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Elimination of fryer tube hot spots,
reduction in amount of cooking oil

Cut frying oil cost $850/month

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FOOD Staff Photo





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ROBLEM: When Iceland Products, Inc., anned their new fish processing plant at ump Hill, Pa., management decided to go all-electric in order to take advantage of the attractive rates offered by the local power and light company. Problem was to find electric fryer that would give Iceland uniform frying temperature needed to oduce a high quality fried seafood prod-

LUTION: Iceland installed an autotic heat transfer system which electrily heats a heat transfer fluid, then nps the hot fluid through coils imsed in the cooking oil in the fryer. r full details on how system works, see c.)

Fryer handles 5000 to 6000 lb/hr of steaks and sticks, frying the outside ting of batter and breading in 15-50 nds — depending on size and shape product. Fish is then flash-frozen in tunfreezer.

nstallation of equipment was simple e the heat transfer system was reed as an integral package. All that was ired was bringing electrical power to em and connecting piping and wiring between system and fryer.

Fireproof enclosure around the fryer was not needed since there is no direct flame in that vicinity, and moreover, the heat transfer fluid is non-inflammable. For the same reasons, a CO_2 fire extinguishing system (cost about $3000) was not required, and insurance premiums are lower.

Heat transfer system at Iceland Products, Inc. supplied by Edwin L. Wiegand Co., 7500 Thomas Blvd., Pittsburgh, Pa. 15208

Fryer and total control system supplied by Design + Process Engineering, Inc., 235 Bear Hill Rd., Waltham, Mass. Oil or gas may be used as alternate heat source if desired.

Therminol (FR) heat transfer fluid supplied by Monsanto Co., 800 N. Lindberg Blvd., St Louis, Mo. 63166.

Two major features of system eliminate rancidity and the need for periodically discarding the frying oil, a practice which becomes necessary where direct fryers are used. First of all, in a direct fired fryer, frying oil is heated by tubes which are in direct contact with flame, and it is impossible to avoid hot spots which are a primary cause of frying oil breakdown and fatty acid formation.

Fryer at Iceland Products, Inc., is designed so that the heating elements are immersed in and heat a heat transfer fluid to no more than 500 F. This hot fluid is circulated through coils immersed in the frying oil — hence frying oil temperature itself never exceeds 500 F.

Actually, frying oil temperature is maintained at 400 F ± 1 F (provided that product infeed rate is kept constant) by an automatically controlled 3-way valve (see box) which regulates flow of heat transfer fluid through fryer coils.

Secondly, fryer system contains about 2/3 less cooking oil than other fryers with the same throughput. Thus, oil is used up faster than fatty acids can form (actual oil turnover at Iceland is 4-5 times daily as compared to once a day with conventional fryers).

Cooking time reduced 2/3

Faster cooking of the batter-breading coating (thorough cooking of the product is done by the consumer) takes place because frying oil temperature is relatively high (400 F as compared to 340 F-360 F

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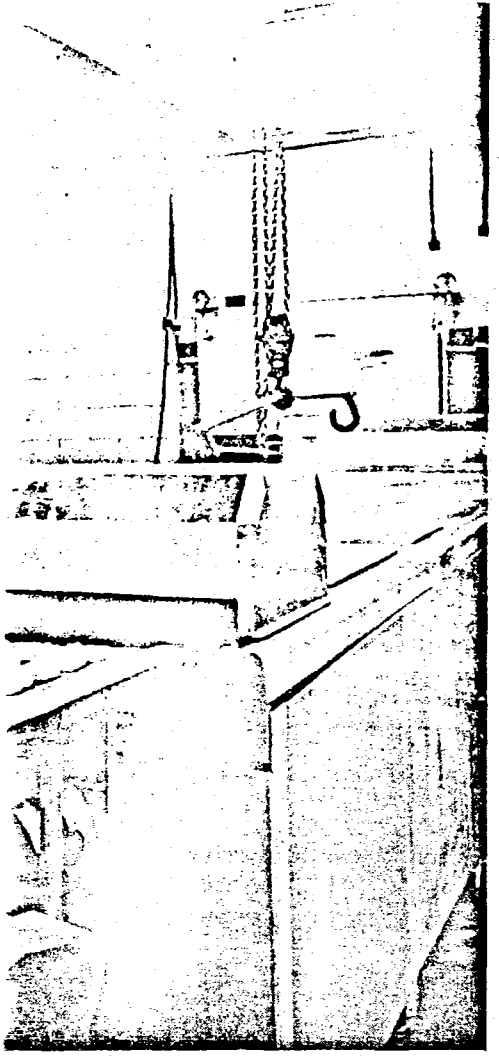
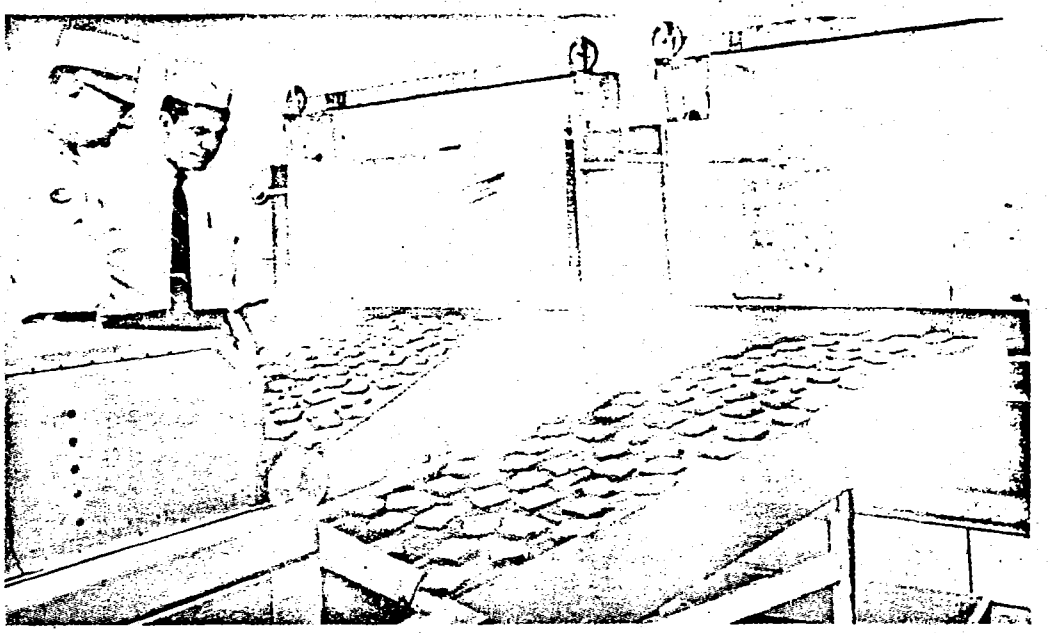
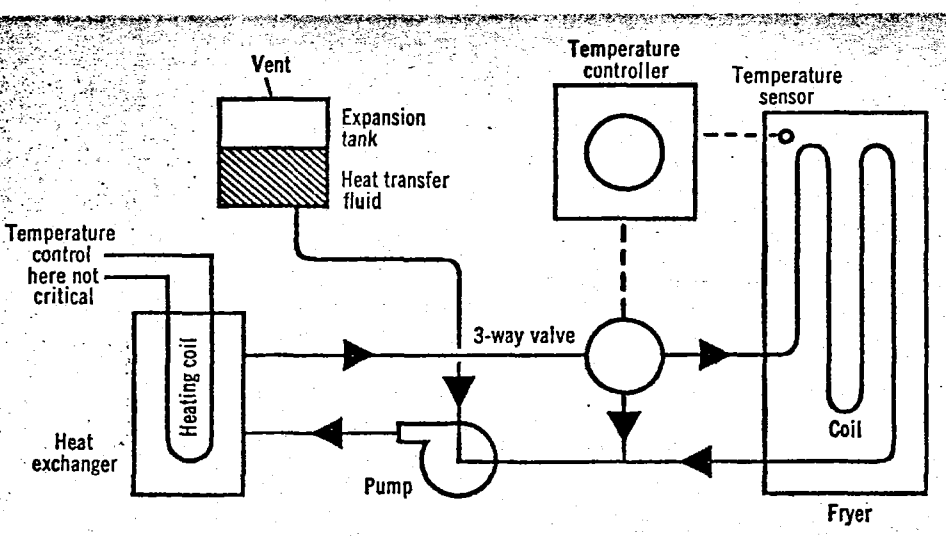




UNIFORMLY FRIED *to a golden brown, fish steaks are conveyed from fryer to 100-ft long tunnel freezer. Swinging conveyor divides fryer product output between two freezer conveyors*

FISH STEAKS *— battered and breaded — start their 26-sec journey through fryer on stainless steel conveyor belt. Chain hoist is used for removing conveyor from fryer for cleaning*

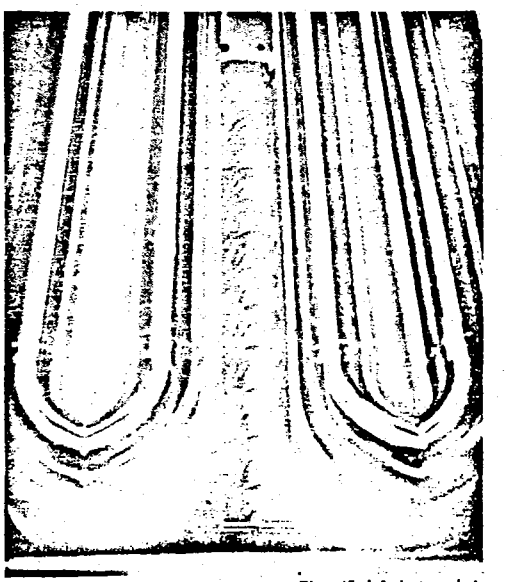


Automatic heat transfer system

Sketch shows how automatic heat transfer system operates. Heat transfer fluid is continuously pumped through heat exchanger where it is heated to 500 F by immersion elements, thence to coils in fryer where it gives up heat to frying oil. Temperature of frying oil is maintained at 400 F ± 1 F by temperature controller which senses frying oil temperature and controls action of 3-way valve, thus modulating flow of heat transfer fluid through coils in fryer.

For example, if fryer calls for more heat, valve position is changed to increase flow rate of heat transfer fluid from heat exchanger through fryer coils. When upper limit of frying oil temperature is reached, valve is automatically throttled so that most of the fluid bypasses fryer coils.

Tank which provides space for expansion of heat transfer fluid during heating is vented to atmosphere, thus keeping system pressure at just slightly above atmospheric.



Electrified Industry photo

STAINLESS STEEL COILS *through which heat transfer fluid is pumped run complete length of fryer, are immersed in frying oil to which heat is transferred. One of two screws (visible at center of photo) continuously removes loose crumbs which have settled into collecting trough at bottom of fryer and transfers them to filtration system*

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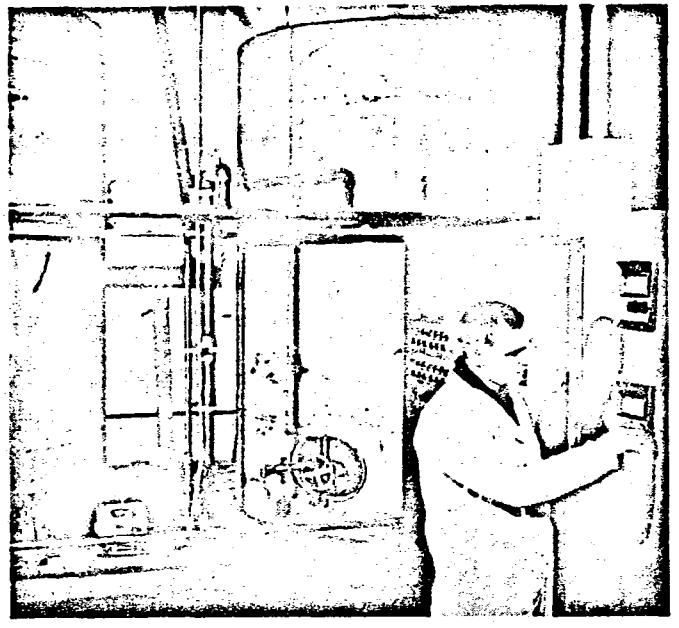
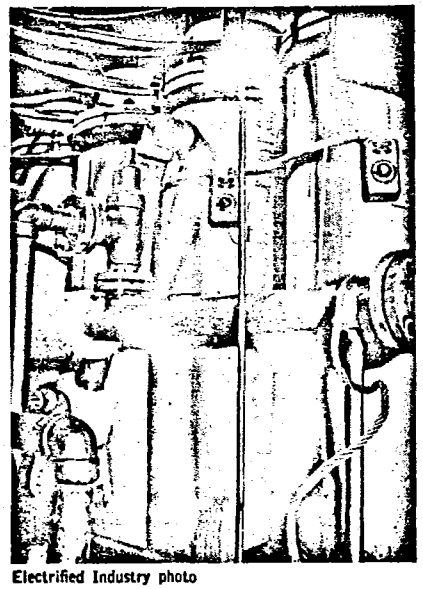


CONTROL PANEL *of heat transfer system is used to regulate temperature of heat transfer fluid. Frying oil from storage tanks (visible in background) is automatically added to fryer by a level control system actuated by photoelectric cell in fryer*



Electrified Industry photo

FOAM INSULATED VESSELS *connected in series are heat exchangers through which heat transfer fluid is pumped and heated. Immersion heating elements in the vessels (three vessels each have a 100-kw heater, the fourth, a 50-kw) automatically keep the heat transfer fluid at 500 F as it is recirculated between heat exchanger and coils in fryer*

for direct fired fryers). As a result, retention time of product in fryer is reduced by 2/3 (e.g — 20 sec vs. 60 sec). Product does not pick up as much heat and refrigeration load on freezer is reduced proportionately.

Higher heating efficiency is made possible because all the electrical heat input goes into the heat transfer fluid. By comparison, conventional fryers lose a significant amount of heat up the exhaust stack where temperatures can go as high as 1500 F.

Oil stays relatively clean and clear because all breadcrumb particles are continuously removed from oil. Crumbs which settle into a pair of troughs at bottom of fryer are transferred by screws (see photo) to a pump in the filtration system which handles the oil-crumb suspension gently. Crumbs are not broken up, are thus more easily removed by filter.

RESULTS: Iceland Products, Inc., President Sverrir Magnusson estimates that $850-$1000 per month is being saved on frying oil costs because oil does not have to be periodically discarded.

Product quality is tops. Fish sticks and steaks are fried to a uniform golden brown, and are better tasting because oil is kept fresh and clean. Less natural moisture is lost and the finished product is less oily because of the shorter frying time.

Sanitary design for ease of cleaning is another feature which contributes to high product quality. All product contact surfaces are stainless steel, internal radii are generous, and entire conveyor assembly can be hoisted out of fryer to make all parts accessible for cleaning. **END**

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