

Survey Says: A Snapshot of Rendering

In 2010, the National Renderers Association (NRA), in partnership with the Animal Protein Producers Industry Committee and the Fats and Proteins Research Foundation, contracted with Informa Economics to develop an updated industry profile including descriptions of raw material streams and markets.

The survey resulted in detailed information collected from 96 rendering plants across the United States and Canada, including independent renderers ranging in size from single plant operations to the very largest firms operating many plants across several states. Rendering plants owned by meatpacking firms also provided information so that the results cover the complete spectrum of North American rendering facilities. Volumes unaccounted for by the survey were estimated using official statistics on livestock slaughter. It is believed that this provides the most accurate, detailed, and comprehensive information on the rendering industry ever collected.

Rendering Industry Profile

The U.S. livestock sector slaughters more than 150 million head of cattle, calves, hogs, and sheep and more than 55 billion pounds of poultry annually. In addition to protein for human consumption, the meat production system produces an enormous amount of by-products that are in turn transformed into nearly 20 billion pounds of highly valuable feed and industrial products in the form of various types of fats and proteins. The task of transforming by-products from slaughterhouses, packing plants, and other segments of the food industry into safe and valuable products lies with renderers. Animal offal (including viscera, heads, bone, blood, etc.) is the primary raw material for rendering operations, with small additional amounts from dead stock and waste generated from restaurants, grocery stores, and butcher shops. From these raw materials, renderers manufacture meat and bone meal (MBM) and other proteins for use in livestock feed, as well as tallow, greases, and various other products of value to the feed, industrial, and food processing industries.

The rendering industry consists of more than three dozen firms operating more than 200 plants across the United States and Canada. It includes plants that are integrated with meat processing companies to process the captive by-products generated by these firms, and independent renderers that are not directly owned or operated by meat processing companies but instead collect and process by-products from many different sources, including livestock slaughter and processing facilities, grocery stores, restaurants, and other entities along the meat production chain. Integrated renderers are typically associated with the nation's largest meat processing companies, such as Smithfield, Tyson, and Cargill, while independent renderers range in size from single-plant operations that process less than 10 U.S. tons, or 20 million pounds, of raw material per year, to firms with multiple plants spread across many states with combined raw-material processing capacity in excess of

one billion pounds annually.

Following are other distinguishing characteristics of rendering operations.

- Integrated renderers, by their nature of being directly associated with specific meat processing facilities or companies, typically render only a single type of species material at each plant, such as cattle, swine, or poultry by-products. Independent renderers commonly collect material from many sources, so both their raw material and finished product stream tends to include mixed species.

- For meat processors with integrated or highly-coordinated livestock supply chains (particularly the swine and poultry sectors), the fats and proteins produced from their rendering facilities are commonly used in the feed rations of their own captive livestock supplies, along with sales to other users and into other markets.

- The collection and processing of restaurant grease, waste from grocery stores and butcher shops, and livestock that die on farms prior to slaughter is done almost exclusively by independent renderers.

- Independent renderers that process animal by-products usually have contractual agreements with meat processors in which renderers pick up offal at the processing plant. Meat processors without their own rendering facilities are served exclusively by independent renderers, and some meat processing firms with their own rendering facilities also sell by-products to independent firms.

- There are several independent rendering firms (as well as individual plants owned by multi-plant firms) that focus exclusively on grease collection and processing.

Raw Material Volume

Livestock slaughter by-products, restaurant grease, and scraps from grocery stores and butcher shops comprise the three primary raw material streams processed by renderers. The total volume of these raw materials processed is estimated at 48.32 billion pounds in 2010, about 91 percent of which consists of slaughter by-products, five percent is restaurant grease, and four percent is waste from grocery stores and butcher shops.

Integrated renderers are estimated to process 48 percent of all raw materials, but their input stream consists entirely of animal by-products. Of the 52 percent of all raw materials handled by independent renderers, 10 percent consists of restaurant grease, seven percent is grocery/butcher scraps, and the remaining 83 percent is in the form of slaughter by-products.

Slaughter by-products comprise the largest share of the rendering industry's raw material stream. The volume processed by renderers is estimated currently at just below 44 billion pounds, down from 46.28 billion in 2008 – a decline of nearly five percent. Raw material volumes available for rendering are directly related to the volume of livestock and

poultry slaughtered, which varies annually based on economic conditions in the industry.

The rendering industry also collects waste generated from butcher shops, grocery stores, and other facilities that perform the final processing function for meat and meat products sold at retail. This waste can include trimmings generated by in-store butchers as well as potentially significant volumes of meat and meat products that are spoiled, beyond their expiration date, or otherwise unfit for human consumption. There are no official or reliable estimates of the volume of this material that is generated on an annual basis. The survey identified 54 rendering plants (all of them independent) that process these scraps, and they processed a combined volume of 1.92 billion pounds of this material in 2010.

Another important service provided by many renderers is the collection of used cooking oil from foodservice operations. The volume of restaurant grease collected exceeded 2.4 billion pounds in 2010, but has declined from more than 2.66 billion pounds in 2005. Some of this decline could reflect the economic recession as well as the sharp increase in vegetable oil prices that has occurred since 2007. The potential total volume of used cooking oil from foodservice operations is estimated at 4.7 billion pounds if all was collected.

Grease Theft

Renderers report that theft of used cooking oil, or restaurant grease, directly from foodservice facilities (i.e., prior to pickup by the renderer) is an increasing problem. For many reasons, restaurant grease can be an easy target for theft. Neither restaurant establishments nor law enforcement officials are likely to take aggressive measures to ensure that this property is collected by the intended owner, particularly since from the perspective of the restaurant this material is viewed simply as waste that they are happy to have removed from their premises.

Stolen restaurant grease could be resold either to competing renderers or to biofuel manufacturers, presumably on a cash basis and without the need for verification of its source. While many of the thefts could involve small volumes collected by unsophisticated, individual operators, there is also the possibility that larger, more organized groups or entities account for a significant volume of stolen grease.

Among the firms in the survey that are engaged in restaurant grease collection and recycling, all reported at least some volume of grease is stolen prior to pickup, ranging from minimal to upwards of six million pounds annually. Main findings from the survey include:

- The annual volume of stolen grease is estimated to equal about 7.9 percent of the volume currently collected, or around 190 million pounds. This equates to about 78,500 metric tons of the finished product referred to as yellow grease. Assuming an annual average price of \$500 per metric ton, this represents more than \$39 million in lost revenue to targeted firms.

- Grease theft often results in some damage to the equipment used to store and secure the grease on-site. The median annual value of equipment damage experienced per plant is \$8,750, ranging from under \$1,000 to over \$500,000 annually. Across all plants, the total annual cost of equipment damage from grease theft is estimated at \$3.26 million.

- The majority of plants (78 percent) report that they become the owner of the grease at the time it is placed in the container. The balance (22 percent) report that they do not own the grease until it is picked up by the renderer.

- Incidents of grease theft have been increasing steadily over at least the past five years. Based on the number of thefts reported during the first half of 2010, the total number of theft incidents for the entire year likely exceeded 5,400; up 8.1 percent from the previous year and more than double the number reported in 2005.

- The majority of thefts go unreported to law enforcement, and among those for which criminal charges are filed, relatively few result in successful prosecutions.

Dead Stock

The U.S. Department of Agriculture (USDA) estimates cattle mortalities to be about four million per year. In addition, every year more than 200,000 cattle and calves are condemned and/or non-ambulatory prior to slaughter and therefore cannot be processed for human food.

The North American rendering industry has always played an important role in disposing of this material unfit for human consumption, processing it along with all other raw materials into feed ingredients for non-ruminant livestock as well as into fats and greases used widely by the agricultural and industrial sectors. The environmental benefits of recycling this material as opposed to disposing of it by other means are obvious, particularly given that the most common alternatives would tend to involve burial, incineration, or composting, each of which includes potentially significant risks to groundwater, human and animal health and disease transmission, or air quality.

The survey indicates a sharp reduction in the volume and percentage of dead stock cattle and calves rendered since 2005, falling to just over one million estimated for 2010, down from nearly 1.9 million in 2005. As a result of increased regulation preventing the use of some of these materials in feed, and the negative economics of handling small volumes, today there are only 22 rendering plants that still accept all dead stock cattle and 24 that still accept calves. Across all species of livestock, the survey estimates that approximately 2.1 billion pounds of livestock that die prior to slaughter are rendered, with dead stock swine accounting for the largest share – about 43 percent of the total dead stock volume (all species) processed by renderers – followed closely by dead stock cattle. Poultry accounts for about 17 percent of the total on a volume basis.

Product Markets

Protein Products

The rendering process results in the production of nearly equal volumes of fats and proteins, reflecting the typical composition of the raw material stream. The primary protein product produced is MBM, but its characteristics, use, and market value can vary based on the raw material from which it is derived. Common types of MBM include ruminant-based, non-ruminant mammalian (which is typically derived from swine by-products and often referred to as porcine MBM),

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poultry by-product meal, feather meal, and fish meal. Mixed MBM could include material from several species including ruminants, so for marketing purposes its use is limited to applications for which ruminant MBM is allowed. In addition to MBM, when feasible, blood is processed separately to produce blood meal, which can be characterized as either ruminant blood meal or non-ruminant mammalian blood meal. Various other protein-based products are produced in smaller quantities to serve niche markets, including gelatin and cooked meat for use in pet foods.

The vast majority of rendered protein products are used in livestock and poultry feed rations, as well as pet food. Rendered products are especially valuable to the livestock and feed industry because of their high protein content, digestible amino acid levels (especially lysine), mineral availability (especially calcium and phosphorous), and relatively low cost in relation to their nutrient value. There are few close substitutes for animal proteins in most rations. For most feeding applications, animal proteins provide the lowest cost nutrient balance compared to plant-based or synthetic alternatives.

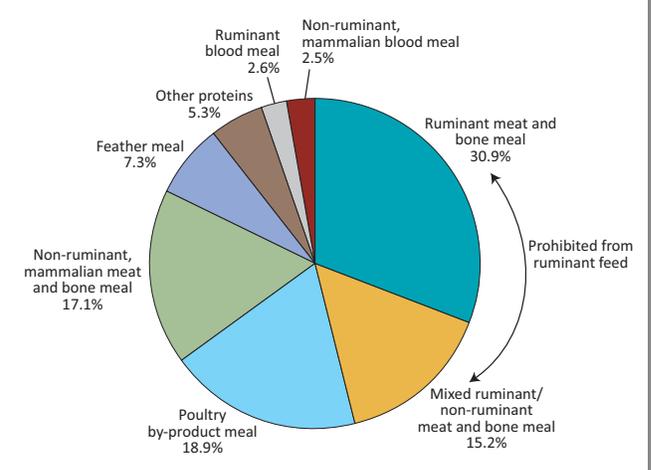
In some specialty applications, animal proteins offer advantages that are very difficult to reproduce. For instance, blood meal is highly valued for its content of by-pass protein and its ability to deliver essential amino acids that are not broken down in the rumen. Hence it is used heavily by the dairy industry both in milk-replacers for calves and as a feed supplement for lactating cows. It is also used in various animal starter rations to promote growth.

Table 1 reports 2010 estimates of rendered protein production by type, which the survey estimates to total over 9.2 billion pounds. Reflecting the composition of the raw material stream, ruminant MBM accounts for the largest share of production (more than 30 percent of the total), but the 1.4 billion pounds of mixed MBM produced (15.2 percent of the total) means that more than 45 percent of all rendered protein products are prohibited from use in ruminant livestock feed.

Poultry-derived protein meals account for the second largest product category, including more than 1.7 billion pounds of poultry by-product meal and 673 million pounds of feather meal. Non-ruminant mammalian MBM, which in the survey consists entirely of porcine MBM, accounts for approximately 17 percent of total protein meal production. Blood meals are a relatively small, but highly valuable, segment of the protein meal production stream, and production is nearly equally split between ruminant-based and non-ruminant (i.e., porcine) varieties, which combine to about five percent of all protein meal production.

Across all types of rendered proteins, the greatest share of these products is used in poultry feed, which consumes significant quantities of each type of protein and accounts for 39 percent of total rendered protein usage. The pet food market is the second largest outlet for rendered proteins with a 31 percent share, and while it consumes no blood meal, it is the largest market for both poultry by-product meal and non-ruminant mammalian MBM. Cattle feed accounts for a relatively small share of all rendered proteins, but it is the

Chart 1. Rendered Protein Volume Production Share, 2010



largest user of blood meal and consumes significant quantities of feather meal.

Fats, Greases, and Tallow Products

Total fat production by the rendering industry is supplemented by the inclusion of restaurant grease in the raw material streams of many renderers, which is largely vegetable-based used cooking oil and is converted directly to yellow grease. The rendering industry produces many types of fats and greases that differ based on the level of processing and purification (including whether or not they are approved for human food, i.e., edible) and the type of feedstock from which they are derived.

Primary categories include:

- animal fats derived as by-products from animal processing facilities (edible products must be approved by USDA, and in all cases, the term edible only refers to approval for use in human food; all of these fats and greases are edible for livestock and pets, even if they are labeled inedible for the purpose of human food);
- edible and inedible tallow processed mainly from cattle;
- lard (edible) and choice white grease (inedible) processed from swine;

Table 1. Volume Production of Rendered Proteins, 2010

Type of Rendered Protein Product	000 pounds
Ruminant meat and bone meal	2,853,257
Poultry by-product meal	1,744,176
Non-ruminant mammalian meat and bone meal	1,580,518
Mixed ruminant/non-ruminant meat and bone meal ¹	1,403,261
Feather meal	673,147
Other proteins ²	491,209
Ruminant blood meal	240,150
Non-ruminant mammalian blood meal	234,162
Total	9,219,879

1. Considered as ruminant meat and bone meal for use in livestock feed.
 2. Includes fish meal, gel bone, raw meat for pet food, lamb meal, and other specific items identified by individual renderers.

- poultry fat (inedible) processed from poultry; and
- greases derived from animal and vegetable oil. Yellow grease (inedible) is manufactured from used cooking oil and other fats and oils collected from commercial or industrial cooking operations. Renderers filter out the solids and heat the used cooking oil to reduce moisture content until it meets industry specifications for yellow grease.

Unlike rendered proteins, which are used almost entirely in livestock feed and pet food, rendered fats and greases have many important non-agricultural uses. The oleochemical industry is a major user of animal fats for the production of lubricants, soaps and detergents, inks, personal care items, and hundreds of other products, and they are also used in biofuels production. However, the livestock industry is still the largest single market for these fats and greases, and if pet food markets are included, use of these products for animal feed accounts for about 50 percent of total production.

Livestock Markets for Rendered Fats

Fats are an important component of all diets, and rendered animal fats offer important nutritional and functional properties to livestock feed rations. Fats are extremely calorie dense and also perform many indispensable functions related to cellular activity, disease prevention, and the storage and absorption of certain essential vitamins. And, the addition of fats tends to increase the palatability of livestock feed while also making the feed less dusty and easier to handle. Rendered fats are used in the feed rations of all livestock species and are typically the primary source of added fat to most rations. Yellow grease is likely the most common type of plant-derived fat added to feed rations.

Among the different livestock sectors, the largest proportion of rendered fat is used by the poultry industry, which accounts for about one-half of the volume used for animal feed (excluding pet food). The cattle and swine industries consume nearly equal amounts and account for nearly all of the remaining 50 percent of the volume used in feed rations, but minor quantities are also used in aquaculture feed rations and rations for other species.

Biofuel Markets for Rendered Fats

Survey estimates found that the production of biofuels consumes more than 510,000 U.S. tons (about one billion pounds) of rendered fats and greases, accounting for roughly 10 percent of total production of these materials with inedible tallow and choice white grease the most widely used for this purpose.

Animal fat-based biodiesel feedstocks offer strong greenhouse gas (GHG) advantages over all vegetable-based alternatives (the Environmental Protection Agency estimates GHG savings relative to petroleum of 86 percent from rendered oils, fats, and greases compared to 57 percent savings from soybean oil), and production of animal fats is not associated with indirect land use changes in the way that could result in reduced GHG savings from even higher production of vegetable-based oils. As a result, biodiesel from rendered oils, fats, and greases qualifies directly as an advanced biofuel (GHG savings greater than 60 percent), and its low-carbon status will likely support wider production in the future for blending with vegetable-based oils to achieve targeted GHG reductions. **R**

Chart 2. Animal Fats and Tallow Production Share, 2010

