL™ SG A16M



Chickpea



Lentils



Pan fried nut and vegetable based patties, internal studies, Bomlitz, February 2016

Pan fried legume and vegetable based patties, internal studies, Bomlitz, February 2016

Vegetable Based Vegetarian Patties	
Ingredients	%
Cooked and chilled potato chunks	30.2 + 10.3
Chopped, fried and chilled leeks	17.2
Frozen chopped broccoli	8.6
Frozen chopped green beans	8.6
Frozen chopped spinach	8.6
Smashed up frozen peas	8.6
Cooked and chilled millet	4.3
Potato fiber <sup>1</sup>	1.7
METHOCEL™ MX	0.9
Salt	0.7
Nutmeg	0.3
<b>TOTAL</b>	<b>100</b>

<sup>1</sup> Paselli, Avebe



Pan fried vegetable based patty, internal studies, Bomlitz, February 2016

Pea and Buckwheat Based Vegetarian Sausages	
Ingredients	%
Pureed frozen green peas	45.2
Cooked and chilled buckwheat	39.7
Tomato concentrate	9.0
Pea fiber <sup>1</sup>	4.5
METHOCEL™ MX	0.9
BBQ spice mix <sup>2</sup>	0.7
<b>TOTAL</b>	<b>100</b>

<sup>1</sup> I50M, Roquette

<sup>2</sup> BBQ herb & spice blend (dried onions, salt, chili powder, cumin, garlic, brown sugar, coriander, paprika, mustard flour, parsley...), Schwartz

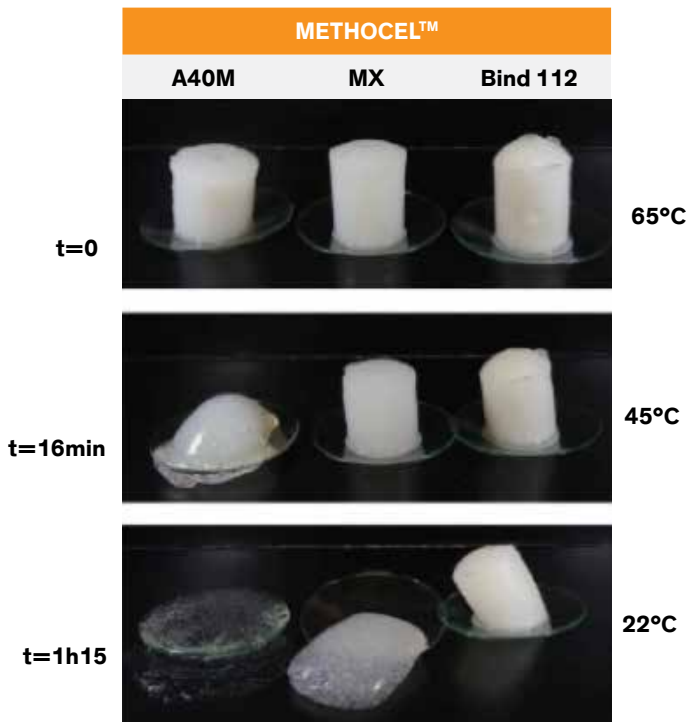


Boiled pea based sausages with METHOCEL™ MX and buckwheat, internal studies, Bomlitz, February 2016

# METHOCEL™ Bind in Vegetarian Products

## METHOCEL™ Bind – an innovative methyl cellulose with new cold structure capacity

METHOCEL™ Bind 112 and 092 differentiate from METHOCEL™ MX and other methylcelluloses due to their **lower melt back property** that results in **long lasting gelling behavior**. These products are the preferred option for applications that require both hot and cold bite. METHOCEL™ Bind 092 has a lower viscosity specification than METHOCEL™ Bind 112.



## Differences between METHOCEL™ MX and METHOCEL™ Bind 112

Properties	METHOCEL™ Bind 112 and 092	METHOCEL™ MX and SG A16M
Hydration temperature	< 2°C	< 10°C
Gelation temperature	30°C	40°C
Melt back temperature	10°C	20°C
Strong hot gel	Yes	Yes
Cold bite & texture	Yes	No

The lower melt back temperature of METHOCEL™ Bind 112 ensures the **cold bite** benefit

2% solutions of METHOCEL™ were heated up to 65 °C (until achieve gelling state) and then allowed to stand and cool down to room temperature. The illustration shows the comparative melt back behaviour between METHOCEL™ MX and METHOCEL™ Bind 112 – both supergelling methylcellulose products patented by Dow – and METHOCEL™ A40M, a standard methylcellulose

**This lower melt back property contributes to improve structure and texture at cold and ambient temperatures resulting in increased stability, bite, cohesiveness and firmness.**

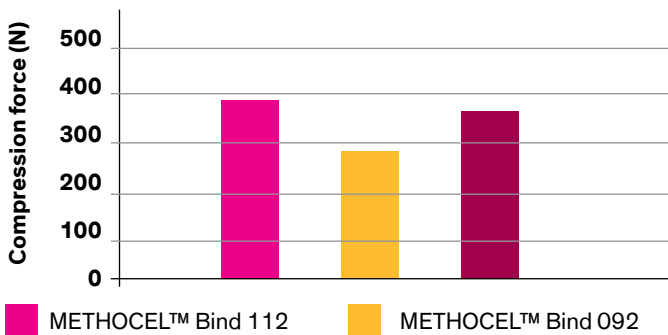
**Application example: comparison of METHOCEL™ Bind and egg white in soy patties**

METHOCEL™ Bind 112 and METHOCEL™ Bind 092 (added as solutions) were compared with high gel egg white (added as powder) in soy patties.

Ingredients	METHOCEL™ (%)	Egg white (%)
Textured soy protein concentrate	25.4	25.4
Water for protein hydration	16.0	39.6
Water	42.6	39.6
<b>METHOCEL™ (powder dosage)</b>	<b>1.0</b>	-
<b>Egg white powder</b>	-	<b>3.0</b>
Sunflower oil	10.0	10.0
Glucose syrup	1.8	1.8
Salt	1.0	1.0
Yeast extract	0.7	0.7
Spices mix	1.4	1.4
<b>TOTAL</b>	<b>100</b>	<b>100</b>

Internal Trials - Germany, January 2016

**Hardness of patties**

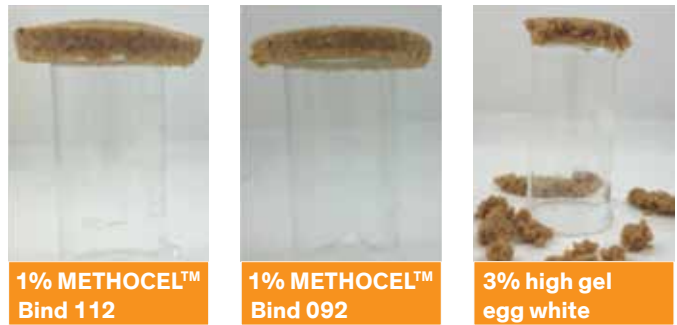


**Hardness:**

- METHOCEL™ Bind 112 provides similar bite and texture as egg white
- METHOCEL™ Bind 112 improves hardness compared to METHOCEL™ Bind 092

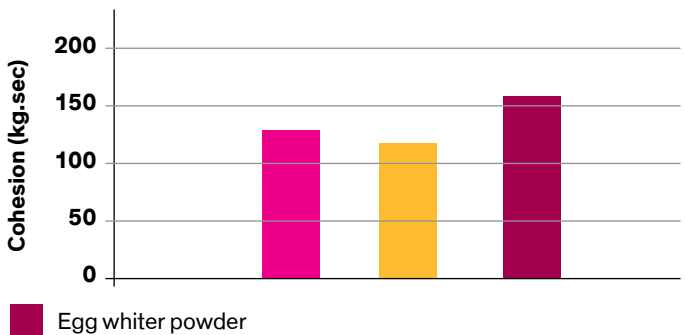
All dry ingredients were mixed together then added to pre-hydrated soy protein. Soy patties were formed with a burger press at room temperature. Already during forming, METHOCEL™ Bind provides stability to the raw soy patties while patties with egg white were very crumbly and collapsed.

**“Beaker test” with just formed raw soy patties**



The soy patties were then frozen and pan fried. The texture of the fried soy patties was assessed with texture analyzer at 20°C.

**Binding of patties**



**Binding:**

- METHOCEL™ Bind 112 and 092 provides similar or slightly lower cohesion than egg white

Lower viscosity of **METHOCEL™ Bind 092** can be an advantage for some processing (e.g. pumping) and forming conditions (less sticky).

General comparison of METHOCEL™ against egg white as binder:

	Egg white	METHOCEL™
General features	<ul style="list-style-type: none"> <li>• Not vegan</li> <li>• Allergen</li> <li>• Compatible with METHOCEL™</li> </ul>	<ul style="list-style-type: none"> <li>• Vegetarian and vegan</li> <li>• Easy to handle and use</li> <li>• GRAS</li> <li>• Compatible with egg white</li> </ul>
Storage	<ul style="list-style-type: none"> <li>• Microbiological difficulties</li> <li>• Chill storage required</li> </ul>	<ul style="list-style-type: none"> <li>• Microbiologically stable and pure</li> <li>• Dry long life storage</li> </ul>
Cost	<ul style="list-style-type: none"> <li>• Cost in use – high and fluctuates</li> <li>• Potential availability problems</li> </ul>	<ul style="list-style-type: none"> <li>• Potentially reduced cost in use</li> <li>• Reliable availability</li> </ul>
Functionality and texture	<ul style="list-style-type: none"> <li>• Non-reversible thermal gelling</li> <li>• Dry eat</li> <li>• Extended chew</li> </ul>	<ul style="list-style-type: none"> <li>• Reversible hot structure</li> <li>• Also cold structure with METHOCEL™ Bind range</li> <li>• Succulence</li> <li>• No extended chew</li> </ul>

## Conclusion

Recommended product line	Target applications	Benefits	Viscosity	Hydration Temperature
METHOCEL™ SuperGel (SGA7C, SGA16M and MX)	Products eaten hot	<ul style="list-style-type: none"> <li>• Gives good juicy bite in hot temperature</li> <li>• Enhanced binding and stability in hot temperature</li> <li>• Forming ability in cold temperature</li> </ul>	<ul style="list-style-type: none"> <li>• SGA 7C: low</li> <li>• SGA 16M: medium</li> <li>• MX: high</li> </ul>	~ 7-10° C
METHOCEL™ Bind112 and 092	Products eaten hot and cold	<ul style="list-style-type: none"> <li>• Improved binding, structure, bite and texture at hot and cold temperatures</li> <li>• Improved stability and binding when product is cold or has cooled down after cooking (not eaten immediately) – easier to manipulate</li> <li>• Gives good juicy bite in hot temperature</li> <li>• Forming ability in cold temperature</li> </ul>	<ul style="list-style-type: none"> <li>• 092: medium</li> <li>• 112: high</li> </ul>	~ 2° C

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