POLLUTION SOURCE REDUCTION IN FOOD PROCESSING

LOOK FOR A BENEFICIAL USE FOR EVERYTHING

MILLER BREWING COMPANY

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Look For a Beneficial Use For Everything

"We have a problem!" How many times do we hear THAT every week? Well, whether we are talking about a problem or an opportunity depends on your perception. Perception is a key word today.

We all have one little planet in our vast solar system that is our one and only home - at this point in time. Brazil recently announced it was going to discontinue its support for ethenol fuel - too costly. Inflation problems - more air pollution. We are destroying our rain forests at an alarming rate over in the Amazon region - our greatest 02 supply.

Lets get closer to home. One key problem is that our landfill sites are filling up - "Not in my backyard!" What's the answer? Let's look for a beneficial use -- for <u>everything</u>! Is it a problem? Or is it an opportunity? For most all of us in this room it is gainful employment!

The question is, what can we physically do? As a general food industry we must be more than strictly technical - we need to communicate - avoid misperception. That's become of the all important axiom: "Perception is reality".

Marketing brewery by-products for the past 15 years has been challenging and rewarding. MBC operates seven breweries in the U.S. Any one of them puts out lots of quality packaged beer and a ton of by-products! Both wet and/or dry brewers grains, liquid brewers yeast, food grade CO_2, recycled aluminum cans, corrugated materials, FARM O.N. or biomass, fly ash, and cullet (recycledglass) are a few of our current by-products.

My first experience marketing a biomass was with a previous employer. I transferred into their by-product area just prior to their completion of a 4 million dollar drying plant for animal feed. Feeding trials had been complete, all with positive results and all I would have to do is sell it!

After a bit of evaluation, it was determined the product contained a 2-2 1/2 ml/lb level of Vit. B12 supplement. AAFCO required a minimum of 1 1/2 mil/lb so registration was attained and marketing commenced in the late 70's. This experience was very helpful when I moved to Miller Brewing in '82. Miller was already completing initial land application fertilizer trials with brewery biomass (FARM O.N.) thru Cornel1 University. Results were very positive demonstrating liming and fertilization value. Remember you have food grade ingredients being processed with only food grade cleaners and sanitizers

allowed within the facilities. All sanitary and laboratory streams are kept distinct -- then are piped into local municipal systems. Total land application has been our goal since 1983. Both our Albany, GA and Eden, NC breweries have long since achieved this. The newly enacted NY State regulations should allow year around application in NY State from our brewery there. This new law recognizes the distinct difference between solid waste and food processing (wastes) residuals having no sanitary waste. Again, with food processing you have defined the input and held processing within G.M.P., you have a different, distinct and defined by-product.

A national EPA food processing residuals exemption similar to NY, being proposed in NC, and outlined in Dr. Carawan's comments to the EPA on their proposed "Standard for the Disposal of Sewerage Sludge" is what we all need. It is a practical, beneficial use of a food processing by-product.

A brewery is really a beer factory and produces many by-products. A by-product survey was distributed to all plant controllers. (Table I) Here were examples of some plants producing waste and others marketing by-products from the same sources. A monthly by-products report to my supervisor with copies to all controllers helped highlight some of these opportunities.

Continuing to work with the accountants and controllers, a by-product profit contribution report was developed (Table II). You might note the similarity to the by-product survey. Its development over the years has even created some competition between plants.

Another major area addressed at Miller was the brewers grains contracts. The breweries were very pleased to have someone work with them to address their individual contracts. They were also very cooperative in providing their variable cost to dry. These costs identified labor, energy, sewer, electricity, and sometimes a set minimum maintenance fee. This would allow a logical, financial approach to wet versus dry brewers grain marketing decisions. The contracts were also modified over time to provide for a joint sales effort for both wet and dry, and pricing was allowed to move with commodity markets. This improved profitability and eliminated some previous severe summer surplus situations - the result was to eliminate waste and protect the environment. A further step into the food area is being explored with a brewers grain marketed as a Barley's Best product.

Brewers yeast is another prevalent brewery by-product which we've been addressing from day one. Great strides have been made in turning this by-product into a very profitable side

business, one with many food applications. We have done this without necessitating a capital expenditure for major processing equipment.

A research trial completed with our Texas yeast, which replaced soybean meal, in a dairy feeding trial increased milk production 6%. The results of this feeding trial were published in the February 8th, 1988 issue of FEEDSTUFFS (Table III). This now provides another viable profitable market for non-fermentative liquid brewers yeast.

One new by-product developed over the past three years has been food grade CO_2 (Table IV). In 1982 our company spent many hundreds of thousands of dollars to purchase CO_2. This is an excellent example of how that by-products profit contribution report I showed you earlier was effective. In 1984, two breweries were successful in generating sales of food grade CO_2. When the director of brewery operations received a copy of that report, he asked the obvious question: "If these two breweries are able to sell CO_2, why do the other four have to buy so much" The results have been gratifying. As of this date, all six breweries have succeeded in generating sales. For 1989 our goal is to have zero dollars net/net purchases. That is, CO_2 sales dollars less some CO_2 purchases will net out even to positive revenue.

Corrugated is another by-product receiving more attention. Landfill costs are going up and so is corrugated price. This makes corrugated recycling projects very profitable. In other words, if you do not recycle corrugated materials, the cost of disposal is milch higher. It is important to set up a program which can float with a fluctuating market. As market and corrugated prices cycle down the price must also go down to maintain the recycling chain. The recycle survives on a margin too, he cannot buy high and sell low!

Cullet or broken glass reclamation is another growing area. Cullet contracts can now be set up with price variation based upon a variety of parameters: cullet inclusive of contaminants, cullet without paper contaminants, and color separated without contaminants. This provides employee involvement teams a clear picture of the financial impact of their recycling efforts.

Miller Brewery Company has also strongly supported an Employee Involvement, or E.I., program. This program has many benefits, one of which is that it provides employees a personal opportunity to identify and resolve problems related to their work. Many positive by-product projects relating to corrugated and cullet have been fostered by E.I. And it's been a great way to foster understanding and support for recycling opportunities lower down in the organization.

In summary, turning waste into salable by-products and protecting the environment is a challenging endeavor. Whether it be fly ash to cinder blocks, brewers liquid yeast to feed for dairy cows or into biotechnology applications, or wet versus dry brewers grain to Barley's Best high fiber flour or land applicable FARM O.N. - it all relates to protecting the environment and maintaining a clean and profitable workplace. We all must continue looking for a beneficial use for everything.

I'd like to leave you with this one final thought. The challenge we face is being able to stretch our engineering and technical expertise so that we can and communicate adequately about the issues. The success of so much of what we do depends upon the opinions and perceptions of others.. government, the media, the public. Remember, "perception is reality" -- and, by communicating the facts about recycling, we have an opportunity to influence people's perceptions for the better. This will do a lot to smooth the way to help for our food plant by-products utilized to their true value, in harmony with our environment.

George 0. Wornson
Manager of By-product Development
Plant Operations

TABLE I

Brewery

Product is:	Sold	Given Away	Waste Treatment or Sewer	Land Fill	Other (Define)
Brewers Grains					
Brewers Yeast					
Excess CO_2					
FARM O.N. (Biomass)					
Fly Ash					
D.E.					
Non-Potable Beer					
Cullet					
Aluminum					
Stainless Steel					
Lubricants					
Iron					
Corrugated					
Folding Cartons					
Solid Fiber (return cases w/ metal staples					
Paper					
Labels					
Miscellaneous (Define)					

TABLE II

MILLER BREWING COMPANY
BY-PRODUCTS COST REDUCTION
ALL PLANTS SUMMARY
JANUARY, 1988

	Current Month				Year-to-Date			
	Units Sold	Gross Revenue	Variable Costs	Cost Reduction	Units Sold	Gross Revenue	Variable Costs	Cost Reduction
Brewers Grain - Dry Tons								
- Wet Tons								
Sub-Total								
Brewers Yeast - Dry Lbs.								
- % Solids								
Excess CO_2 - Liquid Tons								
Foreign Kegs - Pounds								
Foreign Pallets								
Farm O.N.								
Fly Ash								
D.E.								
Non-Potable Beer								
Cullet - Tons								
Aluminum - Pounds								
Stainless Steel - Pounds								
Lubricants								
Iron - Tons								
Corrugated Mtls. - Tons								
Folding Cartons								
Solid Fiber								
Paper - Tons								
Cartons								
Miscellaneous								
Total								

	Per Unit				Per Unit			
	Units	Revenue	Var. Cost	Cost Reduction	Units	Revenue	Var. Cost	Cost Reduction
Brewers Grain - Dry Tons								
- Wet Tons								
Bbls. Brewed/Per Bbl. Rates								

NOTE: Per Unit Cost Reduction based on Brewers Grain only.

By SARAH MUIRHEAD
Feedstuffs Staff Editor

Brewers liquid yeast improves milk production in lactating cows

The feeding of non-fermentative brewers liquid yeast to dairy cows in early lactation has been found in a Texas A&M University study to result in increased milk production.

Brewers liquid yeast is not a new ingredient to the feeding industry. Over the years, its value has been evaluated in broiler, turkey, swine, lamb and cattle diets. Results of those studies have varied, with the exception of beef cattle where an increase in dry matter intake has been well documented.

For the most part, the alcohol content (approximately 5%) of brewers liquid yeast is thought to be responsible for the additional energy provided by the byproduct. The amino acid and trace mineral balances of brewers liquid yeast have also been considered extremely beneficial to dairy animals.

Unlike its dry counterpart, liquid brewers yeast allows for more "optimum" consumption. A wet total mixed ration tends to remain in a uniform mix until consumed, while separation usually occurs with dry mixes.

Research

The Texas work with brewers liquid yeast was conducted by Dr. Al Lane, extension dairy specialist with the Texas Agricultural Extension Service. His objectives were to evaluate the byproduct on its ability to improve dry matter intake, compare milk production and composition with protein supplied by the byproduct with the standard ration and to determine the nutrient content of a ration containing liquid from liquid protein supplement (LPS) and water with a ration containing LPS, water and brewers liquid yeast.

For his research, Lane divided a herd of Holstein cows into control and treatment groups. The cows were assigned by production levels to two control strings (168 head each) and to two treatment strings (168 head each). Lane pointed out that completion of a free-stall barn during the trial required a reduction in the number of animals to 116 head on control and 116 head on treatment. Therefore, production data used for the trial was based on 232 head.

To each of the cows, a total mixed ration was fed. Table 1 shows the formula of the control and treatment ration in which a portion of soybean meal protein was replaced by brewers liquid yeast.

Dairy Herd Improvement Assn. (DHIA) records were used to measure production response in the herd on two consecutive test dates — March 13, 1987, and April 24, 1987. Feed intake during the study was measured by recording the total mixed ration delivered to each string of cows.

Results

Lane's work showed that dry matter intake was lower for those cows receiving the total mixed ration with brewers liquid yeast. Cows fed brewers liquid yeast averaged 50 lb. of dry matter (82 lb. as fed a total mixed ration with 61% dry matter.), compared with those cows fed the control ration which averaged 54.2 lb. of dry matter (79.6 lb. as fed a total mixed ration with 68.1% dry matter).

Milk production, according to Lane, was 6% higher on the total mixed ration with brewers liquid yeast even though dry matter was lower. Therefore, he said, efficiency of milk production was improved.

Lane had anticipated an increase in dry matter intake from the cows and could not explain the difference between the control and treatment animals when the results were tabulated. He noted no difficulty was observed in getting the cows to consume the treatment ration.

Milk production was 4 lb. higher for the cows on the brewers liquid yeast at the end of the trial. Milk fat was slightly lower for the brewers liquid yeast animals at 3.40%, compared with 3.62% for the control cows (Table 2). Total fat production, however, was not different and pounds of protein were higher on the brewers liquid yeast, said Lane.

TABLE 1. Norwood TMR-BLY trial (March '87)

Ingredient	Lb./head/day	
	Control	Treatment
Beet pulp	3.00	3.00
Wet brewer's grains	5.00	5.00
Rolled corn	4.00	3.75
Whole cotton seed	7.00	7.00
Hominy feed	5.00	5.00
Rice bran	2.50	3.20
Rice grain	4.00	4.00
Soy hulls	3.75	3.40
Soybean meal	2.25	0.85
Wheat midds	3.00	3.00
Chopped alfalfa hay	9.00	9.00
Processed coastal hay	4.00	4.00
LPS	3.00	3.00
Water	20.00	14.00
BLY	—	8.00

TABLE 2. Milk production/composition

	3-13-87			4-24-87			Difference		
	Milk	% Fat	% Protein	Milk	% Fat	% Protein	Milk	% Fat	% Protein
Control	80.4	3.42	2.86	65.2	3.62	3.00	-15.2	+0.2	+0.14
BLY	80.8	3.40	2.86	69.6	3.40	2.90	-11.2	—	+0.04

TABLE 3. TMR lab analysis (NY-DHIC: 100% DM basis)

%	Control	BLY
Dry matter	68.1	61.0
Crude protein	18.8	18.6
ADF	27.3	25.6
TDN	71.0	72.0
NEL	0.66	0.69
Ca	0.84	0.91
P	0.48	0.50
Mg	0.42	0.43
K	1.04	1.04
Na	0.311	0.333

Table 3 indicates the results from a laboratory analysis of the dry matter content of the two total mixed rations fed during the Texas study. Generally, the analysis showed that the two rations were essentially equal in nutrient content on a dry matter basis and that dry matter content as formulated was calculated to be 65% for both rations.

"It's critical that dairymen do not feed more than 8 lb. per day per animal," warned Lane. He said that although it has not yet been documented, there has been some concern that feeding higher levels results in milk acidity.

Lane said he is interested in continuing his studies with brewer liquid yeast. The next areas he hopes to be able to examine are the effect of the byproduct on reproductive efficiency and the potential feeding value of the fractionated portions of the byproduct — yeast cells and liquid. Lane's work was supported by the Miller Brewing Co., Milwaukee, Wis. The company has been marketing the byproduct from its Ft. Worth, Texas, brewery to dairies in the surrounding area for almost a year. George Wornson, manager of byproduct development for Miller, estimated that the company moves more than 200 tons a week to the Texas market. As the Ft. Worth area continues to grow in its number of dairy animals, Miller hopes sales for his company will follow suit. He explained that although the major market for brewers liquid yeast will remain food and pet food companies, the dairy industry offers the company another marketing option. #

CARBON DIOXIDE SPECIFICATIONS

1. SCOPE

1.1 This document describes specification requirements for cylinder CARBON DIOXIDE, bulk liquid CARBON DIOXIDE, and solid CARBON DIOXIDE.

CAUTION: CARBON DIOXIDE may constitute a physiological hazard.

2. CLASSIFICATION

2.1 **Types** — CARBON DIOXIDE in cylinders at ambient temperatures is denoted as Type I. Liquid CARBON DIOXIDE at subambient temperatures in bulk containers is denoted as Type II. Solid CARBON DIOXIDE (dry ice) is denoted as Type III.

2.2 **Quality Verification Level** — Table I presents the component maxima, in PPM (v/v) unless shown otherwise, for quality verification levels for Types I, II, and III CARBON DIOXIDE. Volatile component maxima for Type I CARBON DIOXIDE are the average in the combined liquid and gas phases, as obtained by heating the sample container to slightly

TABLE I — COMPONENT MAXIMA FOR CARBON DIOXIDE
(ppm v/v unless otherwise stated)

COMPONENT	QUALITY VERIFICATION LEVEL				
	MAXIMA FOR TYPES I AND II				MAXIMA FOR TYPE III
	A	B	C	D	
Carbon Dioxide Min. % (v/v)	99.5	99.5	99.5	99.5	99.5
Water Dewpoint °F.	120 –40	32 –60	120 –40	56.3 –52	
Volatile Hydrocarbons as Methane	20	20	20		
Non-volatile Residues PPM (wt/wt)	10	10	10		500
Oxygen			30		
Carbon Monoxide				10	
Hydrogen Sulfide			1	1	
Nitrogen Oxides			5	5	
Phosphine			0.3	0.3	
Sulfur Dioxide			5	5	
Carbonyl Sulfide			0.5		
Meets USP				YES	
Color					White Opaque
Odor	FREE FROM ODOR				