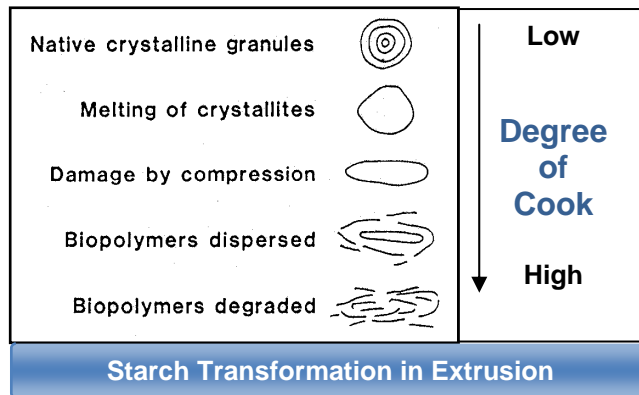


Using the Rapid Visco Analyser (RVA) to Monitor Production and Quality of Extruded Feed and Petfood Products

Extrusion Background:

For most extruded products, starch and its transformation during cooking exerts the dominant effect on product quality. Starch is included for its nutritional - digestibility, calorific value, flavor - and rheological properties - viscosity, binding, expansion, density control, viscosity, durability, water stability. Even in fish feeds where the primary energy source is the fat, starch is used to provide density control (sinking rate) and binding (dissolution).

Extrusion is very different from traditional atmospheric or pressurized high water cooking processes. It is faster, continuous, conducted at higher shear and higher temperature, and produces lower moisture and more shelf stable products. Extrusion is complex and achieving a consistent, high quality product is difficult as small changes in raw materials, such as pasting temperature of starch, are not evident in ingredient specifications, but they impact the product. Additionally, the extruder barrel and screws wear over time so that the rheology in the cooker changes. Setting consistent process parameters like temperature does not take this fully into account due to the complexity of the interactions. The well-known processes of starch swelling in high water systems do not directly apply in extrusion. Starch swells less and is degraded more in extrusion than in conventional cooking.



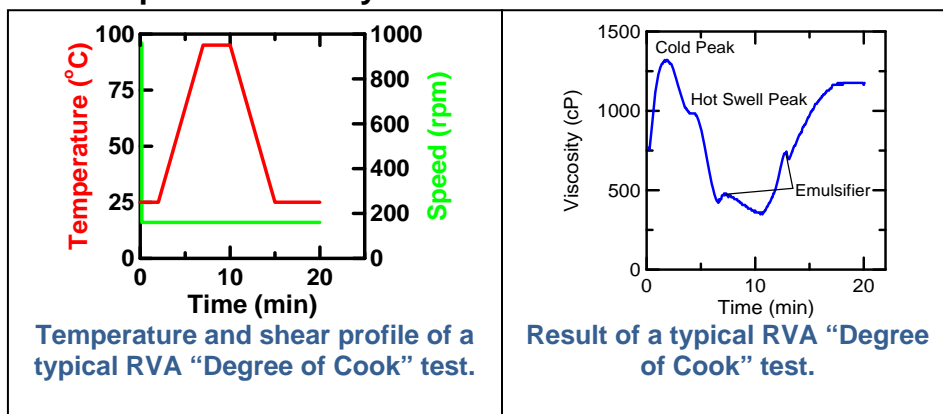
Application of the RVA:

The RVA is a rotational viscometer with programmable stirring speed (shear) and temperature. It can be used to re-cook extrudate (animal feed, pet food, aquafeed) to determine the level of cook achieved in the extruder. It can “fingerprint” product quality to provide a means for more consistent product and process control. It can also be used to test the starchy raw materials and their likely effect on the feed.

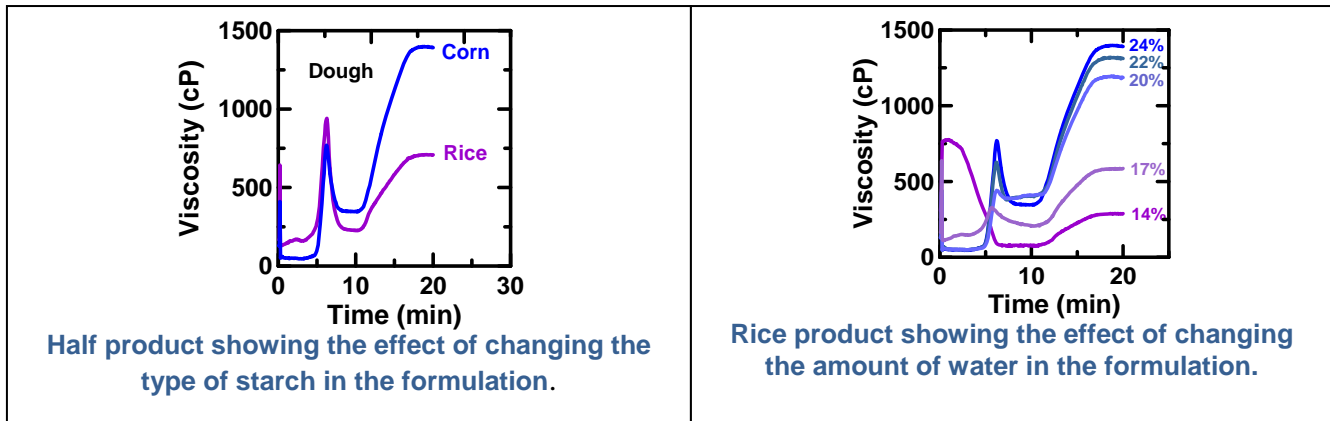


Method for Cooking Extrudate in the Rapid Visco Analyser:

For dough or par-cooked product, freeze the samples (dry ice works fast) to ‘lock’ the starch up prior to RVA analysis. Mill the sample (e.g. in a Waring Blender), sieve it, and then weigh it into an RVA canister with water. Sample is dispersed by shaking or with a little alcohol then re-cooked under constant shear.



Examples:



Applications and Benefits:

- **R&D use** to fast track new product development time by optimizing extruder performance
 - Reduce time and improve efficiency
- **Improve animal performance** by optimizing starch cook
 - Optimal growth through proper nutrition and digestion
- **Test effects of alternate ingredients on formulation**
 - Take advantage of market prices without sacrificing quality or performance
- **Raw ingredient monitoring** to prevent out of spec material from entering production
 - Reduce downtime and product re-work
- **Optimize formulation and extruder** set-up based on ingredient knowledge
 - Increase production by reducing downtime
- **Maximize delivery** of consistent, quality feeds by "fingerprinting" your product
 - Increase in customer satisfaction and loyalty
 - Provide a "fingerprint" plot to your customers proving consistency

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