1.0 Objective.

Establish the steps for determining the viscosity in the product, using a Brookfield Viscometer.

2.0 Scope.

This method applies for determining the viscosity of the product in process and finished goods.

3.0 Reference document.

A. S.T.M. D1439 – 03 American Society for Testing Materials.

F.E.U.M 8th Edition, 2005.

4.0 Responsibilities.

The Laboratory Head is responsible for verifying the application of this analytic method.

The analysis technicians are responsible for exercising the method as described in this document and inform the Head of Quality Assurance, head of Production and Head of research and development of any discrepancies that might arise.

5.0 Terminology.

Absolute viscosity:
It is the force per unit of area, necessary to obtain a unit of gradient speed.

Cinematic viscosity:
It is the quotient of the absolute viscosity and density of a fluid.

NOTE: This method is based on measuring the resistance of a fluid, when an internal force is applied which induces it to move, under set conditions.

6.0 Procedure.

6.1 Sample preparation.

An approximately 300 gram sample is taken and homogenized inside a bag, the required amount for the test is taken afterwards.

6.2 Materials preparation.
The viscometer is to be operated consistent with document CD-G03 " Brookfield Viscometer operation manual" and the analytical balance must be operated as indicated in document CD-G05 "Balance operation manual" and the following materials are prepared:

- Brookfield Viscometers, model LVF o DV-I, RVT o RVF.
- Beaker (polypropylene) 600 ml.

- Spatula.
- Analytical balance.
- IKA Stirrer.
- FLUKE Digital Thermometer.
- 500 ml graduated cylinder.
- Distilled water.

6.3 Test execution.

6.3.1 Determine the concentration of the specimen of which the viscosity needs to be known, (for instance 1%, 2%, 3%, 4%, 5%, etc); which refers to the contents of 500 grams of weight in the solution.

6.3.2 Determine moisture, as indicated in document CK-G24 "Analytical method to determine moisture using moisture Analyzer"

6.3.3 To determine the specimen amount at certain concentration the following math is done:

$$MBH = \frac{C \times S}{100}$$

Where:

C= concentration to which the solution will be prepared.
S= total weight of the solution.

To determine the concentration in a dry-basis the following formula is used:

$$M = \frac{MBH}{(100 - \%\ Moisture)} X\ 100$$

Where:

M= Sample dry-basis weight.

%Moisture = Result from step 6.3.2.

6.3.4 The distilled water to be used is calculated in the following way:

$$V = 500 - M$$

And in wet-basis:

$$V = 500\text{-}MBH$$

Where:

V= Volume of distilled water in milliliters.

6.4 Pour into the 600 ml polypropylene beaker, the amount of calculated water in 6.3.4, using a graduated cylinder. For the high viscosity products adjust the water temperature between 18 and 20°C, for low viscosity products adjust between 23 and 24°C.

6.5 Place the beaker with water in the IKA stirrer and initiate agitation at low speed, the speed is increased gradually as the specimen is incorporated, being careful not to lose any product, continue with the agitation until the product is dissolved, check the solution which should be at 25° +/- 0.2°C.

6.6 When the specimen is completely dissolved and reaches the temperature of 25°C +/- 0.2°C, it is taken away from the stirrer and placed in the viscometer selecting the spindle and rpm, according to the following tables:

It is relevant to mention that table 1 Brookfield LVF Viscometer and our method are consistent to the method specified by ASTM D1439-03.

Table N° 1
Brookfield LVF Viscometer.

Viscosity Range	Spindle N°	RPM Speed	Factor
5 – 100	1	60	1
100 – 200	1	30	2
200 – 1000	2	30	10
1000 – 4000	3	30	40
4000 – 20000	4	30	200
20000 – 50000	4	12	500
50000 – 100000	4	6	1000

In addition to the Brookfield LVF Viscometer, we have RVT and RVF Viscometers which are used only when a Customer requests it, for the viscosity calculus the following table applies, considering the spindle, the RPM and the factor.

Table N° 2
Brookfield RVT and RVF Viscometer

RV 1		RV 2		RV 3		RV 4		RV 5		RV 6		RV 7	
0.5	**200**	0.5	**800**	0.5	**2M**	0.5	**4M**	0.5	**8M**	0.5	**20M**	0.5	**80M**
1	**100**	1	**400**	1	**1M**	1	**2M**	1	**4M**	1	**10M**	1	**40M**
2	**50**	2	**200**	2	**500**	2	**1M**	2	**2M**	2	**5M**	2	**20M**
2.5	**40**	2.5	**160**	2.5	**400**	2.5	**800**	2.5	**1.6M**	2.5	**4M**	2.5	**16M**
4	**25**	4	**100**	4	**250**	4	**500**	4	**1M**	4	**2.5M**	4	**10M**
5	**20**	5	**80**	5	**200**	5	**400**	5	**800**	5	**2M**	5	**8M**
10	**10**	10	**40**	10	**100**	10	**200**	10	**400**	10	**1M**	10	**4M**
20	**5**	20	**20**	20	**50**	20	**100**	20	**200**	20	**500**	20	**2M**
50	**2**	50	**8**	50	**20**	50	**40**	50	**80**	50	**200**	50	**800**
100	**1**	100	**4**	100	**10**	100	**20**	100	**40**	100	**100**	100	**400**

RPM FACTOR SPINDLE NUMBER

6.7 Introduce the needle (spindle) in the specimen sideways to avoid trapped bubbles at the bottom, when inside, center it in such a way that the wave produced by it be the same at all points around the spindle. Turn the viscometer on and let it work freely for a minimum of 30 seconds to a maximum of one minute, in the case the dial goes beyond 100, turn the viscometer off, place the following spindle number and proceed as described from the beginning of 6.7.
When this time is over, press the lever to stop the dial and write down the reading of it.

6.8 Calculus

The following formulas are used when the viscosity is obtained in cps, in wet-basis.

ANALOGUE VISCOMETER

Viscosity at 25°C = (Instrument reading) X (Factor)

DIGITAL VISCOMETER

Viscosity at 25°C = Direct reading.