

The premium freezer payback

How to increase output while reducing the cost-of-freezing with the third-generation Frigoscandia Equipment GYRoCOMPACT M9 and M10 spiral freezers

EXECUTIVE SUMMARY

Why is the GYRoCOMPACT® M Series freezer — the premium-priced spiral freezer from FMC FoodTech — the best-selling spiral freezer worldwide? Simply because the M Series delivers exceptionally high output at an extremely low cost-of-freezing. In fact, when output and costs curves are plotted over the expected life of the freezer, the GYRoCOMPACT M Series easily offers the best ROI and the best value in the industry — the highest output at the lowest cost.

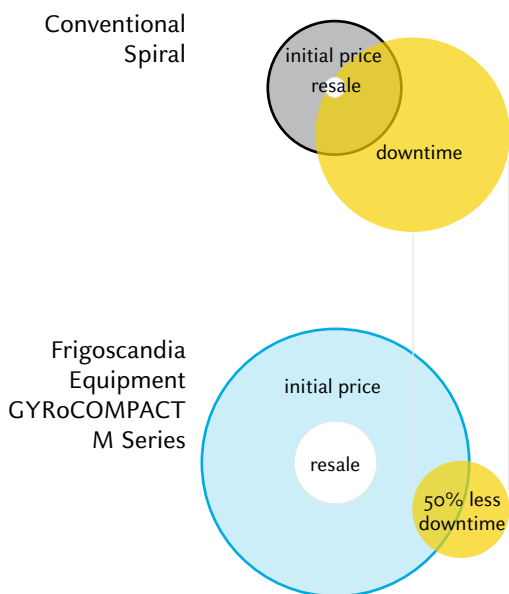
Taking an isolated snapshot of output can be an unsophisticated measurement. Metrics are not meaningful until they include a host of variables — uptime and downtime percentages, for example — plotted over the production life of the freezer. When measuring output, an important distinction should be made between the current output of a freezer — the “apparent output” — and what *could* be produced by a precisely optimized GYRoCOMPACT M Series freezer capable of up to 98-99% uptime — the “potential output.”

Meanwhile, explicit and easy-to-calculate “apparent costs” — especially a lower initial outlay for a “low-price” freezer — are incomplete until more implicit and harder to

[continues]

WHAT DOES DOWNTIME COST?

AFTER 10 YEARS



A conventional spiral freezer purchased 10 years ago for its low initial price can become a costly lesson in lost production due to downtime and diminished resale value.



Frigoscandia Equipment GYRoCOMPACT
M Series spiral freezer from FMC FoodTech

Proprietary FMC FoodTech
food science and engineering
optimizes output for every
application

The best ROI and
the best value
in the industry.

calculate “real costs” are also factored in: income losses due to product blow-off or jam-ups, longer defrost-and-clean downtimes, the uncalculated cost of freezer replacement or future expansion, even potential losses due to a product recall. Only a full accounting of both apparent and real costs that considers *all* production parameters over the full life cycle of a freezer results in an accurate calculation of true costs.

Many of the engineering and food science trademarks driving the high output and low costs of a GYRoCOMPACT® M Series freezer are literally that, patented advances that are exclusive to FMC FoodTech.

Since the 1960s, food scientists from Frigoscandia Equipment have employed mobile lab freezers to analyze the freezing characteristics for each and every specific food application at the processor’s site. The data from each lab test is analyzed at the FMC FoodTech Food Processing and Technology Center, a state-of-the-art food science laboratory in Helsingborg, Sweden. There, Frigoscandia Equipment food scientists and engineers mine the data to drive research and development, create virtual simulations of production, preview new processing equipment and train customer technicians.

Data from the tests — product weight, size, enthalpy and freezing time in the lab freezer — is compiled in GYRoCAP, a proprietary database used by FMC FoodTech applications and sales support specialists to dimension the GYRoCOMPACT freezer. Optimal freezer module selection is pinpointed — all guesswork is eliminated. Each application is also perfectly optimized by specifying operating parameters for capacity, loading pattern, line speed, dwell time and energy consumption that will produce the highest output at the lowest cost — and do so for the life of the freezer. Future GYRoCAP analysis for a potential changeover to another freezing application is gratis for the life of the freezer.

The patented, self-stacking FRIGoBELT® Conveyor further refines the self-contained product zone, allowing for freezing with an even, turbulent-efficient airflow for exceptionally consistent, low-dehydration (high-yield) freezing that maintains superior food quality and preserves weight. This approach is virtually the polar opposite of the inefficient “wind tunnel” freezing employed by traditional spiral freezers that essentially blows cold air right past the product.

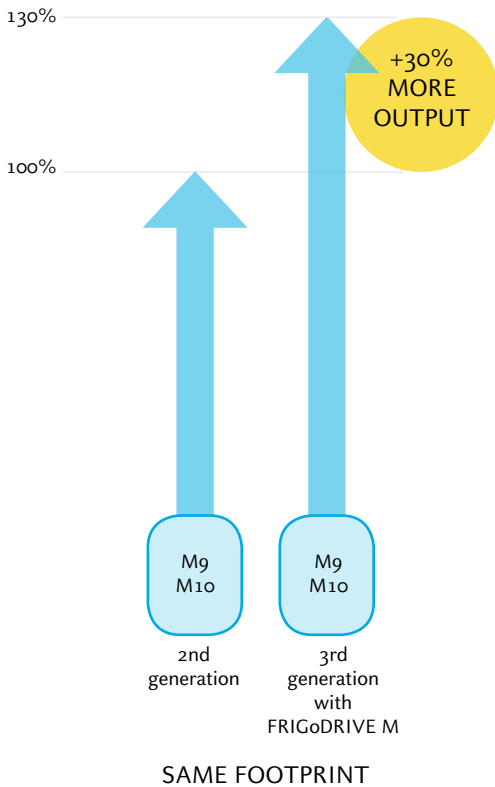
The best uptime in the industry
 + 30% more stack load
 + 30% faster line speed

As evidenced by an industry-best 98-99% uptime potential, the Frigoscandia Equipment GYRoCOMPACT® M Series spiral freezer is demonstratively the most reliable performer in the sector. But the revolutionary, patented, roller-bearing system in the new FRIGoDRIVE M drive system featured in the third-generation GYRoCOMPACT M9 and M10 betters the already best-in-industry. The new FRIGoDRIVE M drive system reduces drive force by 50%, allowing for 30% more stack load than equivalent second-generation GYRoCOMPACT M9 or M10 freezers — more tiers and more product in the same footprint — all run at speeds up to 33% faster. The third-generation GYRoCOMPACT M Series freezer is the most expandable, future-proof freezer on the market.

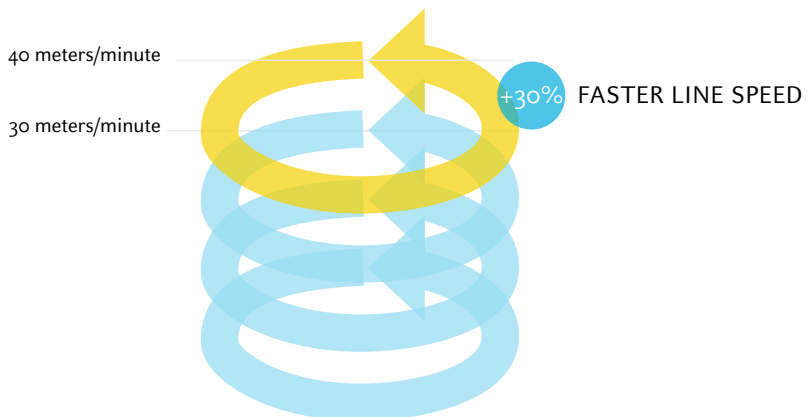
GYRoCOMPACT freezer downtime is also typically only 50% of conventional spiral freezer downtime, in part because cleaning the self-stacking FRIGoBELT® cleans the entire product zone — there is no support structure to clean and has just 5% of the rails and glides found in a traditional spiral freezer. For processors freezing higher-risk foods that may contain pathogens, there has never been a more expensive time to produce a food that needs to be recalled. The Frigoscandia Equipment Clean-In-Place (CIP) non-recirculating-water system is designed for safety and savings — ensuring both visually and microbially clean results that can be verified, while typically using just 1/3 of the water and 1/2 of the chemicals used by Recirculating Cleaning Systems employed by traditional spiral freezer manufacturers.

With the highest output and the lowest cost-of-freezing, GYRoCOMPACT M Series spiral freezers are part of the reason that Frigoscandia Equipment freezes 50% of the frozen food in the world. •

FRIGoDRIVE M INCREASES OUTPUT IN THE SAME FOOTPRINT



INCREASING OUTPUT THROUGH FASTER LINE SPEED



FRIGoDRIVE M DRIVE SYSTEM

THE COST OF A FREEZER VS. THE COST-OF-FREEZING

How to calculate ROI?

The formula seems perfectly simple: To maintain margins and profits in the increasingly competitive global marketplace, food processors must find ways to maximize output — especially of safe, high-quality foods — while reducing the cost-of-freezing. A thorough understanding of output and costs, though, requires meticulous measurement and careful analysis of a host of variables, none of which remain static. There is a virtual calculus in play — a system of calculation and reasoning that requires the analysis of output and cost values as they dynamically change over time frames as long as the projected duration of production and the expected life of the freezer.

Only when output and costs curves are plotted over time can a real, bottom-line return-on-investment (ROI) be derived.

Current output vs. potential output

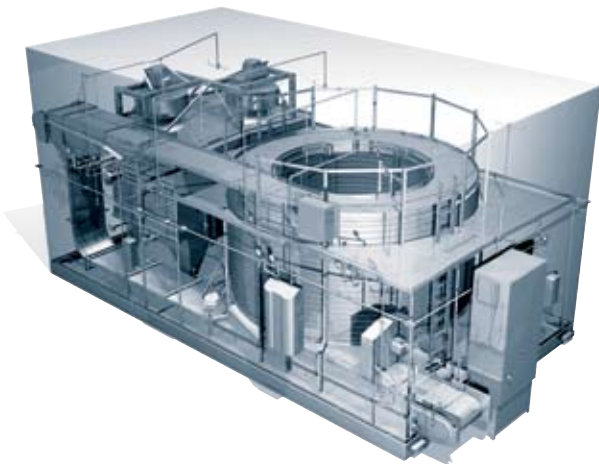
Output is not static.

While calculating current freezer output is an important production metric, taking a snapshot of output can also be unsophisticated. Again, output metrics are not meaningful until they include a host of variables — uptime and downtime percentages, for example — that are plotted over long time frames, like the projected duration of production or the expected life of the freezer.

Demand is not static.

While some processors will run the same freezing application around the clock for years, a dynamic marketplace is requiring more processors to rapidly adapt, typically to increase output by expanding freezer capacity and/or converting to multi-shift production. As unpredictable as the current business environment is, one thing is certain: the volume of food being frozen is always going up. And next year or five years or a decade from now a processor may need to, say, increase output capacity by 30%, or change to an entirely different freezing application. As food processors look for solutions, very-high-capacity spiral freezers — especially freezers that are expandable and flexible — are the answer.

With these considerations about the dynamic nature of output and demand in mind, an



Frigoscandia Equipment GYRoCOMPACT®
M Series spiral freezer from FMC FoodTech

important distinction should be made between the current output of a freezer — the “apparent output” — and what *could* have been produced if the freezer was more precisely optimized, expanded for greater capacity and/or simply run longer — the “potential output.”

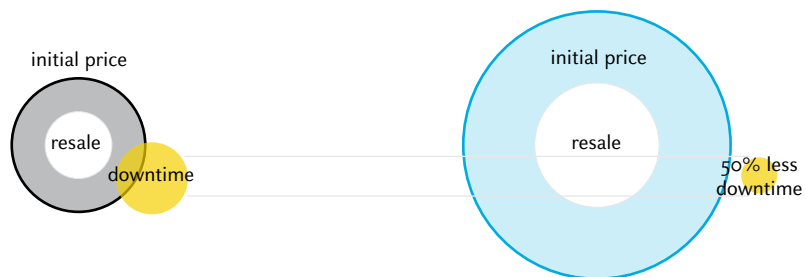
The third-generation GYRoCOMPACT® M9 and M10 freezers not only offer the highest capacity spiral freezers for their footprint and their class, Frigoscandia Equipment-exclusive optimization also makes them the most productive. And because they are also expandable (more tiers given the footprint) and otherwise adaptable to other applications, they offer the highest potential output, making the M9 and M10 the most future-proof spiral freezers in the marketplace.

Apparent costs vs. real costs

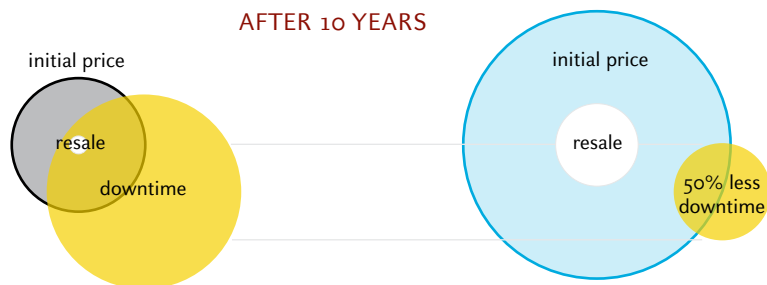
In the simplest terms, apparent costs are the tip of the iceberg, those outlays that are explicit and easy to calculate — for example, the one-time capital expenditure to buy the freezer, plus the production expenses required to meet a specific production target.

WHAT DOES DOWNTIME COST OVER TIME?

AFTER 1 YEAR



AFTER 10 YEARS



Conventional Spiral

Frigoscandia Equipment
GYRoCOMPACT M Series

FRIGONomics — THE LOW COST-OF-FREEZING (LOW LIFE-CYCLE COSTS)

Why does FMC FoodTech freeze 50% of all frozen food around the world? Why are spiral freezers with a premium initial price — the GYRoCOMPACT M Series — the best-selling spiral freezers worldwide? Simply because they deliver an extremely low cost-of-freezing.

As more food producers measure every production metric — especially uptime — and plot them over the life of production and the life of the freezer, only the GYRoCOMPACT M9 and M10 spiral freezers from Frigoscandia Equipment — offer the best ROI and the best value.

The FRIGONomics of the GYRoCOMPACT M9 and M10 produce the low cost-of-freezing through:

- Highest capacity-to-footprint ratio available (as high as 30% more output in the same footprint as a second-generation GYRoCOMPACT M Series freezer)
- Frigoscandia Equipment-exclusive precision optimization to maximize output and minimize dehydration
- 98%-99% uptime potential
- Long runs before defrosting
- Faster defrost-and-clean
- Hygiene-By-Design™
- Lower utility costs to operate
- Future-proof adaptability and expansibility
- Longer freezer life
- Higher residual resale value

LONG LIFE AND RESALE VALUE

While some conventional spiral freezers end up being sold for scrap value after as short a life as 10 years, Frigoscandia Equipment GYRoCOMPACT spiral freezers at 10 are typically just middle aged — with up to half their processing life ahead of them.

Because GYRoCOMPACT freezers are more reliable, more durable and more future-proof than any other spiral freezer, food processors have a long time frame to review three options: just keep running the GYRoCOMPACT knowing that each year is a payback; expand capacity and/or change applications to take advantage of market demand; or sell the freezer for its high resale value.

Meanwhile, the real costs are the 7/8s of the iceberg that lies beneath, those sometimes-short-term and sometimes-long-term outlays that are implicit and often harder calculate:

- income losses due to product blow-off or jam-ups
- losses due to longer defrost-and-clean times
- losses due to maintenance downtime
- losses due to shorter freezer life cycles and replacement costs
- losses due to the uncalculated cost of future expansion to increase output or adapt to trends, and
- potential losses due to a product recall

Then there's the footprint. In a processing environment, space is money.

Low apparent costs — especially a low initial outlay for a “low-price” freezer — may influence processors focusing on returns over a short time frame. But plotted on a graph, the ROI curve for a freezer with a low purchase price is likely to look favorable for — depending on the application — something on the order of three years. Over the 15-20 year life cycle of a premium GYRoCOMPACT® spiral freezer from FMC FoodTech, though, the ROI will swing decisively in favor of the GYRoCOMPACT spiral freezer.

In particular, the ROI curve for a low-priced freezer can quickly level off or even reverse direction when, for example, a processing line is shut down for a month because a three-year-old freezer needs a major overhaul or a seven-year-old freezer needs to be completely replaced. Or if the processor experiences the nightmare of a hygiene shortcoming that results in a food recall. For that matter, where does a ROI curve express the cost of a freezer that isn't expandable to meet demand for higher output in the future?

Only a full accounting of the entire iceberg — both apparent and real costs that consider all production metrics over the full life cycle of a freezer and also factor in the residual resale value of a freezer — results in an accurate calculation of true costs. Only when true costs are plotted against output — or even potential output — can the true value of a freezer be determined. [continues on page 9]

Frigoscandia Equipment GYRoCOMPACT spiral freezers



Generation after generation of refinement

After over 3000 installations worldwide, GYRoCOMPACT® spiral freezers from FMC FoodTech are simply the best selling in the history of the industry. They are also continually refined at an unmatched frequency and scope, with FMC FoodTech engineers and food scientists — empowered by FMC FoodTech R&D investments — constantly working to make the best even better.

Constantly
working to make
the best better.

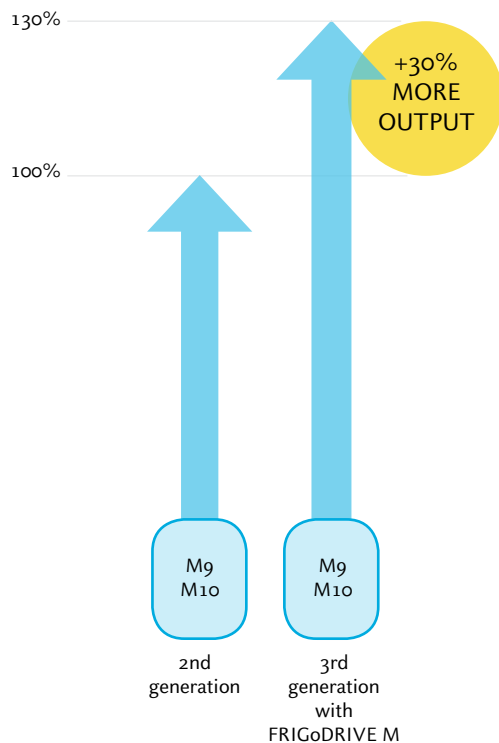
Incorporating 217 refinements — from systemic to minuscule but ingenious — second-generation GYRoCOMPACT M Series freezers offered enhancements and benefits across four areas critical to processors: performance, reliability, hygiene and safety. And third-generation M9 and M10 freezers featuring the new FRIGoDRIVE® M drive system offer 30% more capacity in the same footprint as second-generation M Series freezers.

Performance

More tiers, 30% more product,
faster speeds

To boost capacity, the new, third-generation M9 and M10 GYRoCOMPACT® spiral freezers feature the revolutionary FRIGoDRIVE® M drive system to power the FRIGoBELT® stack. Frigoscandia Equipment engineers outdid themselves by improving the drive system that was already recognized as best-in-industry by cutting friction and reducing required drive forces by an astonishing 50%. Now, the stack can handle 30% more load — more tiers and more product in the same footprint as a second-generation GYRoCOMPACT M Series freezer — and be run 33% faster to meet the demands of tomorrow's higher-speed processing lines.

FRIGoDRIVE M INCREASES OUTPUT IN THE SAME FOOTPRINT



Reliability

Less frost,
less stopping

To increase uptime, fans on Frigoscandia Equipment M Series spiral freezers have been relocated on the dry side of the evaporator, optimizing air velocity through the evaporator, increasing freezing capacity, reducing frost buildup and maximizing heat transfer. Expanded evaporator combinations and variable fan capacities precisely optimize and expand capacity for a given footprint and line width. Also, a simplified integrated belt takeup minimizes tension to extend belt life.

Hygiene

From visually clean to
microbially clean

To provide optimal hygiene, M Series freezers offer more than a dozen enhancements, ranging from trap-free, easy-access seal-welded infeeds and outfeeds; seal-welded, stainless steel floor design; open profiles; and an open freezer design with self-closing hatches. Optional Clean-In-Place systems shorten cleaning and sanitation time, reduce labor costs, eliminate human variables, save water and energy costs, and decrease maintenance requirements.

Safety

Building toward traceability

Responding to marketplace concerns, FMC FoodTech continues to contribute to industry efforts to promote responsible self-regulation, and also consults on document preparation for future legislation for “farm to fork” traceability of the entire supply chain. Enhancing design by keeping hygiene, fast-and-easy cleaning, and sanitation in mind, as well as process control automation and record keeping, the GYRoCOMPACT M Series freezers establish new safety benchmarks.

THERMODYNAMICS: THE SCIENCE OF FREEZING FOOD

Mobile lab freezers
analyze how food freezes

Only in a lab environment,
can the true optimal
freezing process —
with all its variables — be
comprehensively tested.

What really matters to a pizza processor is not the freezer, but a specific end-product — frozen pizzas. A food processor simply wants as much of the most consistent, highest-quality product as possible in the shortest runtime that still ensures a safe product.

But freezing a specific product calls for product-specific thermodynamics. The heat load of a fully-cooked poultry product with a high entry temperature obviously presents a different heat-exchange problem than a proofed bakery product with a low entry temperature. The poultry product, for example, necessitates high-capacity evaporators and relatively high air-flow velocities. The low-heat-load bakery product, on the other hand, acts as an isolator and requires low evaporator capacity, lower air-flow velocities and longer dwell times.

Different freezer operating parameters are called for, but what is the *optimal* heat-exchange process for each specific product? That fundamental question in all its complexity is why Frigoscandia Equipment approaches the science of freezing food with what just might be the most important freezers the company has ever built — mobile lab freezers. First fabricated in the 1960s, these portable laboratories perfectly replicate the freezing process available throughout the range of Frigoscandia Equipment freezers, including the third-generation GYRoCOMPACT® freezer.

Only in a lab environment, can the true optimal freezing process — with all its variables — be comprehensively tested. Only armed with data from a mobile lab freezer can every what-if question be exhaustively explored. What is the food thickness? Product spacing? Link height? Number of tiers? Optimal temperature? Belt speed? Air velocity? Dwell time? Evaporator size? Fan size? Run time before defrost? Complementary optimization of all variables is critical. Even a single decision — for example, selecting the optimal evaporator from the 36 sizes offered for the GYRoCOMPACT spiral

What sets FMC FoodTech apart and makes them such a “formidable force” is the company’s pioneering spirit and commitment to product engineering and design excellence.*

*All comments from 2007 customer survey by third party research firm for FMC Foodtech.

freezers — impacts the volume and the quality of output for the life of production and the number of run cycles before defrosting. And it does so for the life of the freezer.

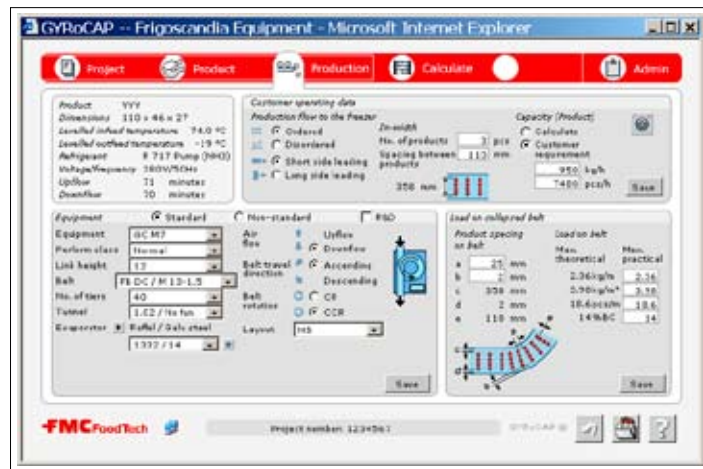
To test each and every specific food application, FMC FoodTech food scientists travel to the processing facility with a mobile lab freezer featuring a refrigeration pack, tiers of self-stacking belts and an air flow that perfectly replicates the freezing process in a GYRoCOMPACT® freezer. Load the lab freezer with, say, a poultry product or a bakery product, and FMC FoodTech technicians will run a battery of tests. Thermocouples precisely measure a wide range of data — including heat load and moisture loss — to make a record of how the freezing process affects these particular products.

When necessary, food processors can also ship product to the FMC FoodTech Food Processing and Technology Center in Sweden for testing that precisely matches all variables on the processor's line.

GYRoCAP: the perfectly dimensioned freezer

Data from the tests — product weight, size, enthalpy and freezing time in the lab freezer — is compiled in GYRoCAP, a proprietary database of more than 15,000 such lab freezer tests. This database compares a processor's specific application with more than 15,000 such tests covering virtually every food application over the last 50 years. The data is used by FMC FoodTech applications and sales support specialists to dimension the GYRoCOMPACT freezer. Optimal freezer module selection — freezer size, belt width, number of tiers and evaporator capacity — is pinpointed. All guesswork is eliminated.

Working with proprietary GYRoCAP software, FMC FoodTech applications and sales support specialists dimension the GYRoCOMPACT freezer, then specify operating parameters for the highest output at the lowest cost, including loading pattern, line speed, dwell time and energy consumption.

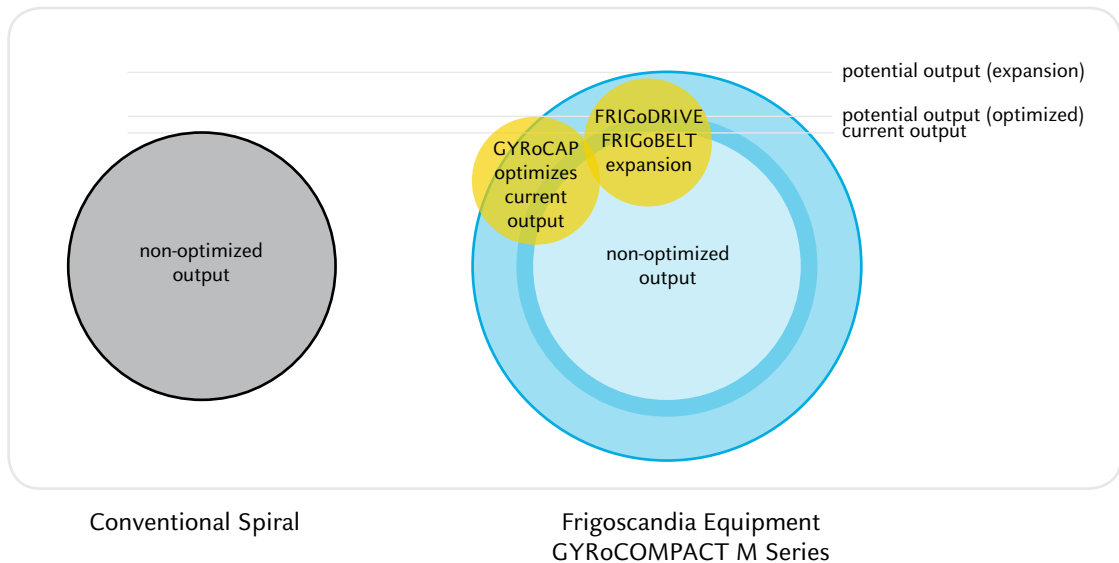


The perfectly optimized freezer

Given the full complement of variables — there are literally millions of possible freezer configurations and operating parameters to freeze any food product — only one optimization is precisely right for any particular product.

Working from GYRoCAP data, FMC FoodTech applications specialists also specify operating parameters — loading pattern, line speed, air velocity, processing temperature, dwell time, energy consumption, even altitude — for the highest output at the lowest cost for each specific application. If in the future, the processor's food application changes, FMC FoodTech food scientists return to the GYRoCAP software for a new analysis of freezer architecture and operating parameters — and a new output capacity calculation.

TWO WAYS TO INCREASE OUTPUT



The most critical factor (for low-cost freezing)

If the result of FMC FoodTech food science is a precisely optimized freezer that produces more output over the life of production; if costs are reduced because the GYRoCAP determined dwell time is no longer than necessary; if a precise air velocity over the face of the evaporator reduces frost and allows for more run cycles before defrosting; then a GYRoCOMPACT® freezer will be delivering maximum output at the lowest cost-of-freezing for the life of the freezer.

What is the real value of a freezer that precisely hits output projections from day one, maintains industry-best uptime, and runs for 15-20 years?

The cost of guesswork

Experience has shown that there are just too many operating inefficiencies, hidden costs, added service burdens and frustrations when you do not source the best equipment. This is especially true when that equipment is to be used in a high volume, continuous production line operation, which is where all our twelve GYRoCOMPACT spiral freezers are now operating.*

*All comments from 2007 customer survey by third party research firm for FMC Foodtech.

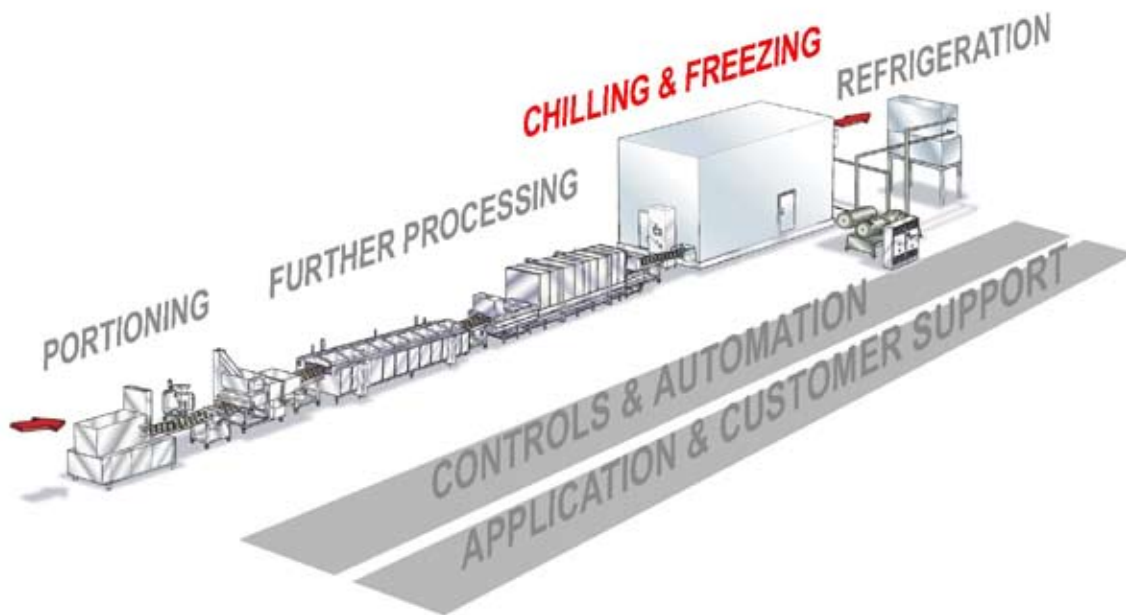
Other freezer manufacturers also recommend freezer operating parameters. But they do so based on substantially less food science. Rather than scientifically analyzing a processor's specific food product, these manufacturers generally rely on "standard settings" that are unlikely to precisely optimize the freezer or the freezing process. Some have even been known to ask prospective customers to share data produced by Frigoscandia Equipment GYRoCAP analysis software! But because every product is different, using standard settings borders on guesswork. Additionally, other manufacturers' attempts at optimization are restricted by a more limited scope of offered freezer and component configurations.

Given the guesswork, it is left to the processor to fine tune the freezing process by trial-and-error. What if the number of tiers — much less any of the other variables — just isn't optimal? What if dwell times have been extended "just to be safe"? Will output be less than projection or of lesser quality than optimal on every production run for the life of the freezer? What, then, is the implicit, uncalculated cost of anything less than precise optimization?

While the projected output using standard settings may seem within normal ranges, there is, again, the difference between current output and potential output. A freezer producing any output less than the output of a perfectly optimized GYRoCOMPACT® freezer is constantly costing the difference.

FMC FOODTECH IS IN THE FOOD SCIENCE BUSINESS

Why don't all other freezer manufacturers employ a portable lab freezer? Because no other freezer manufacturer was founded by a chemist who worked for a major food processor. Tore Lauritzson initiated the legendary Frigoscandia Equipment focus on food in 1960 by establishing what is now the FMC FoodTech Food Processing and Technology Center, staffed by food scientists collaborating with professional colleagues and universities. While FMC FoodTech engineering is legendary, it could be said that FMC FoodTech is in the food science business, and just happens to also manufacture the most technologically sophisticated freezers in the world.



THE OPTIMIZED LINE

In addition to GYRoCAP analysis of the freezing process, the LINK® Control System extends food science intelligence upstream to the entire processing line to ensure that the optimized GYRoCOMPACT® spiral freezer perfectly complements the processing workflow.

The scalable LINK system records all process parameters automatically or manually generated during production — freezer temperature, conveyer speed, holding or dwell time — throughout the line. LINK Process Analysis continuously reacts to product and process conditions and controls the line to ensure a smooth production flow that optimizes product consistency and maximizes output. Additionally, LINK analysis stores all data and prepares relational reporting, allowing processors to mine the data to improve processing. LINK Consulting food scientists can also evaluate line process on-site or remotely from Frigoscandia Equipment.

For example, to improve product appearance and reduce drip loss to increase yield, some food products may be base-frozen in a SuperCONTACT® crust freezer from Frigoscandia Equipment, with final freezing in a GYRoCOMPACT spiral freezer. Freezing broccoli may be a three-step process: a pre-freeze in a Frigoscandia Equipment FLoFREEZE®, then a water glaze, and finishing in a GYRoCOMPACT freezer. A shrimp line may be frozen in a GYRoCOMPACT, then glazed and finished in a GLAZoFREEZE after-freezer. Or a fish finger line may include other FMC FoodTech processing equipment upstream — a Stein batter breader and par fryer, for instance — coupled with GYRoCOMPACT freezing. Whatever the line, proprietary FMC FoodTech analysis and control systems can extend optimization to an entire processing line.

THE COOLEST THING EVER

How the FRIGoBELT changed the calculus of freezing

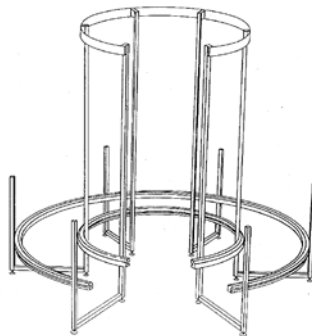
The patented, self-stacking FRIGoBELT® Conveyor completely differentiates GYRoCOMPACT® freezers from all traditional spiral freezers in the marketplace. When the FRIGoBELT was introduced in 1979, the idea transformed Frigoscandia Equipment spiral freezing, altering freezer design, the freezing process itself and the economics of low-cost freezing. The new FRIGoBELT also revolutionized the freezing industry. The first GYRoCOMPACT freezers demonstrating the new FRIGoBELT at trade shows were sold right off the exhibition floor!

After 25 years of continual refinement, the Frigoscandia Equipment GYRoCOMPACT M9 and M10 offer what no traditional spiral freezer can: the highest spiral freezer output potential, balanced air flow, belt-width and link-height flexibility, exceptional and fast cleanability, extremely low utility operating costs — and future-proof flexibility and expandability.

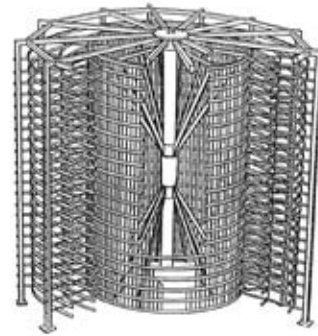
A self-stacking belt vs. a supported belt

Most fundamentally, because the FRIGoBELT Conveyor self-stacks, the cumbersome and hard-to-clean support structure of a conventional spiral is simply unnecessary. And because the interlocking belt creates a self-contained, self-ducting product zone, GYRoCOMPACT freezing does not require the higher air flow velocities of traditional spiral freezers. The result is exceptionally even freezing, potentially higher moisture retention (yield) and gentle food handling of value-added food products.

The patented, self-stacking FRIGoBELT virtually eliminates the scaffolding-like encasing of a conventional spiral system.

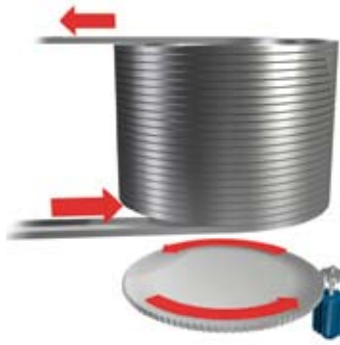


GYRoCOMPACT M Series



Conventional Spiral

The FRIGoBELT interlocks to form a solid column stack in the shape of a coffee cup. The saucer-like FRIGoDRIVE rotates the stack — the FRIGoBELT doesn't have to be pulled or stretched.



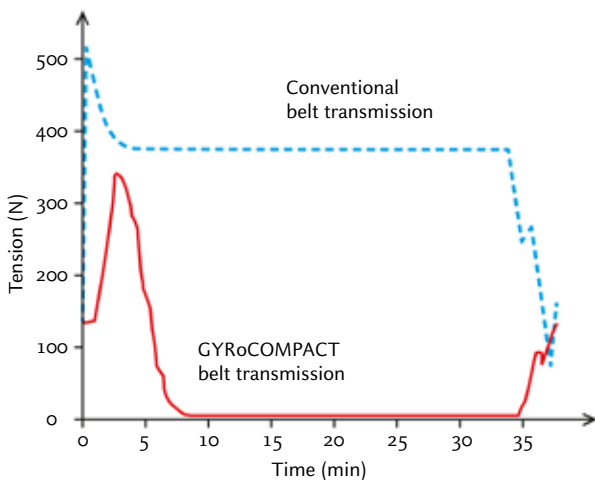
FRIGoBELT/FRIGoDRIVE



Conventional Spiral

But the capstan drive systems in traditional spiral freezers operate under very high weight loads and are directly engaged with a belt experiencing constantly varying friction drags. When belt friction increases, the belt can become overstretched and “Christmas tree” — or tilt. Overstretching a belt causes wear, and potentially costly failure and replacement.

TENSION-FREE PROCESSING



The FRIGoBELT and FRIGoDRIVE combination is nearly frictionless and virtually vibration free. Maintenance and lubrication requirements are minimized.

Traditional spiral freezers suffer repeated production shortfalls and maintenance downtime costs primarily due to two issues: belt tension and drive stress. Because the belt in a traditional freezer requires the support of literally kilometers of rails and plastic glides, friction is a primary factor. Plus, friction coefficients change constantly due to the food pickup — sugar, flour or grease can be extremely sticky, and even more challenging over a temperature spectrum. When belt friction increases, the belt can become overstretched and “Christmas tree” — or tilt. Overstretching a belt causes wear, and potentially costly failure and replacement. But the FRIGoBELT® Conveyor doesn't have to be pulled or stretched.

Similarly, while the capstan or center drum drive systems in traditional spiral freezers operate under very high weight loads and are directly engaged with a belt experiencing constantly varying friction drags, the FRIGoBELT interlocks to form a solid, nearly friction-free column stack that rotates virtually without drag or vibration. The FRIGoDRIVE® drive system — with the lowest friction coefficient in the business — can be smaller and more efficient than drives in traditional spiral freezers. Durability increases substantially. Maintenance and lubrication requirements are minimized.

Additionally, because the FRIGoBELT stack is nearly tensionless and frictionless, it doesn't need to be periodically turned over to guard against fatigue, an involved and expensive maintenance procedure for traditional spiral freezers that also clocks significant downtime.

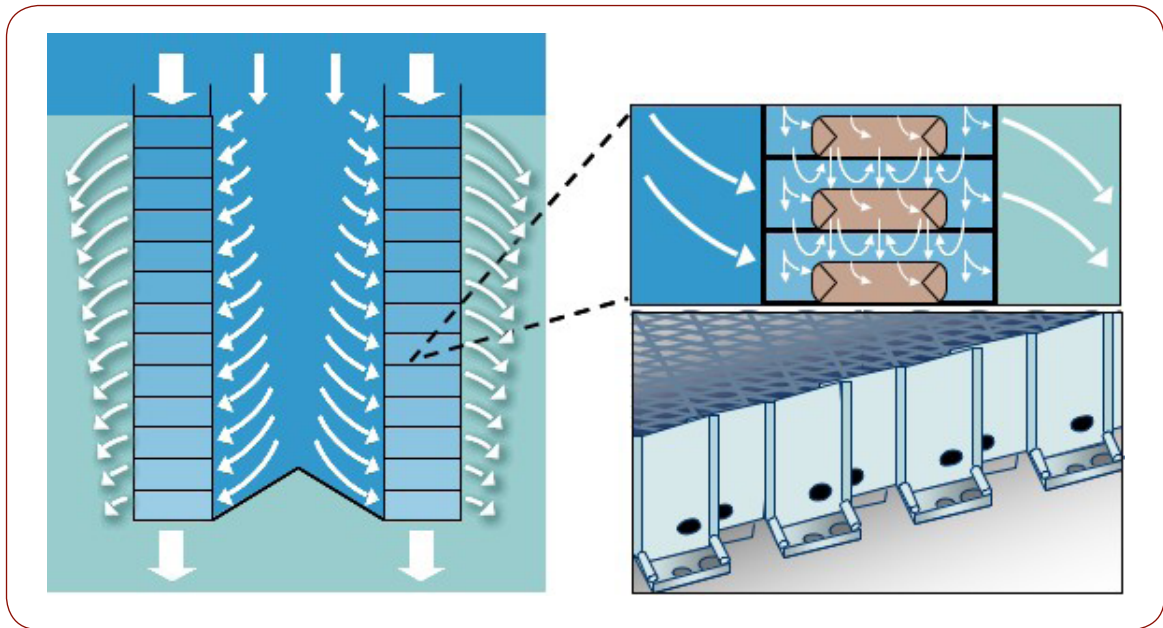
FMC FoodTech is the only spiral freezer manufacturer that can offer a belt life guarantee of up to 10 years or 50,000 prorated hours.

THE BALANCED AIR FLOW ADVANTAGE

Freezing with an even, turbulent-efficient airflow ...

Because the patented interlocking FRIGoBELT® Conveyor creates a self-contained, self-ducting product zone, food products freeze in a controlled airflow. As cold air is forced down through both the FRIGoBELT stack and through the core of the spiral, air flows evenly downward through the belt mesh. The air is also naturally drawn through the inner side links, through the product zone and out through the outer side links. While the GYRoCOMPACT® freezer can employ an even, lower-velocity airflow generated by energy-efficient plug fans, it is nonetheless creating a very high rate of turbulence around the product — a high heat-transfer coefficient that can shorten freezing times.

The even, turbulent-efficient airflow throughout the entire spiral and each product zone also allows for exceptionally consistent, low-dehydration (high-yield) freezing that maintains superior food quality and preserves weight. Plus, even air balance is a key to reduced frost build up for increased run-time between defrostings.



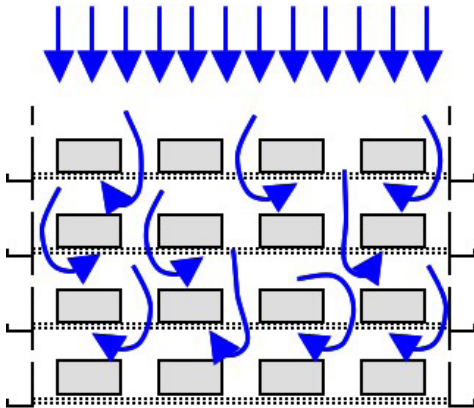
As cold air is forced down through both the FRIGoBELT stack and through the core of the spiral, air flows evenly downward through the belt mesh. The air is also naturally drawn through the inner side links, through the product zone and out through the outer side links.

Air from the side vents collides with the descending air to create a very high rate of turbulence around the product for a high surface-heat-transfer coefficient — and potentially shorter freezing times.

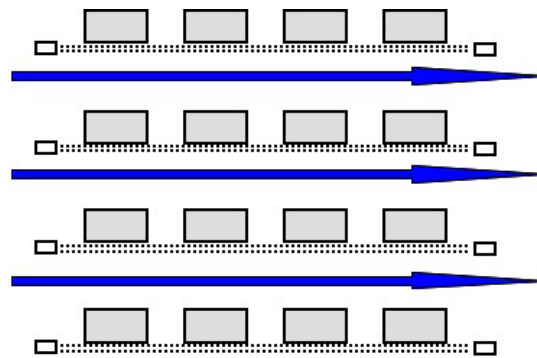
... vs. freezing in a wind tunnel?

Because traditional spiral freezer belts don't interlock and don't stack, freezing is done out in the open — there is no contained freezing zone. Given this architecture, there is only one available path for airflow — horizontal. Very high velocity air is blown across the belts from the side, but because of the open freezing environment, there is substantially less turbulence around the product: the low surface-heat-transfer coefficient can translate into longer freezing times. To compensate, air velocities are increased. In fact, to reach the same heat-transfer coefficient, a traditional spiral freezer generally employs many light-duty propeller fans to generate airflow velocities about 2.25 times faster than in a Frigoscandia Equipment GYRoCOMPACT® freezer — a wind-tunnel-like freezing environment that can literally redistribute product and create jam-ups or blow toppings off pizzas, while also driving up the utility bill.

TURBULENT-EFFICIENT VERTICAL AIRFLOW vs. HORIZONTAL AIRFLOW



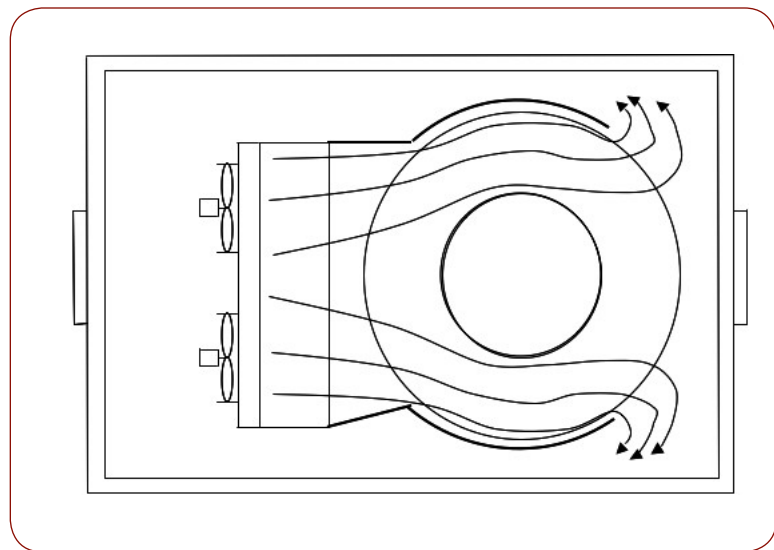
The self-contained product zone of the self-stacking FRIGoBELT® Conveyor allows for freezing with an even, turbulent-efficient vertical airflow for exceptionally consistent, low-dehydration (high-yield) freezing that maintains superior food quality and preserves weight.



To match the same heat-transfer coefficient, a traditional spiral freezer with a horizontal airflow uses propeller fans to generate airflow velocities about 2.25 times faster than a GYRoCOMPACT freezer — an inefficient “wind tunnel” that essentially blows cold air right past the product.

The horizontal airflow also means that food products are alternately rotated into very cold temperatures, then rotated downwind away from the air source and into the “wind shadow” of other products. Further, the high-velocity airflow is prevented from streaming out the sides of the open stack by baffles that add an unintended consequence: intensified air velocities along the baffle walls along the outside of the stack. Food products positioned on the outside of the belt are buffeted by cold winds that products located on the inside of the belt never experience. As the food products spiral upward both the warmest and the coldest product face the coldest air.

In a traditional spiral freezer, baffle walls are built around the stack to “enclose” the product zone. But accelerated airflow along the baffle walls buffet food products positioned on the outside of the belt. Products located on the inside of the belt are not exposed to the same air velocities.



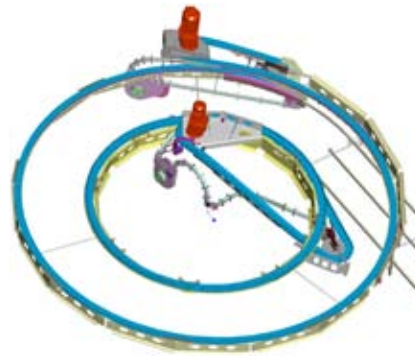
The net result of such uneven airflow is inconsistent, lower-yield, higher-dehydration freezing that can reduce food quality and weight. Dwell times are potentially longer and, in fact, are often increased to ensure that all products are completely frozen. Lastly, both unbalanced airflow and more food dehydration promote frost buildup and shorten the number of run cycles before defrosting.

All one has to do is buy a competitive spiral freezer just once, and you will find, as we have, that you will argue far less when you purchase your second freezer from FMC.*

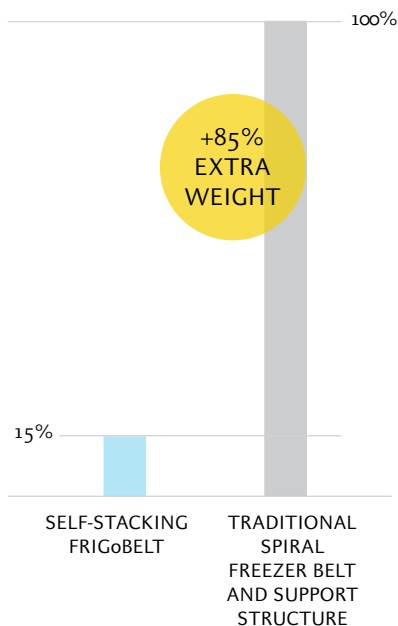
*All comments from 2007 customer survey by third party research firm for FMC Foodtech.

THE REVOLUTIONARY NEW, ULTRA-LOW-FRICTION FRIGoDRIVE M

Third-generation FRIGoDRIVE M refines industry-best drive system



WHICH STACK WEIGHT IS EASIER TO DRIVE?



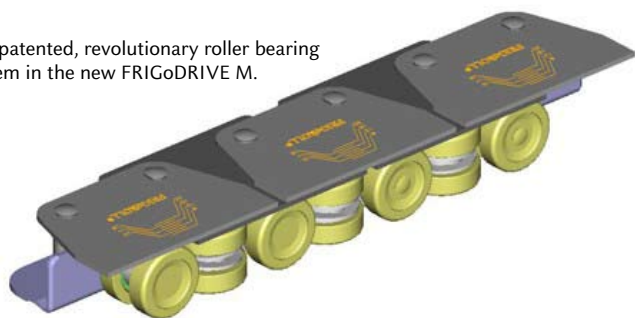
Visualize a coffee cup and a saucer.

If the solid column stack of the interlocking FRIGoBELT® forms something of a coffee cup, then how much drive power — how heavy of a saucer — is required to rotate the cup? Two factors come into play. First, stack load: the unique FRIGoBELT stack weighs only 15% as much as the cumbersome belt-and-support-structure stack in a conventional spiral freezer. Perhaps to make the analogy more accurate, the FRIGoBELT column stack should be thought of not so much as a coffee cup, but as a paper cup. Regardless, the lighter the weight, the less load drive force required.

The second factor: friction. Set the no-tension FRIGoBELT stack on centrally lubricated ball bearings — as it has been for years — and the best-in-the-industry, second-generation FRIGoDRIVE® system required a very low rotational drive force, just a fraction of the force required by traditional spiral freezers.

A new roller-bearing system reduces drive force 50%, carries 30% more stack load

The patented, revolutionary roller bearing system in the new FRIGoDRIVE M.

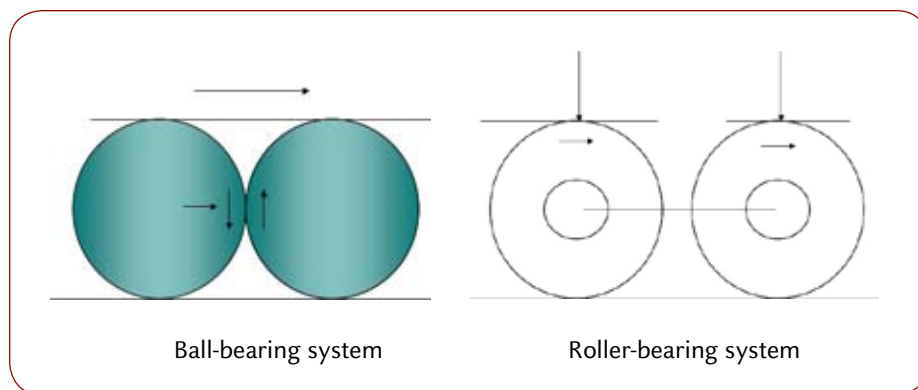


But the industry-best drive system wasn't enough for FMC FoodTech engineers. They continued to push for drive system innovations that would substantially reduce the needed drive force while boosting stack load. The revolutionary new, ultra-low-friction, third-generation FRIGoDRIVE® M delivers just that.

The FRIGoDRIVE M rethinks the second-generation FRIGoDRIVE system's already-low-friction, ball-bearing system with a roller-bearing system: alternating vertically-oriented steel rollers handle the stack load, while horizontally-oriented plastic rollers address the radial forces generated by the drive motor. This multi-axis, true roller-bearing system represents a change from a combination of rolling-and-sliding friction to rolling-friction only — the internal friction between ball bearings is completely eliminated and the system requires 50% less lubrication than second-generation FRIGoDRIVE systems. FMC FoodTech engineers also redesigned the belt takeup on the low-tension stack to substantially reduce winding tension on the return rail.

These advances in the third-generation FRIGoDRIVE M form the foundation of the performance gains in the new third-generation Frigoscandia Equipment GYRoCOMPACT® M9 and M10 spiral freezers over second generation models — an astonishing 50% reduction of required drive forces, creating a superior system that can handle 30% more stack load (more tiers and more product) without larger drive forces.

MULTI-AXIS ROLLERS CUT DRIVE FRICTION 50%



The multi-axis, true roller-bearing system represents a change from a combination of rolling-and-sliding friction to rolling-friction only — the internal friction between ball bearings is completely eliminated and the drive system requires 50% less lubrication than second-generation FRIGoDRIVE systems.

Compounding the benefits: faster belt speeds

The ultra-low-friction, third-generation FRIGoDRIVE® M system virtually glides — with no vibration. Such a system can be run *faster*. The refined system can not only handle 30% more stack load — more tiers and more product — *but can also* be run faster than a second-generation GYRoCOMPACT® freezer.

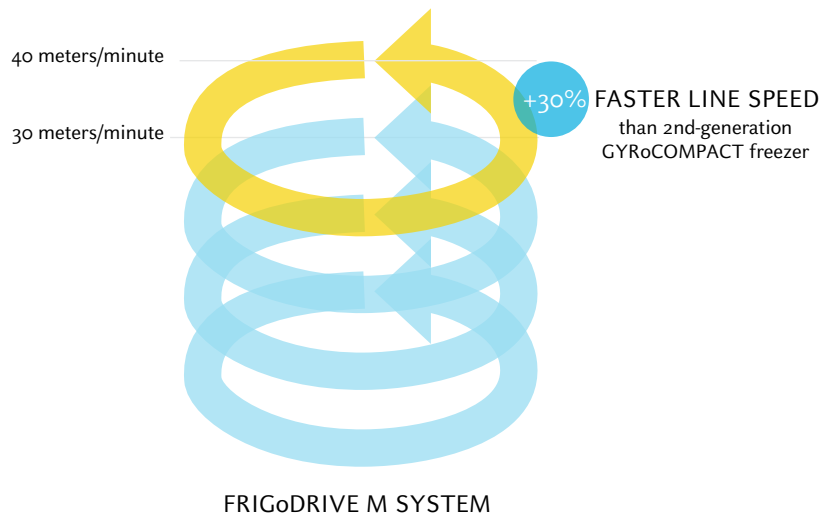
Maximum belt speed has been increased 33% — to 40 meters/minute (131 feet/minute) from 30 m/min (98 ft/min). The enhanced speed potential even benefits processing lines that don't increase speeds: at a current line speed of 30 m/min, the FRIGoDRIVE M is now performing at just 75% capacity, so drive system reliability, uptime and projected operating life are all enhanced.

But the greatest payback may well be in the future: if the line in front of the Frigoscandia Equipment freezer is optimized to run faster or output more or if the application changes, the GYRoCOMPACT freezer will be able to keep pace. The same freezer with the same drive system is flexible enough to run faster, carry more tiers, or both. Plus, the FRIGoDRIVE M system would have the power to pull a wider belt in the future.

OPTIMIZING AN UPGRADE?

The FRIGoBELT® Conveyor combined with the new third-generation FRIGoDRIVE M makes it very easy to add tiers to augment capacity. When a processor considers increasing capacity, FMC FoodTech food scientists return to the GYRoCAP database to analyze a host of dimensioning criteria, including evaporator capacity, drive power and the refrigeration plant. A module expansion bundle is engineered to support the upgrade.

INCREASING OUTPUT THROUGH FASTER LINE SPEED



RUN LONGER, DEFROST AND CLEAN FASTER

The uptime payback

A very high uptime-to-downtime ratio can have a sweeping effect on both output and the cost-of-freezing. Run more cycles without stopping to defrost, and output naturally increases.

When downtime is simultaneously reduced — by shortening defrost-and-clean times, for example — output increases are magnified. Do both consistently run-after-run, year-after-year and output is maximized while the cost-of-freezing is minimized. How to ensure a very high number of run-cycles before stopping to defrost? Reliability + optimization.

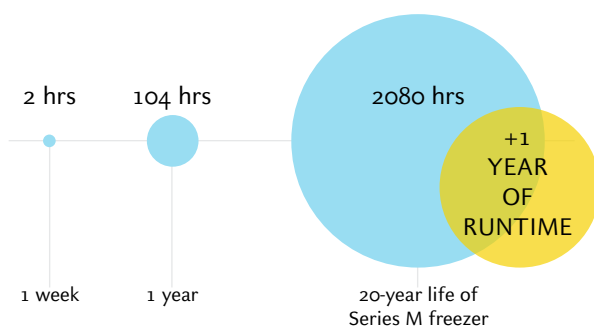
Though naturally contingent on support issues such as application complexity, processing conditions and geographic location, the FRIGoBELT® and FRIGoDRIVE® system is demonstratively the most reliable performer in the spiral freezer sector, with 98-99% uptime potential. Issues that can halt production in traditional spiral freezers — product jam-ups, for example — are virtually unheard of in a GYRoCOMPACT® freezer, and this typically limits GYRoCOMPACT downtime to only 50% of conventional spiral freezer downtime. What is the value of no lost sleep?

Then there's the precision science behind Frigoscandia Equipment proprietary GYRoCAP analysis to optimize every GYRoCOMPACT freezer specifically for the particular food processing application. As described previously, freezer component architecture, product zone temperature, air flow velocity and balance are just some of the variables in play with GYRoCAP, but these variables also all contribute to frost accumulation in the freezer — especially, on the evaporator.

Even a perfectly optimized freezer eventually, though, requires defrosting. And when the downtime clock starts running, a Frigoscandia Equipment GYRoCOMPACT freezer can be defrosted and cleaned significantly more quickly than a traditional spiral freezer.

If, for instance, a multi-shift processor can save 1/2 to one hour per-shift, per-week because of the faster GYRoCOMPACT defrost-and-clean time, then 50-to-100 hours per year of production time are preserved. That's an extra week or two of processing per year when compared to a hard-to-clean traditional spiral freezer. Over the 15- to 20-year lifetime of a GYRoCOMPACT freezer, such savings could total up to 50 weeks of runtime — the equivalent of as much as one year of extra production — a phenomenal payback from the GYRoCOMPACT® spiral freezer.

HOW EASY-CLEANING SAVES RUNTIME



TWO-SHIFT PROCESSOR
saving just one hour per-shift, per-week

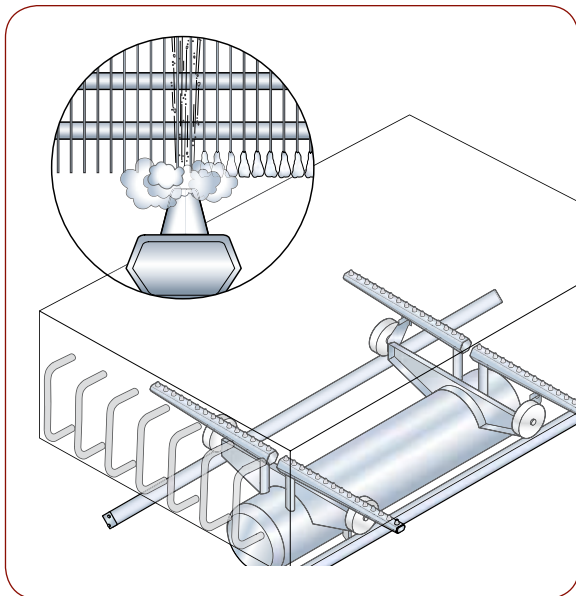
Continuous, in-process defrosting the Frigoscandia Equipment way

To compete with the advantages offered by Frigoscandia Equipment freezer architecture and technology that speed defrost-and-clean times, processors using traditional freezers may have incentive to take cleaning shortcuts to save time. But in today's environment, any potential compromise of food safety is an extremely risky business practice.

Because the freezer component that frosts up first and blocks airflow is the evaporator, retarding frost build up substantially increases uptime. To extend the number of run cycles without stopping, the GYRoCOMPACT line of freezers offers either Frigoscandia M Series Sequential Defrost or the Frigoscandia Equipment-exclusive Air Defrost System (ADF).

M Series Sequential Defrost operates on a parallel-evaporators principle also utilized by other freezer manufacturers: evaporator-and-fan pairings are separately housed so an individual evaporator can be temporarily cycled off-line for in-process defrosting. The M Series execution of this approach prolongs processing up to six times, putting off what might normally be a daily stop for cleaning for as much as a week.

Another approach — the patented Air Defrost System from FMC FoodTech — focuses on keeping a single evaporator frost free in the first place, eliminating the need for redundant evaporators. ADF ingeniously fires perfectly aimed micro-bursts of very-high-pressure air at frost accumulating on the face of the evaporator — the equivalent of shooting accumulating snow off the roof. The technique extends processing run cycles before defrost by two to three times without the cost, relative complexity and maintenance of redundant evaporators.

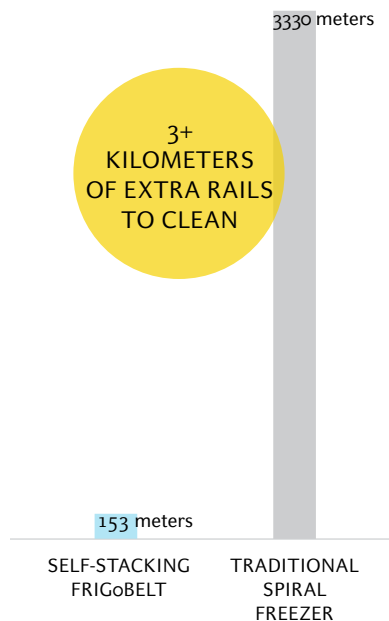


The Air Defrost System from FMC FoodTech fires perfectly aimed micro-bursts of very-high-pressure air at frost accumulating on the face of the evaporator.

The easy-to-clean GYRoCOMPACT freezer vs. traditional spiral freezers

Which is easier to clean: a traditional spiral freezer with 1,300 meters (1,422 yards) of rails and 2,025 meters (2,215 yards) of glide strips or a GYRoCOMPACT® freezer with less than 5% of that total — just 33 meters of rails and 120 meters of glides? That's a combined 3.33 kilometers (2.07 miles) versus a combined 153 meters, not much longer than a football field.

WHY HAVE MORE RAILS AND GLIDES?



The over 3 kilometers of rails and glides — all with a harder-to-access “shadow side” — has to be largely cleaned by hand, an obviously time-consuming process that’s inherently subject to a multitude of human factors. Because something as basic as failing to maintain the proper cleaning product concentration can compromise food safety, processors with traditional spiral freezers find that cleaning issues put a premium on skilled technicians and/or costly and time-consuming training sessions to ensure that cleaning is properly executed.

For that matter, the 153 meters of rails and glides in a Frigoscandia Equipment GYRoCOMPACT freezer are not even located in the product zone. The accessible freezer architecture features a 100% cleanable product zone that contains 96% less stationary support structure and surfaces to thaw and clean than a conventional spiral freezer. It’s simply faster and easier to clean the GYRoCOMPACT freezer — *much* faster and *much* easier.

You will certainly pay a premium for a Frigoscandia Equipment GYRoCOMPACT spiral freezer, but the price disparity is easier to accept when you factor in the downtime, inconsistent performance and operating headaches that are commonplace with most of the competitive lines of spiral freezers. Too often, these can often result in inefficiencies we cannot tolerate.*

*All comments from 2007 customer survey by third party research firm for FMC Foodtech.

HEALTH CONCERNS IN THE GLOBAL MARKETPLACE

There has never been a more expensive time to make an unsafe product.

No processor can afford to take food safety for granted. As bacteria, avian flu and other pathogens threaten the food supply, the price tag on a product recall — lost accounts, legal jeopardy and fines — is soaring. Another costly concern is the potential for significantly reduced shelf life for products that may become unsalable.

But the truly astronomical price of an unsafe food is the potential for the loss of goodwill in the marketplace. Processors that unintentionally produce unsafe foods are subject to media exposure and consumer awareness that can literally “spoil” a brand or shut down a processing facility. There has never been a more expensive time to produce an unsafe product.

In this business environment — and as regulations and traceability requirements also continue to intensify — processors are stepping up efforts to ensure safety. Some have responded by slightly decreasing freezer temperatures, while increasing air velocities and dwell times — just “to be sure.” But with proprietary GYRoCAP analysis of each food application by FMC FoodTech food scientists, processors can be assured of complete, safe freezing without over-freezing that can reduce food quality and unnecessarily waste production time.

Critical Control Points

As important as proper processing is to food safety, hygienic practices are perhaps even more critical — especially exhaustive cleaning. A meticulously cleaned freezer is a safe freezer.

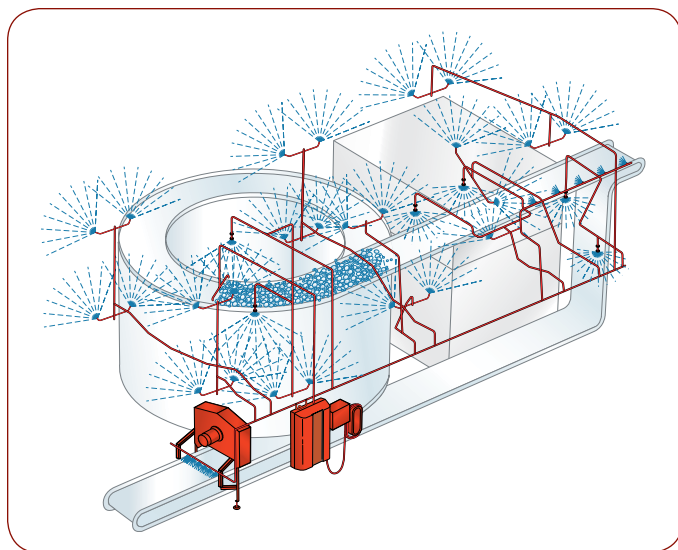
As processors seek to identify and control threats to food safety, risk assessment is now a widely accepted concept. Processors handling lower-risk, packaged foods don't require the same level of freezer cleaning as processors handling mid- or high-risk foods that may contain pathogens. In practice, higher-risk food processors participating in the now globally accepted concept of supply chain responsibility for inspections typically use Hazard Analysis Critical Control Point (HACCP) analysis tools to identify Critical Control Points (CCP) — any point, step or procedure at which control can be applied or a food safety hazard can be prevented, eliminated or reduced to acceptable limits.

That's also to say that critical points in a production line are those that potentially pose safety concerns. These CCPs are naturally subject to more review, inspection and reporting than those points or zones that are established as non-critical.

Ultimately, the hygiene requirements for a freezer are tied to the freezing application. Processors that are freezing foods sealed in packages have lower hygiene requirements, so a closed-loop, recirculating Clean in Place (CIP) system may be sufficient. Freezing open food products requires a higher level of hygiene, so an open-loop, non-recirculating CIP system is best.

Once a risk assessment has been made, the question turns to choosing a cleaning system that ensures highly reliable results while minimizing cleaning time, labor costs and resource — water and energy — usage. The ideal cleaning system would be fast, economical and so effective and verifiable that the freezer would not be designated as a CCP.

Why is a non-circulating cleaning system safer?



The Frigoscandia Equipment Clean in Place system preferred for GYRoCOMPACT freezers is an “open-loop” system that doesn't recirculate cleaning water.

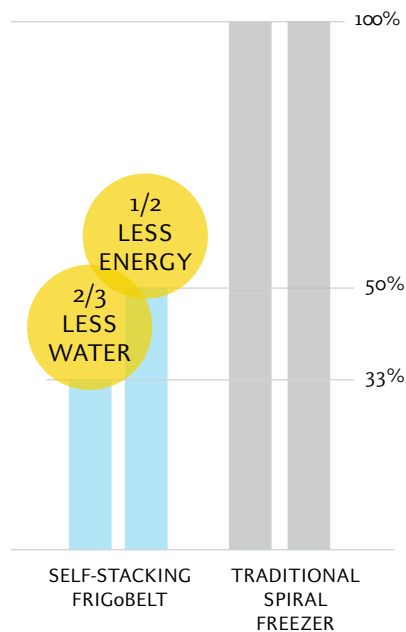
The Frigoscandia Equipment CIP semi-automated cleaning system — that defrosts, washes, sanitizes, rinses and dries — meets these criteria. First, it shortens downtime. It completes a full cleaning cycle more quickly than competitors' cleaning systems, primarily because there is so much less to clean: a rigorous cleaning of the self-stacking FRIGoBELT® cleans nearly the entire product freezing zone. The Frigoscandia Equipment CIP system distributes cleaning foam and water at different rates to maximize coverage and cleaning efficiency. And requires very little water or heat, minimizing the diffusion of aerosols.

Perhaps most importantly, as part of the Hygiene-By-Design™ system, the Frigoscandia Equipment CIP system preferred for GYRoCOMPACT® freezers — particularly those processing open (non-packaged) foods — is an “open-loop” system that doesn't recirculate cleaning water.

What about the “closed loop,” Recirculating Cleaning System (RCS) systems used in many traditional spiral freezers that are “completely sealed”? Are they as safe? Not for processing higher-risk foods. Unfortunately, recirculated water poses an inherent — and potentially dangerous — risk. Despite its name, a “closed loop” system is simply not closed because the freezer itself may be opened at any time — particularly during inspection stops — providing an opportunity for a contaminant to enter the freezer.

New water is safe water

THE WATER AND ENERGY COSTS PAYBACK



Because cleaning the FRIGoBELT® in a GYRoCOMPACT spiral freezer virtually cleans the entire product zone, an automated Clean In Place (CIP) system from Frigoscandia Equipment saves substantial water, energy and chemical costs when compared to either manual cleaning or the Recirculating Cleaning System (RCS) used with traditional freezers. It simply takes less to clean less. Every processing application is different, but a Frigoscandia Equipment CIP system typically uses just 1/3 of the water and 1/2 the energy and chemicals

When a “closed loop” system picks up a contaminant, that problem can spread as it is recirculated through the system. Bacteria can grow in the tanks, pumps and main piping, then be injected into the freezer during the next cleaning cycle. The only way to return the freezer to a hygienic state is to disassemble and clean the tanks, pumps and main piping after each CIP cycle, a labor-intensive and costly process.

By contrast, a non-recirculating cleaning system like that used in a Frigoscandia Equipment GYRoCOMPACT® spiral freezer uses new water for each cleaning cycle, eliminating both the risk of cross-contamination and the cost, complexity and cleaning of “dairy grade” piping, tanks and pumps.

And even though the Frigoscandia Equipment CIP system doesn’t recirculate water by design, because the GYRoCOMPACT freezer has just 5% of the rails and glide strips compared to a traditional spiral freezer, it typically uses just 1/3 of the water and 1/2 the energy and chemicals used by a Recirculating Cleaning System (RCS) employed by traditional spiral freezer manufacturers.

compared to either manual cleaning or automated cleaning of a freezer using a RCS.

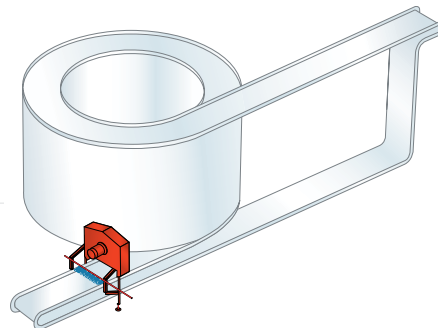
With environmental factors increasingly being priced into the cost for water and waste water treatment, with energy prices going nowhere but up, and given the projected 15-20 year life span of a Frigoscandia Equipment spiral freezer, these potential savings can form a substantial annual payback — an annuity as well as an environmental dividend.

4 CLEANING SYSTEMS FROM FMC FOODTECH

Whether it's a simple belt rinser, a low-pressure foaming Product Zone Cleaner, an aggressive defrost-and-clean Product Zone and Evaporator System, or a comprehensive Cleaning in Place system that defrosts, washes, sanitizes, rinses and dries a GYRoCOMPACT® freezer automatically, there's a Frigoscandia Equipment cleaning system that matches any risk assessment.

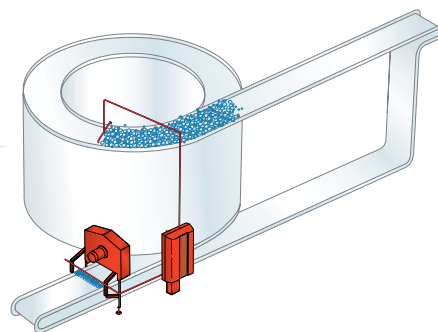
PRODUCT ZONE RINSE (PZR) SYSTEM

- Convenient system for rinsing and drying the FRIGoBELT® Conveyor, suitable for packed product applications and freezers that are manually washed.
- Dryer fan uses air from inside the freezer, preventing airborne debris from contaminating the belt.



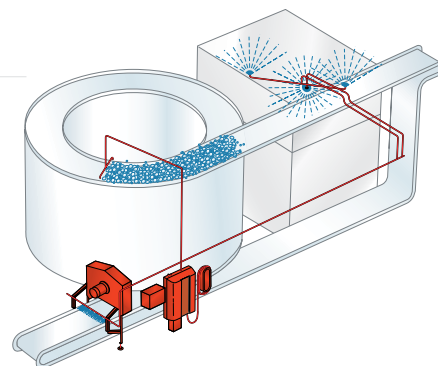
PRODUCT ZONE CLEANER (PZC) SYSTEM

- Automatic low-pressure cleaning system that includes foaming, as well as all the features of the PZR System.
- The PZC System cleans the FRIGoBELT and side links during rinsing cycle.
- Automatically controlled via the freezer control panel.



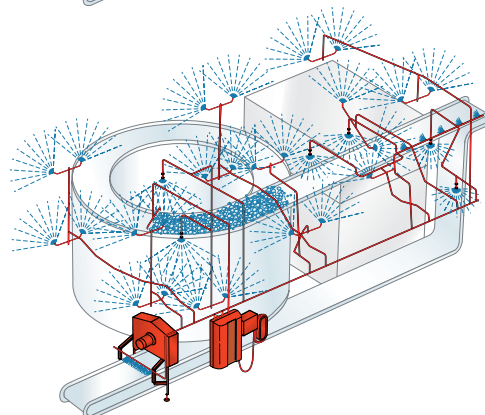
PRODUCT ZONE AND EVAPORATOR (PZE) SYSTEM

- In combination with the PZR and PZC Systems, the PZE is a complete wash system for consistent cleaning results on the two most critical components — the product zone and evaporator.
- Process includes defrosting of the freezer.
- All cleaning components are safely located inside the freezer.
- Automatically controlled via the freezer control panel.
- Includes a manually operated cleaning station outside the freezer.



CLEAN IN PLACE (CIP) SYSTEM

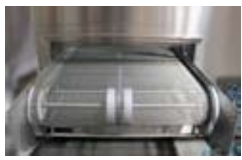
- Complete and open cleaning system that defrosts, rinses, washes, disinfects and dries the freezer.
- Combines automatic and manual wash cycles to provide a better and safer cleaning.
- Unique low-pressure foaming allows detergent and disinfectant to penetrate and thoroughly clean the entire freezer system.
- Consistent cleaning results.
- Lower maintenance cost and less mechanical damage.



3 ENCLOSURE LEVELS FROM FMC FOODTECH

Open plan, fully welded stainless steel GYRoCOMPACT® enclosures are available in three levels of interior finishing to meet rigorous hygiene control requirements. Enclosures range from a fully-welded floor to a fully-welded enclosure, all with easy evaporator access from all sides, including below the evaporator, now cleared of fans and fan motors.

Additionally, the refined in-feed and out-feed of Frigoscandia Equipment GYRoCOMPACT M Series spiral freezers from FMC FoodTech feature pre-fabricated and pre-assembled seal welded stainless steel construction (no field cutting/flashing), fewer surfaces and no support legs for enhanced cleanability and hygiene.



LEVEL ONE: MILD CLEANING

- Caulked, insulated panels.
- Suited to hygiene needs of all applications.
- For regular, systematic cleaning with mild detergents and low-pressure hoses.
- Recommended for processors of packaged, boxed or bakery products.



LEVEL TWO: AGGRESSIVE CLEANING

- Inside and outside seal-welded stainless steel paneling up to height of door frame.
- No caulked joints up to the height of the door frame.
- Fully welded stainless steel doors with heated frame.
- For daily hygiene control using aggressive detergents and high-pressure hoses in enclosure areas below the mezzanine.



LEVEL THREE: AGGRESSIVE, COMPREHENSIVE CLEANING

- Inside and outside fully seal-welded stainless steel paneling from floor to ceiling.
- No caulked joints.
- Fully welded stainless steel doors with heated frame.
- For daily hygiene routines that should include the most comprehensive cleaning and disinfection with aggressive detergents and high-pressure hand-held guns.
- Recommended for processors of protein products.



THE HISTORY OF FROZEN FOODS



As little as 30 years ago, food products were frozen mainly for preservation. Restaurants bought a frozen block of fish, and sawed it into portions for battering and frying. Consumers bought a brick of frozen broccoli. The introduction of the fried chicken dinner was a harbinger of today's ready-meal that epitomizes today's market for frozen quality and convenience.

As the brick of broccoli evolved into individually frozen flowers, the block of fish first became battered fish fingers — and today, a bag of filets or a fish-based ready-meal. The frozen chicken dinner evolved into chicken “nuggets” — and today, a portion-controlled, ethnically themed boneless, skinless chicken breast ready-meal.

It is no exaggeration to declare that frozen food technology has made a significant contribution to the profound socioeconomic and cultural changes that have taken place over the past 50 years.

A SHORT HISTORY OF FROZEN FOODS

from the American Frozen Food Institute

1930s: As refrigeration assumes an indispensable role in food distribution, Clarence Birdseye launches retail sales of frozen foods in the U.S. — meat, fish, oysters and vegetables appear in low-temperature display cases on the Eastern seaboard of the U.S.

1940s: New frozen products are introduced: puff pastries, soups, entrees, French fries, meat pies, seafood and pizza. Foil packing is introduced for frozen foods.

1950s: Post WWII boom in frozen foods. U.S. frozen food sales exceed \$1 billion. The introduction of pre-cooked or prepared frozen foods opens up an entirely new growth field. Swanson introduces the first “TV dinners.” Frozen foods enter the airline market. Fruits and vegetables are a primary frozen product for food service.

1960s: Frozen main courses, entrees and vegetable mixes take off. The microwave oven is introduced. Frozen foods sales continue to soar, especially after astronauts returning

from the moon eat frozen entrees. McDonald's accepts frozen meat patties and fish filets.

1970s: Frozen stir-fry vegetables are introduced. Supermarkets offer re-heated frozen foods at deli counters.

1980s: Frozen ethnic cuisines rise in popularity. Low-calorie frozen entries are introduced. Low-priced frozen entrees introduced. The microwave is ubiquitous. Retail stores run short on freezer space.

1990s: FDA deems frozen fruit and vegetables nutritionally equivalent or superior to fresh counterparts. Popularity of ethnic foods and “healthy portion” meals continues to increase. Ready-meal trend explodes on market and immediately captures consumer affection. Ready-meals expand into traditional home-cooked-meal territory by offering family-sized frozen portions. Consumers demand more convenience. Club stores compete with traditional grocery outlets.

ONE INNOVATION AFTER ANOTHER

FMC FoodTech has played a leading role in the history of frozen food, with FMC FoodTech food science driving constant freezer innovation and refinement. A few highlights, with an emphasis on the GYRoCOMPACT® spiral freezer.

1960s

The first Frigoscandia Equipment lab freezer for in-house food product testing of airblast, fluidization and belt-freezing technologies.

1962

Introduction of the first FLoFREEZE® freezer for vegetables, an innovation based on the fluidization technique, the world's first IQF in-line freezer for products of small dimensions. First installations in the U.S. and Sweden.

1965

GYRoFREEZE No. 1 — installed at Samfod in Sweden — the first spiral freezer with controlled airflow, based on a licensed belt design.

1970s

Introduction of the PELLoFREEZE®, an innovative IQF system for forming and freezing of liquid and semi-liquid products in pellet form.

1979

Introduction of GYRoFREEZE Compact — later GYRoCOMPACT® — with innovative self-stacking FRIGoBELT®.

1982

Introduction of Frigoscandia Equipment Air Defrost System (ADF) — for extended uptime. Innovation utilizing microbursts of compressed air to blow frost from coils in FLoFREEZE and GYRoFREEZE. Later introduced for GYRoCOMPACT.

1983

GYRoCOMPACT M 64 — new, pre-tested, modular design.

1985

GYRoCOMPACT P 42 — fully pre-built one-box freezer introduced. Pre-tested for plug-in, two-day installation.

1986

GYRoCOMPACT M 76 — important extension of the self-stacking series with wider belt.

1986

FRIGoPAK® line of packaged refrigeration systems is introduced.



- 1988
Introduction of ICP — Internal Cleaning Process — for programmed sanitation improving hygiene and reducing defrost-and-clean downtime while minimizing water consumption.
- 1989
Introduction of FRIGoDRIVE®, tension-free second generation drive system available on new GYRoCOMPACT® M 92 GYRoCOMPACT.
- 1989
Introduction of the “Hygiene-By-Design™” concept launched as the argument of the ‘90s.
- 1991
GYRoCOMPACT M106 introduced, along with wide FRIGoBELT® — and increased stack weight.
- 1992
GYRoCOMPACT introduced as both sequential defrost, descending spiral and as twin stack spiral.
- 1992
GC Cleaning System — options for enhanced GYRoCOMPACT hygiene: belt rinse, product zone cleaning and CIP — Clean in Place.
- 1992
Three, taller FRIGoBELT link-heights now available to match product dimensions.
- 1992
Special emphasis on optimization of GYRoCOMPACT temperature, process control and hygiene.
- 1993
Flat Product Freezer (FPF) introduced. Innovative development of impingement technology, first hamburger freezers installed for QSR processor in the U.S.
- 1994
GYRoCOMPACT M58 introduced.
- 1995
Second-generation, one-box freezer GYRoCOMPACT 42 introduced.
- 1996
GYRoCOMPACT 400 Classic introduced. One-size freezer with limited options but with key features of self-stacking concept.
- 1997
Introduction of first version of GYRoCOMPACT 106 TC. New, tight-curve FRIGoBELT conveyor with 1060 mm width that fits in the same freezer box — and turns in a smaller radius — as standard 760 mm belt.
- 1999
Introduction of GYRoCOMPACT 600 Classic.
- 2001
GYRoCOMPACT M7 introduced, the first M Series freezer.
- 2002
Second-generation GYRoCOMPACT M9 and M10 M Series freezers debut featuring over 217 refinements.
- 2003
GYRoCOMPACT M6 M Series freezer introduced.
- 2006
GYRoCOMPACT M10 TC M Series freezer with third-generation FRIGoDRIVE M drive system.
- 2007
GYRoCOMPACT M10 Twin Stack Spiral based on FRIGoDRIVE M drive system for mega-line capacities of proofed laminated dough and high freezing capacities.
- 2008
Third-generation GYRoCOMPACT M9 and M10 spiral freezers include the new FRIGoDRIVE M Drive System with higher stack weight capacity for output increases up to 30%. M10 freezer features 1,060 mm (40-inch) belt width. M9 spiral freezer offers 920 mm (36.22-inch) belt width.

When you consider the amount of money FMC FoodTech spends to fund their research programs, maintain a strong local market presence, and continue to retain the services of those freezer experts and problem solvers, the initial price spread becomes more justified.*

*All comments from 2007 customer survey by third party research firm for FMC Foodtech.

TRENDS IN FROZEN FOOD

A chicken dinner in every freezer

A 2006 study found that almost half of the food served at home was either frozen ready-meals or ready-to-eat fare prepared outside the home.

Though social, cultural and economic shifts continue to de-emphasize the in-home family dinner, three-quarters of Americans are still eating meals at home each night. Still, the number of meals *prepared* at home continues to decline. In fact, a recent survey by the Institute of Food Technologists shows that fewer than a third of American households are still making meals from scratch. Instead, consumers are looking for “during the week convenience,” and the percentage of portable, eat-on-the-run breakfasts, lunches and dinners continues to rapidly rise.

Moreover, a 2006 study found that almost half of the food served at home was either frozen ready-meals — including pizzas — or ready-to-eat fare prepared outside the home. In essence, the old American “chicken in every pot” measure of prosperity is now, more accurately, a “chicken dinner in every freezer.”

Another way of looking at the trend: wherever the meal is consumed, the *kitchen* for everyday meals is continuing to move out of the home and up the food chain. Consumers now increasingly purchase meal components or complete heat-and-eat meals — chiefly, pizzas, chicken “nuggets” and “tenders” or beef patties, plus prepared “sides” — rather than ingredients to cook a recipe. For more and more consumers, assembling ready-to-eat components or reheating frozen ready-meals is the new “cooking.” Even so, this group increasingly demands meal preparation times of no longer than 20 minutes.

Meanwhile, in another sector, grocery and club stores and other providers are rapidly adding or expanding in-store or local kitchens to meet demand. But as these new kitchens seek higher capacities and economic efficiencies, commercial cooking, too, is also moving increasingly further upstream to fully-cooked or par-baked, value-added products prepared — then frozen — by large-scale industrial food processors.

Industrial food processors, to complete the circle, are under pressure from grocery stores and quick-serve restaurants channeling consumer demand for more meal choices and new tastes, higher quality and healthier fare, all in greater quantity, delivered just-in-time, at everyday low prices. Adding to the pressure are tightening safety regulations and traceability requirements that leave absolutely no room for compromise.

Processors that can increase output capacity while maintaining consistency, efficiency, safety and economy — plus, remain flexible to adapt to the constantly moving target of trends and demands — are in the most advantageous position to maintain current profitability and capture highly competitive future business.

Regional influences

While poultry products and beef patties continue to dominate the world marketplace, the global market for frozen fish and seafood continues to grow. Whether whole sides, filets or cut pieces, Norwegian and Chilean frozen salmon and tilapia has literally become the chicken of the sea in many markets. Everywhere, more convenience and more ready-meals are the trend. Some national, regional and cultural trends naturally persist. Others, frequently cross oceans, borders and cultures.

In North America — choices, convenience multiply

Demand for frozen foods continues to grow unabated. At quick-serve chains: more and more varieties of chicken offerings, especially with new flavorings. Coming soon: marinated chicken wings. In the grocery and club stores: aisle-after-aisle of ready-made chicken entrées, often with an ethnic theme. Plus, the ultimate in convenience: par-baked frozen pizzas evolving along two branches: robust pizzas that target offerings by major pizza delivery chains, and lighter, thin-crust “gourmet” pizzas that appeal to health-conscious “foodies.” Mexico primarily exports frozen vegetables to the United States and has recently started to produce frozen poultry products. Coming soon: more added-value freezing.

In Europe — ethnic foods, plus buns, rolls and laminated doughs

Two major frozen food trends in Europe: ethnic ready meals and crusty breads. Consumers are snapping up more frozen world cuisines, especially Indian and Pacific Rim offerings like Vietnamese TV dinners and frozen sushi. And now battling with traditional corner bakeries throughout Europe is the large scale production of buns, rolls and crusty white breads used for breakfast and lunch sandwiches — among them, the French baguette, Spanish ciabatta and German brötchen. Another fast growing segment: laminated dough products, croissants, for instance. Prepared, proofed and frozen upstream at large-scale industrial food processors; downstream, these traditional bakery staples are thawed and “fresh-baked” in grocery store ovens or “home-baked” in consumers’ ovens. The trend is expected to jump the Atlantic to the U.S. in 2008. Coming soon: more “functional” foods that blend in pharmaceuticals and promise health benefits.

In Asia — modernization and safety

Another rapidly growing and fast evolving region. Structural changes in the export market are compelling Asian food processors to seek more sustainable margins by moving up the value chain and providing greater safety assurances. This repositioning necessitates a modernization of processing operations to produce large quantities of value-added products, frozen in high-capacity freezers that can be easily and reliably cleaned. In China, frozen dumplings and steamed buns are growth areas. In Japan, it's frozen ready-meals and karage chicken. In India, Thailand and Indonesia, prawns remain a primary frozen export, with the adoption of sophisticated freezing techniques to produce a substantially more consistent product with less weight loss, damage or burn from uneven freezing.

South America

Traditionally large producers and exporters of beef and poultry, Argentina and Brazil are now also exporting fruits, vegetables and fish — especially tilapia from Brazil. Chile remains primarily focused on fish (salmon fillets) and seafood (mussels), but is also expanding into fruits and poultry products. Coming soon: more added-value products, including ready meals for export. Also, the domestic demand for convenience foods and ready-meals continues to grow.

FLoFREEZE®, FRIGoBELT® Conveyor, FRIGoDRIVE®, FRIGoPAK® Refrigeration, LINK® Control System, GYRoCOMPACT®, Hygiene-By-Design™, PELLoFREEZE® and SuperCONTACT® are registered trademarks of FMC FoodTech.

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