“Individual serving sizes are on the rise.”

Director of Process Engineering
2013 Dairy Industry – A Market Assessment
Executive Summary

Five years back and five years ahead
In 2009 PMMI released a comprehensive report on the dynamics of the dairy industry. Five years later, PMMI is again taking the pulse of the dairy market to answer how global consumers are driving production rates to increase at dairy product manufacturers. The 2013 PMMI Dairy Industry report summarizes conversations with 50 dairy professionals. Their perspectives provide insight into the influences driving operational improvements in the dairy industry and what equipment is needed to deliver new products and new packaging.

Areas of the dairy industry where dynamic changes are taking place include:

I. Dairy production and consumption
II. Alternative beverages
III. Innovation
IV. OEM involvement
V. Equipment needs
VI. Future trends

2009 predictions hold true
In the five years since PMMI surveyed the dairy industry many of the trends predicted in 2009 have come to fruition. Key trends forecasted five year ago include:

1. Continued industry consolidation
2. Formation of more mega-farms with a shift to west coast regions
3. Increased consumption of dairy products
4. Use of more sustainable packaging materials

Today, industry consolidation and the shift toward mega-farms continue and California leads the country in milk production. Sustainability and traceability remain top-of-mind concerns. The overall consumption of dairy products has risen, while consumption of fluid milk per person in the United States (U.S.) has declined slowly since 2009. Much of the decline is due to consumers choosing competitive beverages, such as protein and energy drinks and plant-based products – almond, soy and rice milk.

2013 challenges
The Top 20 North American dairy processors account for 76% of sales revenue in the region. The 2013 PMMI dairy report includes most of their viewpoints along with other dairy industry professionals. Their collective opinions and predictions offer a global outlook of the dairy industry.

Adding to the 2009 list, today’s concerns of dairy processors are:

1. Ensure compliance for sanitation, product safety and worker safety
2. Cost containment
3. Increase production without adding staff
4. Compensate for the U.S. decline in consumption of fluid milk, frozen and some cultured products
One underlying trend to emerge from the discussions with dairy professionals is that when it comes to processing and packaging operations, dairy manufacturers are keenly focused on improving operating efficiencies. Below is a list of the top-of-mind improvements dairy processors indicate that they are focused on in the near future.

## Top-of-Mind Improvements

- Increase productivity
- Compliance with the Food Safety Modernization Act (FSMA)
- Machine operator safety
- Automate packaging operations
- Preventive maintenance
- Operator training
- Reduce product giveaway
- Find skilled labor
- Improve track and trace
- Smooth line integration
- Install more packaging robotics

### I. Dairy Production and Consumption Rising

**Global dairy outlook**

At its core, the dairy industry’s perpetual drive to optimize production has led to a willingness to adopt new technologies that enable more to be done with less. Farmers are producing more milk per cow and dairy processors are increasing output and reducing operating costs. Due to a focus on efficiency, the dairy industry has shown steady growth the past five years despite an economy that has slowly recovered from a hard-hit decline. During this period the global compound annual growth rate (CAGR) of 4.1% according to Global Industry Analysts.

Global sales of dairy products are forecast to reach $494 billion in 2015 of which the U.S. will account for approximately 25%. In addition to being one of the largest single global dairy markets, the U.S. is also a major dairy exporter. In 2012, 16.7% of U.S. milk production was exported, up from just 10% in 2010. Two-thirds of milk produced in the U.S. is for domestic use as fluid milk or processed into other dairy products. *Source: Dairy Products: A Global Outlook, Global Industry Analysts, Inc., January, 2012*

Underlying reasons for the increasing global demand for dairy products and rising U.S. exports are:

- Popularity of dairy products
- Westernization of diets (to include more dairy)
- Broader array and appeal of dairy products
Global milk production

Total world milk production is estimated to grow from 692 million tons in 2010 to 827 million tons in 2020, a 19% increase.

Figure 1 shows the global distribution of 692 million tons of milk in 2010, according to the Global Dairy Outlook Report 2012 released in February 2013 by the Global Dairy Farmers.

The Global Dairy Outlook report forecasts that by 2020 the worldwide annual production of milk will grow to 827 million tons. Production by geographic region, however, is not expected to shift significantly.

Figure 1: Global distribution of 692 million tons of milk – 2010

Highlights of world milk production by 2020

The European Union, EU28 (the 28th member state was added in July, 2013), India and the U.S. were the largest milk producers in 2010 and are expected to remain so in 2020.

However, between 2010 and 2020:

- EU-28 share is projected to shrink slightly
- Shares of India and China are projected to increase
- Shares of other regions/countries are expected to remain equal
- Due to worldwide growth in dairy consumption nearly all countries/regions are projected to increase absolute production volumes

Export and Import of Milk Products

- New Zealand, EU-28, Australia and the U.S. were the largest exporters in 2010
- New Zealand and U.S. exports are forecast to increase considerably by 2020
- Russia, China and Mexico were the largest importers in 2010
- Argentina is expected to become a larger exporter of milk products

Growth opportunities and vulnerabilities of the global dairy industry are compiled from a variety of industry reports and presented by geographic region in Appendix D starting on page 48.

Mega-dairy farms

U.S. dairy farmers produced a record 200 million gallons of milk in 2012, due to their ability to successfully manage larger herds and increase per-cow milk production.

More than half (57%) of milk produced in the U.S. comes from dairy farms managing at least 500 cows.

Milk production at dairy farming operations are increasing due to:

- advances in equipment
- access to higher quality feed
- changes in herd sizes and management


Increased automation and new technology have resulted in greater efficiencies and economies of scale at large dairy farms. These advances are making it harder for smaller, less technologically sophisticated farms to stay competitive. Since 1992, the number of U.S. licensed dairy farms has decreased 61%.
Increased herd sizes around the globe have given way to the so-called mega-farms where herds of a few thousand cows are typical and herds can number in the tens of thousands. Indiana operates one of the largest U.S. mega-dairy farms managing 30,000 cows and Saudi Arabia operates the world’s largest mega-dairy farm with 38,000 cows. Herd sizes are growing at dairy farms in many regions around the globe overtaking the traditional smaller, family-run, dairy operations.

II. Alternative Beverages

Decline of fluid milk - rise of alternative beverages
Over the past decade, consumer eating habits have gradually shifted toward single-serve portions (that can be eaten on-the-go) as well as healthier food choices. This trend has given rise to new dairy products such as Greek yogurt, which is lower in fat and sugars than traditional yogurt and is available in single servings.

While the popularity of Greek yogurt has helped contribute to the rise in overall consumption of dairy products in recent years, one prominent product category – fluid milk - has faltered. Consumption of fluid milk has steadily declined in the U.S. due to a variety of factors, including concerns about its high fat and lactose content and stiffer competition from other beverages such as protein and energy drinks.

The decline in fluid milk consumption is prompting dairy manufacturers to develop alternative, non-dairy beverages to replace lost sales in this product category. These beverages include:

- Iced teas
- Iced coffees
- Fruit juices
- Lemonades
- Almond Milk
- Soy Milk

Alternative milk products, such as almond, soy and rice milk, represent an opportunity for dairy manufacturers to recapture market share. These beverages are lactose-free, lower in fat than even skim milk and have a have a shelf-life of approximately 3 months (unopened); attributes likely to appeal to health-conscious and lactose intolerant consumers who want milk in their diet.

Shelf-stable milk
Increasingly, dairy manufacturers are developing new aseptic packaging that can further extend the shelf-life of dairy products for more than six months, making it possible to ship overseas. Aseptic packaging that can keep unopened milk fresh for up to a year is in development.

Extending the shelf-life of milk which requires no refrigeration until after it is opened has been a tremendous change in the dairy industry as it has improved consumer health in countries where access to traditionally pasteurized milk has been almost non-existent. Ultra-high temperature (UHT) processing is a sterilization method in which food and liquids are heated at a high temperature required to kill bacteria in milk, yogurt and cream.
UHT milk has been a success in Europe and Australia and is growing in popularity in other parts of the world, such as India, China and South America, where inefficient refrigeration and high transport costs for refrigerated foods are common.

UHT milk has seen little success in the U.S. where milk pasteurized using the traditional high-temperature short-time (HTST) remains the preferred consumer choice.

While the benefits of aseptic packaging make it possible to extend the shelf-life of non-refrigerated milk, some industry experts are questioning whether expansion of the packaging could hurt sales of fluid milk in the long run. A reader’s response to a recent article in Dairy Foods, “Can Technology Save Fluid Milk,” suggests that the expansion of the non-refrigerated milk category could ultimately prompt supermarkets to rethink the merits of the stand-alone dairy case. Although the stand-alone dairy case is a time-tested merchandising tool, it is more costly for supermarkets to install and maintain than traditional shelf space.

Influencers of change
The drivers of change in the dairy industry are many. Consumers are attracted to new dairy products, new flavors and improved packaging to satisfy their healthier, on-the-go lifestyles. Retailers want innovative new packaging that pops off the shelf. Understanding the current influences driving change in the industry can help OEMs produce machinery tailored to meet the needs of dairy processors.

Major influences of change in U.S. dairy products and packaging are:

- The consumer
- The retailer
- Extended shelf-life (ESL) of milk products which no longer require refrigeration
- Decline of milk consumption
- Alternative beverages

"The expansion of aseptic packaging in the dairy industry could be significant if U.S. consumers were more accepting of non-refrigerated dairy products." Director of Business Development

Consumers are driving innovation in dairy products and dairy packaging and seek:
- Convenience
- Healthier foods
- Reduced portions
- Natural ingredients
- Energy boosting drinks

Retailers continue to drive packaging changes in all food categories asking for:
- Different size packages
- Multi-packs
- Variety packs
- Retail ready displays
- Sustainable packaging
III. Innovation

New product formulations
As in any industry, the key to remain competitive is product and package innovation. For dairy processors that means carving out lucrative new niche markets and meeting consumer’s evolving needs and expectations when it comes to product and packaging development.

The trend toward consumers leading healthier lifestyles is sparking a slew of innovative dairy products, protein drinks and extended shelf-life beverages. Nearly half (48%) of dairy processors are responding to consumer demand for healthier food choices with new products that are:

- Low fat
- Fat-free
- Reduced sodium and sugar
- Lactose-free
- Organic
- Probiotic cultures, fortified with nutrients, calcium and protein

There is also growing awareness among consumers for GMO-free (genetically modified organism) dairy products. By adding more natural ingredients many dairy manufacturers are able to simplify their ingredient label - further answering the demand for healthier food products.

With a reported decline in milk consumption, fluid milk is being processed into other products experiencing an increase in demand, such as cheese, yogurt and milk powders. In fact, nearly half (43%) of the U.S. fluid milk supply is processed into cheese. The remainder is processed into dairy products such as butter, frozen dairy products and powdered milk products.

Even though the yogurt category is experiencing mild growth in the U.S., within the yogurt category, Greek yogurt is enjoying explosive growth accounting for about one-third of the yogurt consumed. It appeals to consumers primarily for its higher protein, lower sugar content than other varieties of yogurt.

Listed below are product categories dairy processors say are growing, just not as fast as Greek yogurt.

- Cheese
- New flavors of ice cream and milk
- By-products - whey, protein concentrates
- Powdered milk - particularly in Asia
- Almond milk
- Coconut water

Some dairy products are introducing single-serve containers or simply getting a packaging face-lift due to declining consumption, such as cottage cheese, sour cream and frozen dairy products.

Convenient yet stable packaging
While many dairy processors indicate they are introducing new products, 30% of dairy product companies interviewed are re-designing packaging. Some of the new packages being developed will use:

- Sustainable materials to extend shelf-life
- Stronger barrier-protection to increase stability through the supply chain
- Easy to open and close fitments
- Attention-grabbing shapes
- Single-serve, grab-n-go convenience
- Stand-up pouch

Single-serve is the word at nearly every dairy processor when asked about packaging trends. As in many other food categories, single-serve dairy portions are answering the call from on-the-go consumers that place a premium on convenience. As a result, single-serve milk is becoming available in convenience stores and quick service restaurants.

**IV. OEM Involvement**

From cow to carton, dairy processing inspections are designed to ensure the safety of the final consumer product. As a result, the dairy manufacturing industry is heavily monitored and regulated to ensure the highest safety standards are not only in place, but continually upgraded as new equipment is introduced to the production process.

Two out of three dairy manufacturers rank compliance to the Food Safety Modernization Act (FSMA) as their second top-of-mind operational improvement; behind increasing production.

Rather than wait for the FSMA regulations to be finalized many dairy manufacturers are:

- Performing internal audits and making improvements
- Implementing or upgrading track and trace programs
- Creating a compliance manager-type position to oversee food safety
- Working on FSMA documentation

Overall, more than a quarter of the dairy companies interviewed (28%) do not foresee any major changes to their health and safety compliance strategies once FSMA is finalized, because of their adherence to the already strict food safety regulations under which the dairy industry operates.

**OEM partnerships**

While compliance with FSMA is not expected to be a big driver of new equipment purchases, the record keeping requirements are likely to influence how dairy processors evaluate future machine purchases. Dairy processors will be looking for easy-to-clean machinery to prevent cross-contamination and machinery that can collect the data for processing, production and packaging lines to accurately document operations.

In addition to providing equipment that can help dairy processors more easily comply with regulations, opportunities exist for OEMs
to broaden their relationship with dairy processors through enhanced services. The leading services that dairy processors say they need from OEMs to contribute to their operational efficiencies are:

- Operator training
- Preventive maintenance
- Knowledgeable service technicians
- Factory acceptance testing (FAT)
- More timely service
- Be a committed partner

Nearly half of dairy manufacturers interviewed want more machine operator training from OEMs to ensure operators have a thorough understanding of how to work the increasingly sophisticated controls on their machinery and what the data generated by those controls means in terms of machine performance. Given the increasing level of technical sophistication and automation on dairy machinery and the persistent shortage of skilled operator labor, dairy processors will be looking more and more to OEMs to provide a higher level of operator training services.

With operating efficiency a major driver of dairy manufacturing, equipment that achieves optimal run rates and meets productivity and efficiency goals is critical to daily operations.

In addition, dairy manufacturers want OEMs to design machinery that is equipped to:

- Schedule preventive maintenance
- Notify machine operators when maintenance is to be performed
- Pinpoint why a machine failure occurred
- Allow easy access so repairs can begin sooner and are completed faster

V. Equipment Purchases

Bigger batches, faster speeds
Dairy processors are striving for greater operating efficiencies to boost output and profitability and are increasing batch sizes to keep up with demand. For dairy manufacturers, plant equipment plays a key role in their ability to achieve these goals. Some of the reasons for evaluating new equipment include whether it can:

- Increase throughput on the line
- Deliver more extensive per machine performance data
- Achieve optimal run rates
- Minimize unscheduled downtime

Dairy processors want programmable logic controllers (PLC) that can capture pertinent machine operating data and download it to their back-office systems to help identify operating missteps that lead to unscheduled downtime which slows production and increases operating costs.

On the packaging side, dairy processors are looking to boost line speeds through such design improvements as larger filler heads to reduce the time it takes to fill a container. Machines that are easier
to take apart is another must have, as the less time spent cleaning or repairing a machine means it can be put back in operation sooner.

Subsequently, 80% of dairy manufacturers interviewed are evaluating their needs for equipment. Three out of four dairy processors looking to purchase equipment in the next 12 to 24 months expect to purchase new equipment - one third plan to purchase more equipment than they had during the previous 12 months.

The leading reasons for new equipment purchases are:

- New products
- Increasing output
- New packaging
- Aging equipment
- New materials

The need for more automation on new equipment is expected to play a major role in the purchasing decision. “From case erectors, case packers and palletizers to vision inspection, filling and processing machinery, we’re looking for more automation in the entire process,” says a production engineer for a milk, cheese and yogurt processor.

How easily new machinery can be integrated into the production line will also play a role in machine selection. “There needs to be seamless integration from one piece of equipment to another,” says an engineer for a leading dairy processor.

Not surprisingly, most of the wants stated in the list to the right are directly related to dairy manufacturers’ need to increase operating efficiency. Increasing volume production and operational efficiencies was cited by 91% of manufacturers as a top-of-mind improvement goal (list on page 2).

Further opportunities for new equipment sales are likely to arise as some large dairy manufacturers pull their contract packaging operations in-house. When asked to forecast whether contract packaging across the dairy industry is likely to increase or decrease, large dairy manufacturers foresee the latter.

One reason behind this trend is that dairy manufacturers feel they have more direct control over product quality when items are produced and packaged in-house. Industry consolidation is also playing a role in
the trend. “Because of acquisitions there’s not as much competition so there’s less need to outsource,” says a director of operations for a processor of frozen yogurt bars and smoothies.

Finally, OEMs need to be mindful of the importance of delivering new equipment on schedule, as well as shortening lead times for delivery of standard and custom equipment, as these factors play a key role in customer relations. Many of the dairy processors interviewed say lead times for equipment delivery are increasing. In some cases it can take 18 months or longer to receive new equipment.

Interviewees added, however, that lead times are influenced by such factors as whether they order from a U.S. or overseas manufacturer and if the equipment is standard or custom.

VI. Future Trends

Although increased productivity is top-of-mind with dairy processors when it comes to new equipment purchases, OEMs should not overlook other opportunities to provide a broader array of services; equipment integration, machine operator training, factory acceptance testing and helping manufacturers to calculate total cost of ownership.

Dairy processors predict trends that will have the greatest impact on dairy farming and manufacturing in the next five years:

- Pending regulations – FSMA, SQF, Farm Act
- Delivering healthier, high quality dairy foods – safely
- Government involvement with global milk sourcing and pricing
- Single-serve, consumer convenient products in sustainable packaging
- U.S. consumer’s acceptance of non-refrigerated dairy products
- Programs aimed at increasing milk consumption
- More dairy buyouts and consolidations – both mega farms and mega processors
- Finding skilled labor to run higher technology equipment
- The emergence of the stand-up pouch in dairy products

By expanding their breadth of services and designing equipment that increases operating efficiency on the plant floor, OEMs can position themselves as valued-added partners who dairy processors can rely on to help them stay ahead of industry dynamics and grow their businesses.

Editor’s Note: To help OEMs gain a deeper understanding of the global dairy industry an appendix listing the top dairy manufacturers, global mergers and the opportunities and vulnerabilities in the global dairy market can be found at the conclusion of the full report, 2013 PMMI Dairy Industry – A Market Assessment.
**Actionable Outcome**

**Voice of the Dairy Industry**

For OEMs the opportunity to hear what’s on the minds of leading dairy manufacturers as they prepare to move their businesses forward should be viewed as an opportunity to successfully guide them and their machinery into the future. Meeting the operational needs of dairy processors starts with being a partner that listens to their needs when it comes to machine functionality, flexibility and reliability and that proactively suggests solutions. OEMs are also well qualified to advise how operating efficiencies and plant productivity gains can be achieved through higher automation technologies.

By taking a more consultative approach, OEMs will be better positioned to act on their onshore advantages and develop long-standing relationships with manufacturers in the dynamic market of dairy food production.

**Actionable Check List**

Dairy product manufacturers’ most critical concerns that machine builders need to know

Below is a recap of how OEMs can assist dairy manufacturers to increase production through the use of improved machine functionality and services.

**“Build better quality and more reliable machines”**

- Faster fill speeds using bigger fill heads and more heads per machine
- Automate packaging processes to reduce manpower
- Improve worker safety
- Robotic pick and place to increase line speeds
- Preventive maintenance indicators to maximum uptime
- Flexible machinery to handle multiple size products with tool-less changeover
- Integrate diagnostics to track machine performance - uptime and downtime
- CIP capabilities to reduce cross contamination
- Intuitive controls with easily retrievable operator guidance
- Energy efficient machines

**“Train our operators”**

- More machine operator training
- Knowledgeable service technicians
- Improve delivery lead times
- Timely service
- Proficient factory acceptance testing
- Machine integration services

**Trends to watch – opportunities for new equipment**

- Fluctuating milk supplies cause dairy manufacturers to constantly balance inventory and pricing, therefore shifting lines to produce other products
- Acquisitions and mergers
- Dairy processors bringing contract manufacturing back in-house
- U.S. consumers adapting to non-refrigerated dairy products
- Dairy products shifting to a stand-up pouch
Appendix A

Industry Participants
The findings in the *2013 PMMI Dairy Industry - A Market Assessment* report are based on the opinions, perceptions and predictions from conversations with 50 dairy industry professionals and experts working in operations, engineering, procurement, processing, packaging, maintenance and purchasing.

**Figure 17: Surveyed participants and titles**

- Chief Engineer
- Director of Business Development
- Director of Corporate Engineering
- Director of Engineering
- Director of Procurement
- Director Process Engineering
- Director, Maintenance
- Director, Operations
- EVP Operations
- Manager Packaging Procurement
- Packaging Automation Manager
- Packaging Engineer
- Plant Manager
- Production Engineer/Manager
- Purchasing Manager
- Project Engineer/Manager
- Purchasing Manager
- Sr. Packaging Engineer
- Supply Chain Manager
- Vice President, Operations

**Figure 18: Dairy processors interviewed by company size**

Dairy processing companies interviewed for the 2013 PMMI dairy report are ranked as follows:
- 71% Large; $500 million and up
- 11% Medium; $100-$400 million
- 18% Small; under $100 million

**Dairy processors by industry ranking and sales revenue**

The 50 participants in the dairy industry interviews included:

- 14 out of the Top 20 North American dairy processors - represent 61.8% of North American dairy sales
- 8 out of the Top 20 global dairy processors - represent 23.8% of global dairy sales

**Dairy products represented:**

- Butter
- Cheese (shredded/sliced/cubed/brick)
- Cottage cheese
- Fluid milks/creams
- Frozen (ice creams)
- Infant formula
- Juice
- Powders (whey)
- Sour cream
- Yogurt

The complete list of references and resources is listed in the full body of the report.