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Case Study

# Global confections manufacturer easily pulls gum sheeter technology and cost efficiency into the Digital Era


## Abstract

Over the past 100 years, chewing gum manufacturers have radically diversified their offerings with new shapes, sizes, ingredients, flavors and purposes. However, as the industry evolved, manufacturing systems lagged, risking efficiency and profitability.

One global confectioner broke away from legacy, mechanical-based chewing gum sheeter machines for an open architecture system. The new technology platform produced significant reductions in engineering and implementation costs, energy consumption, plant noise, footprint and spare parts – and a significant increase in mean time between failure (MTBF).


## Through the ages, what has changed in the making of chewing gum?

According to the International Chewing Gum Association (ICGA), no one is certain who the first gum chewers were, but historians say civilizations world-wide were chewing natural gum thousands of years ago. Chewing gum as we know it today began to claim its shelf space in modern manufacturing history about 100 years after the start of the Industrial Age. The late 1860s saw the first patent on chewing gum, as well as the first manufactured gum. In 1871, the first gum-making machine was patented.

So much about chewing gum has remained timeless – its form, function, and appeal. One core function of gum-making machines has also remained timeless, and that is the process of kneading and shaping ingredients into sheets for cutting and packaging. Machines that manage this process are called sheeters. While their function has stayed constant, gum sheeters have evolved through innovation.

One global confections provider, in partnership with Siemens, pulled sheeters out of the legacy Industrial Age into the Digital Age.

**Customer**
A global leader in confections with manufacturing and distribution plants on multiple continents.

**Challenge**
The confectioner needed to upgrade its chewing gum sheeter machines. This called for a mechanical and electrical retrofit using highly efficient servomotor and drive technologies, and fully integrated systems.

**Solution**
Based on open system architecture, the Siemens Totally Integrated Automation (TIA) portfolio features uniform hardware and software interfaces, global standards for interoperability with legacy systems, and consistent data management.

Using a common platform of logic, motion control and safety, the new solution would reduce engineering and implementation costs, energy consumption, noise, footprint and spare parts, and increase MTBF.

## The Customer

This U.S.-based manufacturer, a Siemens customer of many years, offers a range of confectionery products. The company maintains manufacturing plants on multiple continents to produce and sell confections worldwide.

## The Challenge

True leaders take big leaps to transform their businesses and industries, but innovation comes with challenges and risks. Issues arising out of legacy technologies led this confectioner to pursue a chewing gum industry first: A mechanical an electrical retrofit of its chewing gum sheeter machines to eliminate these challenges:

- High maintenance costs associated with existing sheeter mechanical cams and spare parts
- Obsolete automation and drives systems jeopardizing overall equipment effectiveness
- Disparate systems adding complexity and costs to communications, engineering and coding
- Multiple plants worldwide sharing similar issues
- Maintaining machine availability during system conversion so as not to affect production

## Smart progression – highly intricate for this global confectioner

The world of manufacturing is anything but static and advancement is necessary for survival. However, the challenges of technological progression are amplified for global producers. For example, as machines and systems become more flexible and productive, they must meet safety requirements in countries where they are installed to protect personnel who operate them. Industry standards, spare parts availability, service and technical support are additional considerations in designing a global application.

## A pilot program for the upgrade of sheeters worldwide

Considering that its existing sheeter machines around the world presented similar challenges, which were inherent to legacy mechanical sheeters in use at the time by all gum manufacturers, the confectioner chose to partner with Siemens in a pilot program within the United States. The upgrade would replace old mechanical components with modern Siemens technologies, and employ an independently repeatable platform with electronic servo technology. The approach would simultaneously cut engineering and implementation costs while delivering faster production processes with greater precision and material processing consistency. The pilot program at one U.S. location would upgrade three sheeter machines, after which the solution would be rolled out globally.

Prior to the launch of the program, the confectioner had three separate PLCs running its sheeter machines at plants

around the world. A Siemens PLC managed machine logic, while PLCs for safety and motion control, including legacy mechanical drives, were from a different automation provider. Disparate systems presented big challenges, from their inability to communicate with each other, to inherent engineering and programming complexities, and high maintenance costs. Combined with legacy drive technology, these challenges resulted in low operating efficiency and high machine upkeep. It was challenging to keep parts of the machines running and spare parts were also hard to get.

### Goals and objectives of the pilot program

The program involved the mechanical and electrical retrofit of gum sheeters using advanced technologies and systems.

- Capitalizing on the benefits of Siemens Totally Integrated Automation, the program would create sheeter machine homogeny for a global rollout over time.
- Standardization of multiple machines using one repeatable format would reduce rollout engineering and implementation costs.
- The upgrade would replace underperforming mechanical cams with advanced servomotors, producing significant energy savings through highly efficient drives.
- Operating noise would be reduced.
- Siemens Automation Solution Partner DMC would perform engineering and implementation.
- The timeframe for completion of the pilot program was approximately six months.

## The Solution

**The move to a 100 percent integrated platform from Siemens**

Upgrading to Siemens Totally Integrated Automation with open system architecture would eliminate challenges, reduce components and spare parts, and deliver operational and competitive advantages for the confectioner. The number of PLCs would be reduced from three to two, and provide a common platform for logic, motion control and safety. While the confectioner preferred a separate controller for safety, the SIMATIC Safety Integrated PLC used in the upgrade would fully integrate with the unified architecture. Uniform hardware and software interfaces, global standards for interoperability with legacy systems, and consistent data management would measurably increase efficiency and performance, and lower the confectioner's overall operating costs.

The Siemens service infrastructure is world renowned for its technical expertise and partnerships. For this project Siemens would assist with the architecture and design overview, the product selection, and drive and HMI programming. DMC, the Siemens integration partner, would implement the architecture and design of the new sheeter machine technologies and PLCs, and perform all systems integration work.

## The Results

The pilot program was completed according to plan in approximately six months. During implementation, the confectioner had to take existing sheeter machines offline, which is the most difficult challenge in any manufacturing

| Challenges | Benefits |
|---|---|
| • Three PLCs from different automation providers precluded communications between the components, and created inefficiencies in engineering and coding.<br>• There were high maintenance costs associated with existing sheeter mechanical cams and spare parts.<br>• Obsolete automation and drives systems were jeopardizing overall equipment effectiveness and performance.<br>• Energy costs associated with mechanical technology were driving profitability down.<br>• Operating efficiency was low and machine upkeep was high, making it a challenge to keep parts of the sheeter machines running.<br>• Existing machines were mechanical-based with large gears, and other noisy and often unreliable mechanical components.<br>• Noise limitations were increasingly mandated in certain countries of operation.<br>• Too many spare parts were needed and hard to get. | • **80 percent reductions in engineering and implementation costs:** Servo modernization cut engineering and implementation costs since machines are designed to be carbon copies of each other. This eliminated the need to develop code from scratch. Reductions helped offset start-up and commissioning of new machines.<br>• **Energy Savings: Electricity use dropped by 70-80 percent** after old mechanical technology was replaced with Siemens energy-efficient electronic servo technology, helping to reduce the confectioner's operating expenses.<br>• **Noise reduction of five decibels:** Noise levels decreased due to the reduction in mechanical pieces involved in machine operation, and because the machine is in a closed cabinet. In older machines, a large line shaft travels down the middle of the machine from which power is drawn. In the upgrade, the noisy line shaft is replaced by quiet, independent servomotors, which are also more accurate and reliable.<br>• **Increase in MTBF:** The SIMOTION servo control system used in this configuration has a MTBF of 50+ years.<br>• **Footprint was reduced by 20 percent** for the machine itself, including the cabinet. The electrical footprint inside the cabinet is smaller due to fewer installed components. In-feed and out-feed space requirements are also smaller.<br>• **Reduction in spare parts inventory:** Common motors and drives used for multiple axes resulted in fewer spare parts overall<br>• **Better maintenance and support:** Siemens Totally Integrated Automation delivers efficient interoperability of all automation components. The open system architecture covers the entire sheeter production process with shared characteristics. Consistent data management, global standards, and uniform hardware and software interfaces minimize and accelerate maintenance and support. |

systems upgrade. Stocking up on confection products, combined with reduced time to market and DMC's implementation skills, ensured a successful conversion. Since the pilot program was completed, the confectioner has upgraded many sheeters with the same smooth and efficient results.

Unique and innovative, this industry-first conversion in gum sheeter technology delivered benefits that far outweighed challenges, along with substantial competitive advantages.

### Products used in the gum sheeter upgrade

Siemens offers a comprehensive portfolio of seamlessly integrated hardware, software and technology-based services that support manufacturing companies worldwide. This enhances the flexibility and efficiency of manufacturing processes, and reduces manufacturers' time to market.

**SIMATIC S7 (S7300TF) Safety Integrated Controller:** Since the new gum sheeters in the confectioner's pilot program would be replicated at plants globally, safety compliance was critical in choosing a technology provider. In all of Siemens integrated safety controllers, global safety requirements are satisfied and cost-effectively implemented, also including safe motion. The SIMATIC S7's drive-integrated safety functions support flexible safety concepts and very short response times. Certified components simplify validation of machine safety, and uniform engineering and reliable communication are ensured for real-time distributed control. Integrated safety is reducing the confectioner's hardware needs, space requirements and installation costs around the world.

**SIMOTION Motion Control System:** Siemens is the world leader in motion control solutions in the machine development sector. SIMOTION D435 simplifies motion control functions for this confectioner and saves engineering time through unified, integrated engineering with user-friendly components: the engineering system, run-time software and the hardware platform. Tools for commissioning, programming, testing and diagnostics, all from a single source, are integrated in the user interface. One system is used for engineering motion control, the PLC and technology functions, and for configuring drives, all of which can be graphically handled. The confectioner was also provided the SIMOTION Training and Test System from Siemens.

**SIMATIC HMI Touch Panels:** The SIMATIC HMI TP1200 Touch Panels from Siemens proved to be the right interface between the confectioner's employees and the new gum sheeter machines. Time and cost savings, and competitive advantages made big contributions to operations. The panels are future-proof and flexible, and fully integrate with the higher-level network of the SIMOTION and SIMATIC Safety Integrated controllers used in the configuration. SIMATIC HMI Touch Panels are characterized by efficient engineering, effective and unique user interfaces, brilliant wide-screen displays, scalability for diverse requirements, reliability under all conditions, protection of personnel and the environment, and comprehensive on-site or remote error detection signaling systems.

**SINAMICS S120 Servo:** The highly efficient SINAMICS S120 servo drives used in the confectioner's platform are part of the modular drive system for high performance applications in machinery and plant construction. They offer high-performance single- and multi-axis drives for an extremely wide range of industrial applications.

**SIMOTICS 1FK7 Servo Motor:** Featuring natural cooling and a maintenance-free design, the cost-efficient SIMOTICS 1FK7 synchronous servomotor from Siemens provides the confectioner the ideal solution for its motion control application, in which a final position must be reached very quickly with ultimate precision.

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