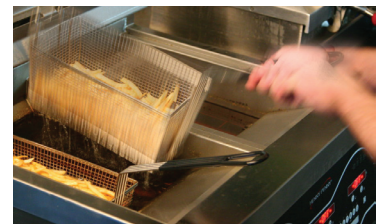


# COMMERCIAL FRYING: VERSION THREE POINT... WOW!

How reduced oil capacity innovation has lowered the cost and improved the quality of high-volume frying



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### INTRODUCTION

This is the story behind low oil volume frying and in particular the Evolution Elite® reduced oil capacity commercial fryer, and how it is currently saving thousands of restaurant owners worldwide thousands of dollars every year in direct cooking oil, labor and energy costs. But it is mainly a story about innovation... about how market forces, rising costs and physical constraints forced the foodservice industry to develop an entirely new equipment solution within an exceedingly mature category.

On one level, it is always useful to see how innovation takes place among and within individual organizations. Large, effective solutions often emerge from a repeating pattern of cooperation and invention. In more practical terms, this article describes the various aspects of commercial frying that engineers had to contend with in order to come up with a fryer “...designed to *preserve* cooking oil rather than destroy it.”

The final section of the article describes the type of savings attributed to the Evolution Elite fryer and where restaurant operators are experiencing the most value.

### Part I: A brief history of open vat frying

#### COMMERCIAL FRYING: VERSION 1.0

In its earliest, crudest form, commercial deep frying was not much different than the way it was done at home: a large stainless steel bucket two-thirds full of oil set over a gas or electric burner. The ones in restaurants were larger and rectangular, sometimes lined up two or three in a row, a bit like utility sinks only greasier.

If you had asked the fry cook back then how the oil (or shortening) was filtered, he would have thought you were crazy: Why would anyone want to *re-use* this stuff? Skim the surface once in a while, and when you can no longer see the bottom of the vat it was time to change the oil.

Heat transfer got a little better with the introduction of immersed electric elements and enclosed gas burner tubes. The fancier models had controls that consisted of a power switch, thermostat heat control, temperature gauge, and timer with buzzer.



At some point, a portable oil filtering unit was invented that could purge oil of the worst of contaminants if it wasn't too late. While conditions in the typical fry vat were acknowledged to be fairly toxic, it is more likely the practice of oil filtration became popular because it extended the useful life of the oil and therefore put off having to dispose of spent oil, a horrid job. Before long, restaurant owners began to associate cleaner oil and cleaner fry pots with better-tasting products.

Oil and energy were still cheap.

## COMMERCIAL FRYING: VERSION 2.0

Frying and fryers began to take on their current modern version in the 1980s. The demand for high volume frying was fueled by the first "fast food" generation to come of age and met by remarkable improvements in design and manufacturing technology. Around this time energy and environmental concerns began to gain steam, which resulted in much of the innovation being channeled into improving heat transfer efficiency and control technology.

The new fryer was smaller in footprint than the old tubs but jam-packed with productivity and features. Frying was faster and easier than ever. The growing quick service restaurant segment was able to rely on much greater consistency in product taste and texture.

Fryers with built-in oil filtration became increasingly popular due to their convenience and effectiveness. Filtering was now a much easier job, and daily filtering and cleanup became the norm. This in turn promoted a beneficial cycle of longer oil life, higher product quality and lower labor and oil costs.

With the advent of computerized controls, cooking became even more precise and automated. Multi-step cooking programs and auto-lift baskets are two examples of how frying required less dedicated manpower and could instead be "monitored" by crew members charged with performing multiple tasks.



## V3—THE GAME CHANGER

By 2005, the high-end commercial fryer had become a marvel of engineering... a powerful yet energy-efficient cooking machine that could turn out 80 pounds of French fries every hour, all day long, from three and a half square feet of kitchen floor space! What more could anyone want?

This is the sort of question that gets asked when the limits of conventional thinking have been reached. Just beyond those limits is where we usually find the unexpected twist or turn in the landscape that changes the game.

Remember trans fats?

On January 1st, 2006, a new consumer labeling law went into effect in the United States requiring food manufacturers to disclose the amount of trans fats in packaged food products. Trans fats had been in the news for years because U. S. health, dietary and nutrition experts were finding more and more reasons to believe that the widespread presence of trans fats in the nation's diet is the cause of significant long-term health problems in Americans.

Trans fats were found to be mostly created in the hydrogenation process common to the manufacturing of anything made with vegetable oil. While the molecular science behind the relationship between



trans fats and elevated LDL (bad cholesterol) is fairly straightforward, it was also clear at the time that other factors in the general population, such as consumption of sugary soft drinks, lack of exercise, and genetics, contributed as much or more to the problem than fried foods. Even so, cities like New York and Chicago were actively seeking to ban trans fats from restaurant menus. The restaurant industry suddenly had to face a serious problem with the foods it served: the oil they were made in.

And that is where the story of *Frying: Version 3.0* begins.

## Part II: The low oil volume solution

### HOW TO MAKE COOKING OIL LAST

The problem was essentially an economic one. There are three good reasons for the popularity of fried foods worldwide: fast, tasty and cheap. Change one or two of those and the picture alters dramatically. Addressing the trans fats issue meant cooking fried foods with alternative oils, a move that would raise their cost or diminish their flavor profile—or both. Tinkering with taste was simply not an option for quick-service restaurant chains. And so the hunt was on to develop low or no-trans fats oils with the same taste as current oils, and to find ways of managing the subsequently higher costs of frying.

Cooking oil is the single most expensive component in high volume frying programs, exceeding even equipment, service and labor.<sup>1</sup> If restaurants were forced to spend more on oil, the difference was going to come from somewhere. What if, on the other hand, there was a way to make oil *last* longer and make up the difference that way? This was a perplexing question because the available low-to-no trans fats oils tended to be less durable than the common corn or soy oils presently in use. To qualify as a long term solution any new process, procedure or technology would have to make up that shortfall, as well.

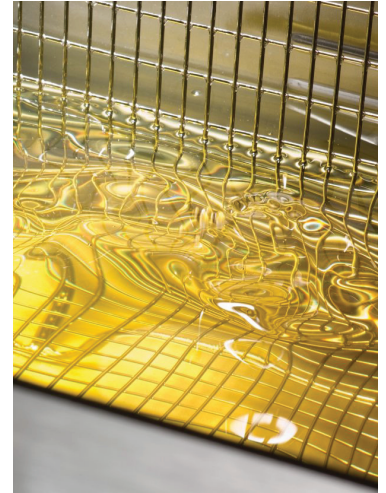
Large agri concerns focused on oil. Could substitutes be developed and introduced into the supply chain in sufficient quantities that would replicate product taste profiles, contain zero trans fats and still be affordable? Specialty chemical companies hyped newer, more effective additives and filtering media that would net longer oil life at minimal increased cost.

Meanwhile, a few global restaurant chains began to examine more closely the fundamental mechanics of frying and filtration, and the associated procedures their systems called for. As the results of this research were compiled, a hypothetical scenario began to emerge that would eventually drive the development, not of a new oil or filtration process, but of an entirely new kind of commercial fryer.

The question, simply put, was this: *What if you never had to change the oil?*

It was a crazy idea, bound to fail quickly in the testing. But it had to do primarily with vat capacity and oil refresh rate.

Even with the most advanced fryers you had to throw out 50 pounds of oil per vat every week or so. Why not try starting out with less oil in the vat? In high throughput commercial deep frying it's not quite that simple. The ratio of oil volume to load is carefully calculated to balance oil temperature recovery and replenishment rate. As the product cooks, it releases moisture and absorbs a



<sup>1</sup> In large fried chicken QSRs, it is second only to the cost of poultry.



certain amount of oil in its place.<sup>2</sup> With every cooked load a little oil leaves the vat. That oil must be replaced periodically to maintain the ideal level of oil in the vat. In a smaller vat, this would need to be done more often.<sup>3</sup> Theoretically, you could cook the same load in the same time using the same amount of energy in a much smaller vat as long as you were able to replenish the vat with fresh oil as often as needed. It was also possible—in theory—that this hypothetical vat size would be small enough for the refresh rate to equal or exceed the oil’s rate of deterioration. *En Voilà!* The perpetual oil fryer!

Not so fast.

The lower the ratio of oil to load, the faster oil breaks down because there is always less good oil available to help disperse contaminants. Thus, as lower vat volumes are computed, the refresh rate chases the deterioration rate until you encounter the prospect of a small vat fryer going through *more* oil than a conventional one. The rate of oil deterioration itself, then, became the limiting factor in how long a fryer can go between discards.

All of this was known. But viewed solely in the context of extending oil life, it became obvious that the key to making oil last longer was to filter *when needed*, not when it was convenient. And yet there were good reasons why most restaurants only filtered once a day. Basically, if you were filtering you weren’t cooking. Filtering on demand would mean tying up valuable frying capacity during busy periods or fielding more vats than were really needed. It also meant reaching under hot fryers to turn various valves on and off, and scrubbing pots while oil is being filtered. Even the best built-in filtering systems required at least 15 minutes to go from cook to cook. For the benefits of filtering “at need” to exceed their cost, you would have to be able to filter in much less time and be able to keep cooking in adjacent vats. It would also have to be so easy that anyone could do it.

By early 2006 the theoretical basis for a low oil volume fryer had been formulated:

1. Significantly shallower vat
2. Automatic oil replenishment
3. Cook-to-cook filtering in 4 minutes or less

There is no way of knowing how many different companies may have been experimenting with a low oil volume fryer. Judging from the commercial success of the few that made it to market since then, it is safe to say that most of the early work was driven by McDonald’s Corporation. Researchers there had settled on a target vat size—the oil volume would be 15 quarts (14 liters), or about 30 lb (13.6 kg). This represented a reduction of 30 percent versus their standard fryer. Beyond this constraint, it remained for McDonald’s equipment vendors to design the onboard replenishment system and come up with a way to filter in such a short amount of time.

## HENNY PENNY DEVELOPS THE WINNING LOV FRYER

Henny Penny Corporation entered the development effort after McDonald’s became dissatisfied with the approach that one of its key suppliers had taken.

## What about the “cold” zone?

Oil breakdown is hastened in a variety of ways. But under normal conditions the main culprits are impurities and particulates that accumulate during use. A conventional fryer deals with these contaminants in two ways: cold zone and filtering.

The “cold zone” is the volume at the very bottom of a vat, below the encircling heating elements. Crumbs and other particulates that accumulate between scheduled filters settle out of cooking circulation and into this cooler area where lower oil temperatures help prevent particles from scorching and carbonizing, which otherwise accelerate oil breakdown. The idea behind the cold zone was to at least get your oil through the busiest part of the day until you could take the time to filter it.

Filtering, of course, is the key to preserving oil. The longer impurities remain in hot oil, the more damage they do to the oil’s molecular structure. Less durable oils break down even faster. Oil life also varies depending on what you cook in it. The higher moisture content of French fries, for example, accelerates oil breakdown. It also results in higher oil absorption as the water is partially replaced with oil during cooking.

<sup>2</sup> This is a natural part of the frying process and is what gives fried foods much of their flavor and texture.

<sup>3</sup> Oil level matters because the volume of oil is what determines how much time and energy are required to “recover” its cooking temperature after cold product is immersed in pre-heated oil. If the ratio of oil to product is relatively high, as in standard vat fryers (roughly 4-1), small changes in oil volume—as indicated by level—have little effect on temperature recovery. The same load of French fries cooked in a smaller vat absorbs the same amount of oil, but has a greater impact on temperature recovery because there is less oil to begin with.

It was a good fit from the start. Having brought the world's first commercial pressure fryer to market 50 years ago, Henny Penny knew as much or more about frying fresh breaded chicken than any other equipment manufacturer in existence. Crumbs from freshly breaded product tend to break down oil more quickly than frozen product, such as French fries. As a result, the company's fryers have always incorporated the latest developments in filtering and oil management controls. It was this bias towards oil-friendly innovation that enabled Henny Penny to put together the winning combination of technologies for the low oil volume fryer.<sup>4</sup>



The first McDonald's Low Oil Volume (LOV) fryer was introduced at the company's biennial worldwide owner's conference in the spring of 2008 to rave reviews. A year's worth of field tests demonstrated an *average* reduction in oil consumption of 22 percent per store. Some stores saw a drop of nearly 37 percent. The average discard interval increased from 7 to almost 11 days. For some stores, oil was lasting 21 days, or *three times as long!*

## Part III: A new kind of fryer

### COMMERCIAL FRYING: VERSION 3.0

The successful development of the McDonald's LOV fryer came at an opportune time for Henny Penny. The company had long enjoyed a reputation for technical excellence and the ability to solve nearly any problem its customers put before it. But only recently had senior management begun to channel this inventiveness into a true culture of innovation and aim it at an industry ripe for it. Here was the chance to bring to market an entirely new approach to frying.

Technically, Henny Penny had already delivered the first new generation fryer for McDonald's. Certain elements of that design would remain proprietary, however. And so Henny Penny continued to work on developing a reduced oil capacity fryer for the rest of the market, a fryer that for the first time in cooking history was designed to *preserve* cooking oil rather than destroy it.

This fryer, dubbed Evolution Elite, was introduced at NAFEM 2009 to a fascinated foodservice public. It was smaller, sleeker and sported a completely new control panel. The fry vats looked impossibly shallow, and the electric version



<sup>4</sup> Henny Penny also understood immediately that reduced oil capacity frying would be much more effective with frozen product than freshly breaded product because the systems that extend oil life with less oil volume are not designed to handle heavier fall-off from fresh breading. For that reason, today's reduced oil capacity fryers are not recommended for freshly breaded applications.

## About the Evolution Elite®

### 30 lb vat

The Evolution Elite fry vat holds the same volume of oil as the McDonald's unit: 15 quarts (14 liters), or about 30 lb (13.6 kg). Split vats are available. There is no cold zone.\* This enabled a vat design that made better use of heat transfer dynamics in a smaller volume and consequently recovered temperature faster and more efficiently. Electric heating elements are hinged to swing up and out of the way for easier cleaning.

### Oil Guardian™ automatic oil replenishment

The automatic oil replenishment system, called Oil Guardian, uses thermocouple sensors built into the vat at two levels. When oil level drops below the lower sensor, the change in temperature sends a signal to add oil from the onboard jug or reservoir. Fresh oil is pumped into the vat until the level hits the upper sensor, which sends a signal to shut off.

The need for enough space to store a standard 50 lb oil jug on board spurred a number of innovations, including a smaller filter pan and a computer controlled valve manifold that eliminates much of the plumbing required to filter multiple vats in conventional fryers.

### SmartFilter Express™ 4-minute filtering on the fly

Key to the whole frequent filtering concept is SmartFilter Express, the filter tracking feature of the new control system that keeps track of loads and knows when each vat needs to be filtered. Filtering is practically automatic. When a vat needs to be filtered, the Filter Beacon—a blue light near the drain release—comes on. All the operator needs to do is open and close the external drain release (the black knob in front) when prompted. From that point, oil is cycled through the filter pan and pumped back into the vat, where the first quart or so is agitated in a special wave action that washes and drains the vat of crumbs. The operator is then prompted to close the drain valve, and the vat then fills completely and heats to temperature.

### iControl™ intelligent filtering and frying management

Henny Penny was able to develop a new control system called iControl, specific to the Evolution Elite. Behind the scenes it directs traffic for SmartFilter Express and Oil Guardian. Display prompts make it simple to use for the crew. iControl also tracks filtering and records all frying data. Managers can use this information to modify settings or adjust kitchen procedures to improve frying operations.

\* The ability to filter on the fly makes a cold zone in the fry vat unnecessary. When prospects express skepticism over the lack of a cold zone, Henny Penny sales engineers point out that the cold zone was not eliminated; it had merely been relocated to the filter pan where it belongs.





had ribbon elements that hinged upward, out of the way for cleaning. There was a strange black knob below the rim of each well.

## STRIKING THE RIGHT BALANCE YIELDS CASCADING BENEFITS

Initial field tests showed that the Evolution Elite fryer was able to *double* the useful life of cooking oil in the vat. Actual oil consumption was reduced by around 30 percent on average. Some restaurants were *tripling* their oil life and going through less than half of the oil they normally used.<sup>5</sup>

Generally speaking, restaurants were saving oil hand over fist. Energy costs went down. Fried products tasted better and were more consistent in appearance and texture. Employees were happier and more productive because their job was easier and safer. The length of time between discards even reduced the restaurant's carbon footprint in terms of fewer oil deliveries, less packaging and waste.

How could tweaking vat size and automating a few manual functions result in such a remarkably beneficial cycle?

The development of the reduced oil capacity fryer was really a matter of setting out to control as much as possible about the frying process in order to do it with less oil. This is much harder than it sounds. In nearly any type of dynamical system with more than two interrelated variables, the behavior of any one variable becomes incredibly difficult to predict. Nevertheless, Henny Penny engineers were able to strike a balance among such factors as heat energy, oil chemistry, food flavor, serviceability, work flow and lifecycle economics, and produce a fryer that extends oil life, requires less labor and uses less energy.

## RETURN ON INVESTMENT WAY BEYOND MARGINAL

For an equipment solution designed merely to stem the tide of rising oil costs, the Evolution Elite so far has managed to offer quite a bit more in the way of direct savings than the sum of its parts would indicate.

In the United Kingdom, a foodservice equipment company called ServEquip performed a four week trial of the Evolution Elite at one location of a popular pub chain. Here is what they found:

- Gas consumption reduced by 80% = £1,000 savings
- Oil usage reduced by 65% = £4,000 savings
- Per pub projected annual fryer operating costs reduced nearly 70%
- Pay-back period approximately 20 months

The economic justification was stunning. With 800 pubs across the UK, this chain was looking at potential savings of more than £21 million over seven years, in *excess* of the cost of the units.

Likewise, famed Latin chicken chain, Pollo Campero, has reduced frying oil consumption by 40 percent according to director of operations, Roberto Bianchi. The Evolution Elite is apparently generating considerable indirect economic



### Saving, saving, saving

Pollo Campero operates over 300 restaurants around the world and has been doing business with Henny Penny for decades. One year after installing its first Evolution Elite fryer, director of operations Roberto Bianchi says the restaurant had reduced frying oil consumption by 40 percent. "In less than two years it will have already paid for itself," he said. "After that it's just saving, saving, saving."

<sup>5</sup> It was later determined that the main factor responsible for differences in oil savings is store volume. Cooking oil deteriorates whether it is being used or not. The more product that is cooked and sold over a given period of time, the more savings accrue. Additionally, good general frying and oil management practices, e.g., seasoning away from open vats, covering vats at night, and following proper cleaning procedures, made a correspondingly bigger difference in oil life with reduced oil capacity fryers.



benefits as well. Mr. Bianchi and others have been quick to credit the new fryer with overall improvements in day-to-day operations, particularly in the areas of manpower, safety, training and maintenance. But their biggest and most pleasant surprise has been the improvement in product quality.

This speaks somewhat to highly variable filtering and oil management practices industry wide. By automating the tasks of filtering and replenishment, the Evolution Elite has essentially optimized them. Not only does oil last longer, it lasts ‘better.’ For all practical purposes, you are cooking in optimal oil every day, all day long, for as long as the vat holds out.<sup>6</sup>

Dennis Quinlisk, director of maintenance for Eat’n Park restaurants in the Pittsburgh area, said the fast, simple filtering process lets them filter every hour or so, right through the busy lunch period. “It keeps the shortening much better... it really has increased the quality of our fried products tremendously.”

“It’s unbelievable,” said George Sombonos, founder of Chicken Licken restaurants in Johannesburg, South Africa. “We are able to go three full months before needing to change the oil, all without a drop in quality of the food we serve our customers.”

## **SUPERMARKET AND RETAIL: OPPORTUNITIES FOR PROFITABLE GROWTH**

Supermarket delis have long sought to emulate the ability of quick-service restaurants to put out a consistent product and make money at it. That effort requires transforming former grocery ‘departments’ into a segment of retail foodservice charged with managing the ongoing costs of preparing, cooking and serving high quality meals with convenience. How do they do that? Chef Raul Benitez, corporate chef for Sedano’s (43 supermarket stores, Florida), is a believer in the new reduced oil capacity fryers and in equipment manufacturers like Henny Penny that focus on enhancing the ability and productivity of his staff.

Chef Raul:

*“We have experienced a major increase in the home replacement meal market and want to maximize our profitability by extending our yields, lowering our energy costs and ensuring consistency in the final product throughout our organization.”*

This has become the anthem of both restaurant and foodservice kitchen as it evolves into its next form, one that can respond effectively to the economic pressures of a growing global middle class.

## **Postscript**

### **“THEY KEPT TESTING THE OIL AND IT WAS STILL PERFECTLY GOOD”**

The story of the development of reduced oil capacity frying began with the hypothetical “perpetual oil fryer,” one in which the oil would never have to be thrown out. Interestingly enough, it turns out there are certain conditions under which that is very nearly the case. McDonald’s discovered, for instance, that the oil discard interval at its very highest-volume stores had sky-rocketed to six

<sup>6</sup> Oil in the vat has a “sweet spot,” the time after its first day and before its last day, when cooking oil imparts its best flavor and texture to foods. If you triple the time between discards, you also get four bonus days of sweet-spot oil!

months!

“It could have been longer,” said a person familiar with one of the cases. “They kept testing the oil and it was still perfectly good. At six months they just felt like they should probably get rid of it.”

By that time, of course, almost none of the original oil would still be in the mix. Earlier we explained how the rate of oil replenishment would approach the rate of deterioration as vat size is reduced. Here the same thing was happening due to exceptionally high level of utilization! In other words, so much product was being cooked every day that most of the oil in the vat was being replaced through replenishment before it had a chance to go bad. This would not be possible, however, without constant filtering—the stress placed on the oil from continuous exposure to high heat, salt and water would turn the vat in a matter of days. As it stands, frequent replenishment and frequent filtering in combination seems to supply the magic necessary for oil in the vat to last indefinitely.

Only a handful of QSR locations in the world approach the volume necessary for such conditions to exist. But the fact that it actually happens is both a testament to the innovation process that brought the reduced oil capacity fryer to market and a wider implication for restaurant owners in general: French fries absorb the same amount of oil they always have. But now the oil is better and restaurants aren’t throwing it away—they’re selling it.

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For more information about Henny Penny Evolution Elite fryers or other Henny Penny products and services, please visit [www.hennypenny.com](http://www.hennypenny.com) or call 1 800 417 8417 in the U. S. and Canada, or +1 937 456-8400 from other international regions.

### **About Henny Penny**

Henny Penny continues a 50-year tradition of innovation that began in Eaton, Ohio USA with the first commercial pressure fryer in 1957. Today, Henny Penny offers a wide range of high quality foodservice equipment designed for easier operation, greater flexibility and lower operating costs. Product lines include pressure and open fryers, combi ovens, rotisseries, holding cabinets, and display merchandisers. These products and complete start-up, service, training and technical support, are available through Henny Penny’s exclusive worldwide distributor network.