

### Jet Cooking Method

#### Scope

- Ingredient suitability for high temperature, high shear processes
- Product development
- Process control
- Mimic the jet cooking process for quality assurance

#### Rapid Visco Analyser 4800 (RVA 4800)

The Rapid Visco Analyser (RVA) is a cooking viscometer with ramped temperature and variable shear capability optimized for testing viscous properties of starch and similar temperature-dependent hydrocolloids. The RVA 4800 can perform regular tests below 100°C, as well as high-temperature tests up to 140°C in a specially designed pressure vessel. The RVA 4800 can be used to assess the viscous potential and stability of starches, gums, dairy proteins and other ingredients under the high temperatures and shear required for jet cooking, extrusion and similar processes. The instrument provides a tool for performing more relevant analyses for a variety of applications and is an aid to formulators for high temperature processing systems.

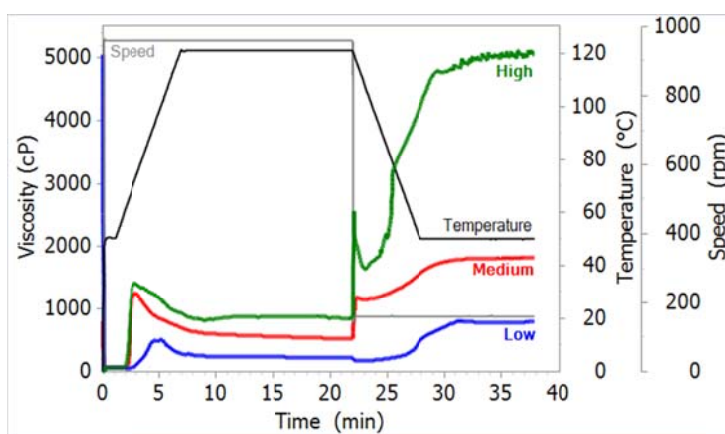


#### Description

The ability of the components of a product to withstand high-temperature processing conditions is of interest to formulators, who must balance the need for acceptable product rheology with safety and throughput. High-temperature processes are used in the manufacture of many food and industrial products. The viscosity, pasting behavior, and stability of starch during the manufacturing process are affected by its chemical make-up and modifications. Steam jet cooking is

commonly used to prepare aqueous dispersions for food and non-food applications. The process involves pumping the aqueous slurry (usually starch) through an orifice where it is mixed with steam. This high temperature (generally in the range 110–140°C) and pressure process subjects the dispersion to high shear stresses, and results in disruption of the starch.

This high-temperature RVA method is applicable to any unmodified and modified starches and their derivatives, including composites with hydrocolloids and lipids. High shear is used in the method to approximate typical processing conditions for these ingredients, which are commonly used as fat replacers, gelling agents and stabilizers, and as paper wet end, size press and coating additives.



**Figure 1.** High shear profile shows enhanced resistance of highly cross-linked starch to high temperature and high shear processing conditions.

## Method

High temperature profile with high shear (960 rpm) and maximum test temperature of 121°C held for 15 minutes.

## Test requirements

**RVA mode:** High temperature coupling, lever forward  
**Cans & paddles:** High temperature, tray of 42 (PN NS106944)



## Sample preparation:

X g sample at 14% moisture and 25.0 mL distilled water. The amount of sample to use depends on the material. Table 1 may be used as a general guide.

**Table 1.** Amount of sample for various materials.

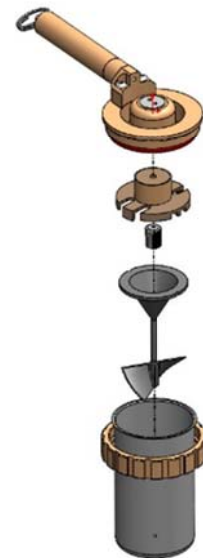
Material	Amount (g)
Gums	0.25-0.75
Modified Starch:	
Acid Modified	4.00-22.00 <sup>1</sup>
Oxidized	4.00-22.00 <sup>1</sup>
Substituted	2.50
Cross-Linked	2.50

<sup>1</sup>The amount to use depends on the degree of modification

## Profile

**Table 2.** Jet cooking method.

Time	Type	Value
00:00:00	Temperature	50°C
00:00:00	Speed	960 rpm
00:01:00	Temperature	50°C
00:06:55	Temperature	121°C
00:21:55	Temperature	121°C
00:21:55	Speed	160 rpm
00:27:50	Temperature	50°C
00:37:50	End	-
Idle Temperature: 50 ± 1°C		
Time Between Readings: 4 s		



## Measure

PT: Pasting temperature (°C)  
 PV: Peak viscosity (cP)  
 PTi: Time to peak (min)  
 BD: Breakdown (cP)

TV: Trough/minimum viscosity (cP)  
 SB: Setback (cP)  
 FV: Final viscosity (cP)