
CASE 3

AMORE FROZEN FOODS

Macaroni and Cheese Fill Targets

Tom Jenkins, manager of quality services at Amore's frozen foods plant in Cortland, New York, thought the summer of 1984 might be the time to return the fill target for Amore's 8-ounce frozen macaroni and cheese pie to 8.22 ounces. Amore had been filling each aluminum tin to an uncharacteristically high target of 8.44 ounces ever since problems with underweight macaroni and cheese appeared in New York City in 1978. The higher target had protected Amore from fines levied against several producers for underweight product, but at the expense of an extra 0.22 ounces of macaroni and cheese in each pie.

Cortland Production Facility

The production facility in Cortland, New York, was originally a cold storage warehouse for locally grown apples and peaches. When these forms of agriculture dwindled, a former Cortland State University student associated with the Duncan Packing Company of Louisville, Kentucky, suggested that the company purchase and convert the warehouse for use as a frozen foods production and storage facility. The Duncan Packing Company had been founded in 1940 and prospered as a supplier of canned goods to the United States military. With the end of World War II, the company decided to expand into frozen foods and chose the Cortland apple and peach storage facility as part of that expansion.

By 1954, Duncan Packing Company sales of frozen meat and fruit pies reached \$11 million. The company employed 925 people in its facilities in Cortland (126,000 square feet) and Webster City, Iowa (116,000 square feet). Duncan was acquired a year later, 1955, by the American Baking Company, which changed the name to Duncan Frozen Foods. The International Communications Corporation acquired American Baking in 1968 and in 1981 sold Duncan to the Amore Corporation (a subsidiary of K. J. Kyburg Industries, Inc.). At that time, Duncan's annual sales of \$187 million represented a significant expansion by the Amore Corporation (primarily involved in canned foods) into the higher-margined areas of processed and frozen foods.

By 1984, the Cortland facility had grown to 500,000 square feet and employed 1,250 people. It produced 30,000 cases a day of finished products that carried the names Amore, Duncan, and Won Ton. Exhibit 1 lists the products made in the Cortland facility.

EXHIBIT 1 Cortland Products

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- Beef, chicken, and turkey pot pies
 - Full line of frozen dinners (13 varieties)
 - Two-pound entrees (10 varieties)
 - Casseroles (macaroni and cheese, and spaghetti and meat)
 - Boil-in-Bag (10 varieties)
 - Donuts (4 varieties)
 - Full line of Food Service meals—primarily in-flight service for airlines
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EXHIBIT 2 Standard Cost Breakdown

<i>Item</i>	<i>Dollars per Dozen</i>
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Ingredients:*	\$1.82
Cheese	
Macaroni	
Packaging:	0.62
Tins	
Cartons	
Case	
Direct labor	0.07
Indirect labor	0.13
Overhead	0.36
Total	<u>\$3.00</u>

*At the 8.44-ounce target.

Macaroni and Cheese Production

The Cortland facility produced 60,000 dozen 8-ounce frozen macaroni and cheese pies each month on a line staffed with 25 workers making about \$6 an hour. When this line was not making macaroni and cheese, it produced any number of other similar products.

Raw materials entered the preparation area where the cheese sauce was made and the macaroni cooked and cooled. The two were then blended in horizontal mixers and pumped to the filling line. At the filling line the aluminum trays were placed on a conveyor, mechanically filled with the macaroni and cheese, and then placed in cartons. The product was then cased (24 pies to the case), frozen, and placed in storage for distribution. The line operated at a speed of 1,000 dozen pies every 20 minutes. It took nine minutes for the mixed macaroni and cheese to end up packaged, cartoned, and cased, and another 40 minutes to freeze the cased product.

Exhibit 2 gives the standard cost breakdown for a dozen 8-ounce macaroni and cheese pies as estimated by the accounting department. Pies sold at a wholesale price of \$4.50 per dozen, \$1.50 above the \$3.00 standard cost per dozen.

Fill Targets

The practice in the food and beverage industry was to set a target weight or volume to which each container or package was filled. Because of the variability associated with the physical mechanisms that actually filled each package, fill targets were always set above the amount stated on the package. Industry practice was to set targets at one standard deviation above the package amount so about 85 percent of all packages would be in compliance. Exhibit 3 gives a detailed table of normal probabilities used to determine the percentage of underweight packages. The filling device for macaroni and cheese at Amore's Cortland plant could fill amounts that were normally distributed around the target value with a standard deviation of 0.22 ounces. Industry practice would then dictate a fill target for an 8-ounce macaroni and cheese pie of 8.22 ounces.

During the energy crisis of the late 70s, Amore (then Duncan Frozen Foods) discovered that cost-conscious supermarkets were turning off their freezers when they went home for the evening. The effect on frozen macaroni and cheese was to cause a softening of the product and a subsequent weight loss due to dehydration. Local government inspectors discovered several examples of underweight macaroni and cheese for which some producers were fined several thousand dollars. In particular, inspectors from the Bureau of Weights and Measures of New York City levied fines of up to \$15 for each 8-ounce package of frozen macaroni and cheese found to be substantially underweight.¹ Despite the industry's presentation of evidence that improper storage of the product led to dehydration that caused the underweight product, the fines were not rescinded. In response to these problems, Amore quickly raised the target to 8.44 ounces in 1978, a full two standard deviations above the package weight. This unusually high target protected Amore from most of the problems brought on by the energy crisis. In 1984, with energy costs at normal levels, fines for substantially underweight frozen macaroni and cheese were virtually nonexistent in the industry.

Weight Control System

The United States Food and Drug Administration (FDA) was the arm of the federal government responsible for monitoring the practices of the food and beverage industry. One part of the FDA's activities required each food packager to submit a program designed to ensure that packages contained the stated amounts (weights) of product.

For Amore's macaroni and cheese pies, the FDA had approved a weight control system that required a sample of five pies be taken every 20 minutes. The five pies were selected consecutively at the beginning of a 20-minute run by a quality control technician, who then spent almost the entire 20 minutes weighing and checking various attributes of the sample. The technician cost the company close

¹The guidelines for levying fines varied with locality. In general, fines were imposed if an average of some number of pies fell under the package amount. It was possible, however, for one significantly underweight pie (e.g., one weighing less than 7.5 ounces) to warrant a fine.

EXHIBIT 3 Normal Probabilities

	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
-3.2	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
-3.1	00069*	00066	00064	00062	00060	00058	00056	00054	00052	00050
-3.0	00097	00094	00090	00087	00084	00082	00079	00076	00074	00071
-2.9	00135	00131	00126	00122	00118	00114	00111	00107	00104	00100
-2.8	00187	00181	00175	00169	00164	00159	00154	00149	00144	00139
-2.7	00256	00248	00240	00233	00226	00219	00212	00205	00199	00193
-2.6	00347	00336	00326	00317	00307	00298	00289	00280	00272	00264
-2.5	00466	00453	00440	00427	00415	00402	00391	00379	00368	00357
-2.4	00621	00604	00587	00570	00554	00539	00523	00508	00494	00480
-2.3	00820	00798	00776	00755	00734	00714	00695	00676	00657	00639
-2.2	01072	01044	01017	00990	00964	00939	00914	00889	00866	00842
-2.1	01390	01355	01321	01287	01255	01222	01191	01160	01130	01101
-2.0	01786	01743	01700	01659	01618	01578	01539	01500	01463	01426
-1.9	02275	02222	02169	02118	02068	02018	01970	01923	01876	01831
-1.8	02872	02807	02743	02680	02619	02559	02500	02442	02385	02330
-1.7	03593	03515	03438	03362	03288	03216	03144	03074	03005	02938
-1.6	04457	04363	04272	04182	04093	04006	03920	03836	03754	03673
-1.5	05480	05370	05262	05155	05050	04947	04846	04746	04648	04551
-1.4	06681	06552	06426	06301	06178	06057	05938	05821	05705	05592
-1.3	08076	07927	07780	07636	07493	07353	07215	07078	06944	06811
-1.2	09680	09510	09342	09176	09012	08851	08691	08534	08379	08226
-1.1	11507	11314	11123	10935	10749	10565	10383	10204	10027	09853
-1.0	13567	13350	13136	12924	12714	12507	12302	12100	11900	11702
-0.9	15866	15625	15386	15151	14917	14686	14457	14231	14007	13786

Note: Row and column headings give number of standard deviations from mean, and table entry gives the probability that a normally distributed uncertain quantity will be less than the specified number of standard deviations from the mean.

*Read: There is a 0.00069 probability that a normally distributed uncertain quantity is more than 3.200 standard deviations below the mean.

Although it was Amore's company policy to react to samples averaging less than 8.22 ounces, the FDA-approved system required formal action only if the sample average weight was less than 8 ounces. In such cases, the entire 20-minute production had to be either fixed (weighed individually with extra ingredient added to all those found underweight, carton destroyed), reworked (ingredient reused, tins and cartons destroyed), or sold as underweight. To avoid the costs of fixing or reworking, Amore usually chose to send the entire 20-minute production to the company-operated Thrift Store on those rare occasions that the sample average weight fell below 8 ounces. In the first six months of 1984, only one such run was sent to the Thrift Store.

EXHIBIT 4 Example Weight Control Report

[illegible]

Thrift Store

The company-operated Thrift Store, located across the road from the main plant, sold a variety of underweight and second-quality frozen food merchandise to the general public. The selection of products available for sale was dictated by the "mistakes" made in the plant. However, any product that presented a potential health hazard, no matter how remote, was destroyed immediately.

Underweight macaroni and cheese was stamped with a 7-ounce label and sold fairly briskly at \$3.60 per dozen. The local demand was such that approximately 60 dozen were sold each week when macaroni and cheese pies were available. This limited local demand and relatively high energy costs of storage led to an inventory policy that limited the amount of stored macaroni and cheese pies to 1,000 dozen pies. If more became available, the oldest cases in inventory were donated to charity.