

Delta T
Moisture Control Technology

**Safely Maximize Water Content
in Petfood**

by

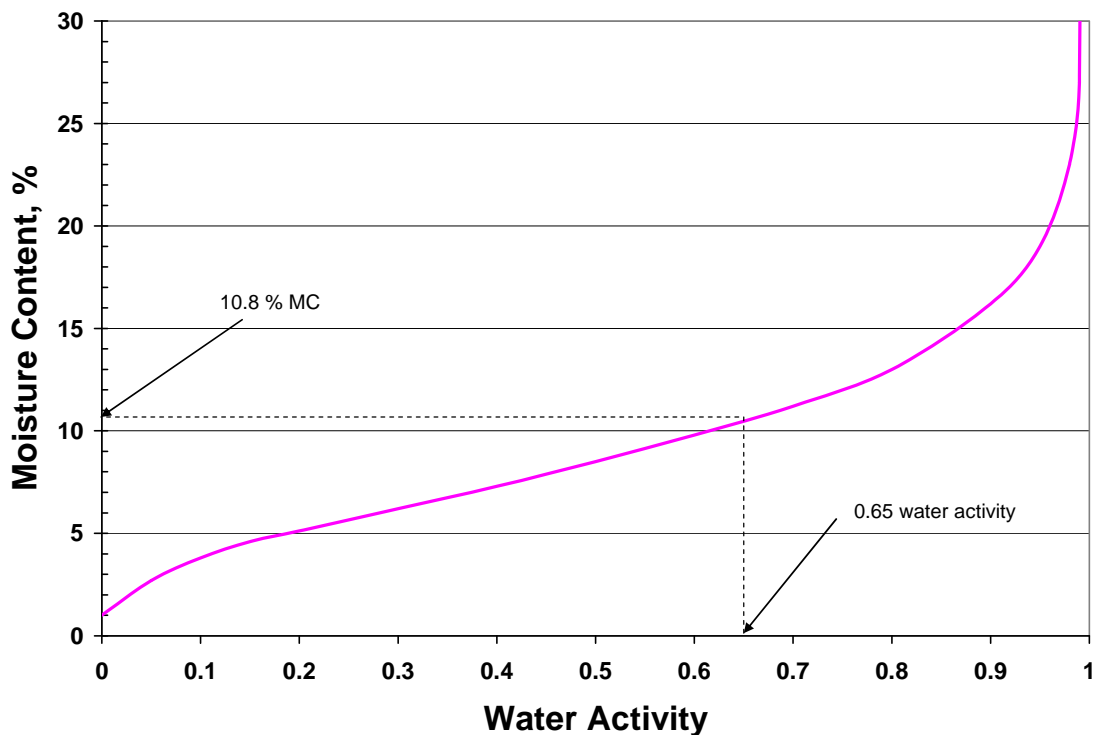
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Safely Maximize Water Content of Petfood

Dry petfood can develop mold if its water activity (aW) is above 0.65. Since on-line water activity sensors are unavailable, it must be indirectly controlled by controlling the product moisture content (MC). Figure (1), an isotherm of MC Vs (aW), is used to determine the upper MC specification limit (USL) above which no appreciable production is produced. According to figure (1), the USL for this particular petfood should be about 11%.

Figure (1) - Moisture Content Vs Water Activity



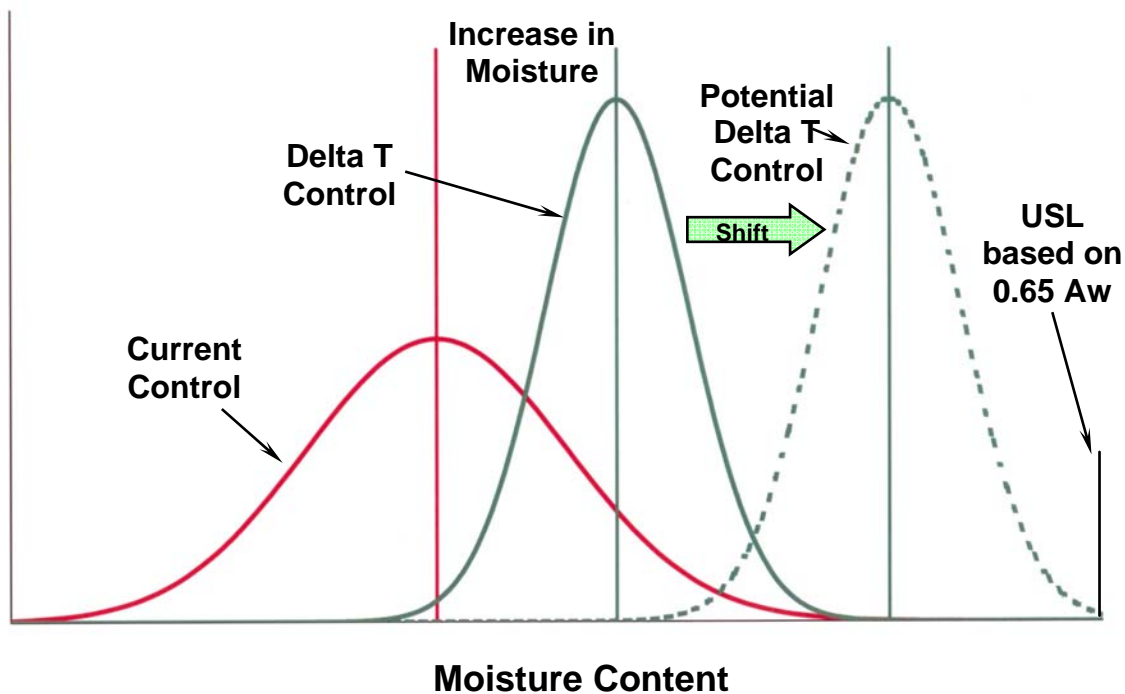
A target mean MC that assures a mold-free petfood product should be three standard deviations (s.d.) below the USL value of 11%; it is calculated as follows:

$$\text{Target MC} = [11\% - 3 (\text{standard deviation})]$$

The MC distribution curves of figure (2) are constructed from real data obtained from dryer runs before and after installation of the Delta T moisture control system. The curve labeled, current control, describes operation before use of the Delta T; the curve labeled, Delta T control, represents results achieved using the Delta T system that enabled an increase of 0.66% in the mean MC. The curve labeled, potential Delta T control, shows that a total of 1.66% increase in the

mean MC over that achieved using current control is possible. Note that the upper (+) 3 standard deviation point of the potential control curve is superimposed over the USL of 11 % to prevent any production above the critical water activity value of 0.65.

Figure (2) – Safely Maximize MC in Product

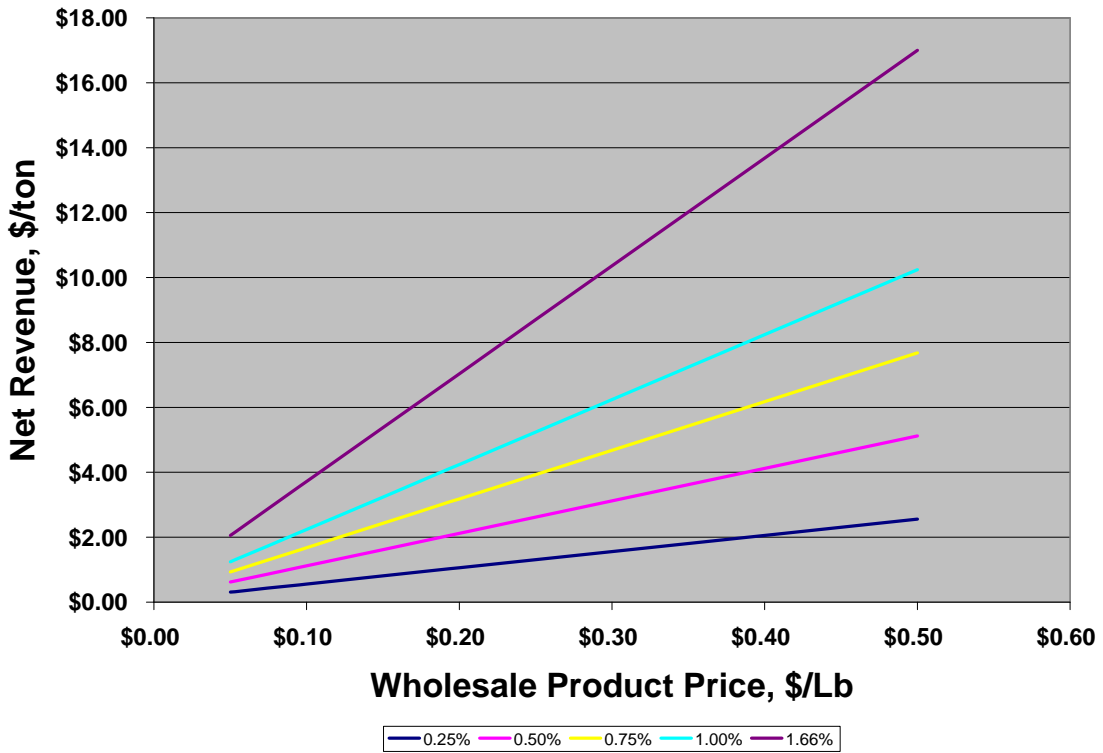


Therefore, by using the improved Delta T moisture control system with water activity option, the target mean MC value may be shifted from the original 8.6% to 10.2 % without exceeding the USL of 11% MC and a water activity of 0.65. There should be no danger of mold growth in the finished petfood. The amount of return will depend upon the water activity isotherm for the particular petfood product.

The economic gain from increasing the mean MC by 1.66% would be the sum of the value of the extra water sold as product plus the energy saved from not having to evaporate that water. Calculations are based on the consumption of 4 million Btu/ton of water evaporated and a fuel cost of \$6/million Btu consumed.

For example, if the MC is increased 1.66% as shown on figure (1), the net annual return would be $(0.0166) (2000 \text{ lbs/ton}) [(\$0.20/\text{lb}) + (2000 \text{ Btu/lb}) (\$6/\text{MMBTU})] = \underline{\underline{\$7.04/\text{ton}}}$ of which \$6.64/ton is from water sales and \$0.40/ton is from energy conservation. Figure (3) gives the net return in \$/ton of dried petfood for various moisture content increases resulting from improved moisture control.

Figure (3) – Net Revenue from Increased Water Sales and Energy Savings



A petfood dryer producing 75,000 tons/yr of a product at a wholesale price of \$.20 per lb (\$400/ton) and a mean MC increase of 1.66% would net \$528,000 annually with no additional raw material or operating costs..