Three Key Factors for Optimizing Extruded Petfood Production

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Extreme thermal extrusion and drying processes help each kibble deliver complete nutrition to pets. But as these processes reduce moisture, they can also reduce consumption preference. Simply adding moisture can adversely affect shelf life stability. Also, increasing the drying time limits throughput speed of petfood production capacity. While optimizing moisture level, production capacity and petfood quality can be difficult, the right balance can benefit producers' economics.

Increasing production capacity

Improving production capacity can be particularly challenging when seeking to optimize kibble moisture levels. A study in South America measured how adding a combination of buffered and non-buffered organic acids with surfactants in the conditioner at two different inclusion rates impacted production parameters. Fylax® Forte-HC liquid* was added in two dosages at the preconditioning stage while maintaining production conditions. Table 1 shows that applying the product with the dryer set at 120°C resulted in a significant increase in throughput while decreasing the moisture percentage and water activity (AW). These results show an opportunity to reduce the temperature or increase the dryer throughput speed, resulting in less energy use and/or improved production process efficiency.

		Control	Fylax Forte-HC liquid, Dosage 0.66 kg/MT	Fylax Forte-HC liquid, Dosage 2 kg/MT
Fixed variables	Extruder Feeder Screw Speed, RPM	55	55	55
	Specific Mechanical Energy, Kw/Hour/MT	18	18	18
	High Intense Preconditioner Steam,%	9.2	9.2	9.2
	High Intense Preconditioner Water, %	14.3	14.3	14.3
	Extruder Steam, %	2	2	2
	Dryer Temperature, °C	120	120	120
Response variables	Speed of Feed Screw, kg/Hour	10000	10500	11000
	Extruder Blade Speed, RPM	1100	1200	1310
	Density Product, g/cm³	0.4347	0.4321	0.4295
	Moisture, %	7.9	7	6.1
	AW	0.62	0.56	0.43

Table 1: Results of adding Fylax Forte-HC liquid to the extrusion process in a petfood plant in South America.

A second study provides more insights on improved production efficiencies. The production speed was accelerated to 11,000 kg/h, the dryer was set between 105-110°C and AW was at a maximum of 0.70, per the producer's quality standards. Two inclusion rates were established to compare with a control treatment. Results in Table 2 show a maximum increase of 0.08 in AW and 2.81% in moisture. Although the AW and moisture were higher, the mould control properties of Fylax Forte-HC liquid proved effective. Shelf life was increased by 72% when the inclusion rate was lower and by 171% when higher, compared to the control treatment. The effect can largely be attributed to the product's inclusion of patent-pending ActiProp® technology.

		Stress Test, Days	Moisture, %	AW
Control		137	7.9	0.62
Fylax Forte-HC liquid Dosage	0.66 kg/MT	236	10.59	0.68
	2.00 kg/MT	372	10.71	0.70

Table 2: Results of adding Fylax Forte-HC liquid in finished kibble.

Further studies in Latin American production facilities show consistent results. Even when the dryer temperature was reduced by 14°C, kibble's moisture percentage increased while the AW value remained below the 0.60 target (Table 3 and Figure 1).

Studies show that Fylax Forte-HC liquid can inhibit mould growth, increase production process throughput and enhance kibble's moisture.

Point of Analysis	Moisture, %			AW		
	Fylax Forte-HC liquid	Control	*p*=	Fylax Forte-HC liquid	Control	*p*=
Extruder	15.78	15.66	0.902	1.00	1.07	0.066
Dryer	9.13	7.26	0.001	0.61	0.58	0.009
Coater	9.01	6.45	0.001	0.61	0.54	0.001
Cooler	8.60	6.22	0.001	0.58	0.53	0.001

Table 3: Results of Fylax Forte-HC liquid application in extrusion process in the Latin American region. N=1554

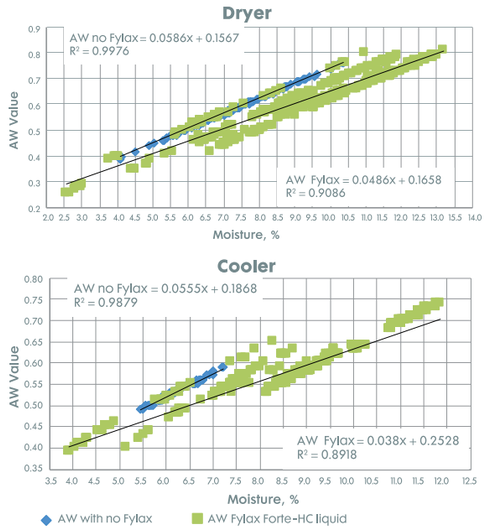

Figure 1: Evaluation of Fylax Forte-HC liquid in a petfood plant in the Latin American region.

Controlling mould and improving shelf life

Commercial environments requiring up to 24 months of shelf life without a deterioration of kibble quality can pose stability challenges.

To guarantee kibble´s shelf life, a mould inhibitor should be added during preconditioning. A highly concentrated, stable blend with a minimum of 95% retention of propionic acid after the extreme environment of the extruder can ensure a prolonged effect throughout kibble's shelf life. Fylax Forte-HC liquid has proven to be effective during extrusion's high temperatures.

Surfactants and emulsifiers also contribute to homogenous distribution of added moisture and organic acids during preconditioning, by reducing the surface tension of water. This allows moisture to penetrate deeper into feed particles, increasing the total fixed water in kibble, which results in a lower free water level.

ActiProp in Fylax Forte-HC liquid contains propionic acid and emulsifiers, as well as a buffering agent to enable a prolonged effect. ActiProp's phytochemical compounds have a proven high synergy with propionic acid.

Applying solutions effectively

Dosing equipment ensuring effective distribution of the blend of buffered and non-buffered organic acids with surfactants is key to achieving such results. Due to production variations, dosing equipment should be adjustable to allow for optimal inclusion in processing. Trouw Nutrition dosing equipment allows for accurate, safe and continuous dosing, mixing Fylax Forte-HC liquid with water used for the preconditioning process before continuously spraying it onto feed materials in the preconditioner.

Complete moisture penetration in the kibble results in uniform starch gelatinization, better starch availability and better palatability. However, increasing the final moisture level and controlling AW can be challenging without an adequate product properly applied. High energy usage during extrusion and drying is required to produce quality kibble and increasing production capacity is usually limited by the drying process. Energy and drying capacity challenges can be managed with properly applied products, such as Fylax Forte-HC liquid. Studies show applying this solution can improve the quality of kibble and its shelf life, while offering economic benefits to producers.

**The product mentioned in this article is not available in the USA.*
References available upon request.