

Fishery Leaflet 208

Chicago 54, Ill.

December 1946

CERTAIN ASPECTS OF THE GERMAN FISHING INDUSTRY

REPORT III - SMOKE CURING OF FISH

One of a series of six fishery leaflets* abstracted from BIOS FINAL REPORT No. 493; Item No. 22 prepared by Mr. W. H. Myles, Ministry of Fisheries, Dr. G. A. Reay, Department of Scientific and Industrial Research, and Lt. H. F. M. Farrer, Herring Industry Board, for the British Intelligence Objectives Sub-Committee, 32 Bryanstone Square, London, W. 1.

Contents

	Page
Smoking Establishments Visited.....	1
The Rudolf Elbe Smoking Kiln (G.F.G.)..	1
The Buttner Werke Smoking Kiln (Kahler and Nordland).....	3
Recommendations.....	4

Smoking Establishments Visited

G.F.G. Hohenzollern Ring 233, Hamburg (Hugo Haberle, Manager).
KAHLER, Bruderstrasse 8/12, Hamburg (Heinz Schroder, ").
NORDLAND (H. GUNKEL) Kiel-Hassee, Kiel (Conrad Weber, ").
NORDSEE A.G.; Wesermunde (Herr Roloff, ").

Some information was also obtained from Dr. Lucke and Dr. Luneburg at the Institut fur Fischverwertung, Wesermunde. The main targets sought at these firms were automatic devices for controlled smoking of fish.

The Rudolf Elbe Smoking Kiln (G.F.G.)

The special smoking kiln installed at G.F.G. was patented and made by Rudolf Elbe, Wannsbek, and is said to be the only one of its kind in Germany. Blue prints and specifications were not available at G.F.G. but Mr. Johnston of Central Fisheries Office, Hamburg, has been asked to obtain these from the maker and to forward them to B.I.O.S. in London.

*F.L. 206 Fish Processing Machinery, F.L. 207 Quick Freezing and Cold Storage of Fish, F.L. 208 Smoke Curing of Fish, F.L. 209 The Preservation of Fish by Canning and Related Processes, F.L. 210 "WIKING EIWEISS" (A Protein Product Manufactured from Fish), and F.L. 211 Institute for the Utilization of Fish of the Federal Fisheries Agency (Artificial Ice, Spoilage in Fish, Anti-Oxidants, and Fish Meal & Oil Manufacture).

The kiln was designed for the smoking of herrings as "Bucklinge" i.e. hot smoked ungutted herrings, a delicious cure that can be eaten cold or heated up. These were very popular in Germany, and were tried out in Britain by a few curers before the war, without much success. Probably the bulk of the best quality herrings coming into the German curing establishments go to make "Bucklinge"; the poorer fish are used for "Marinaden" and similar cures.

G.F.G.'s method was as follows:- Fresh herrings landed in ice (or in ice with a little salt) are brined for 2 hours in 5 to 6 per cent pickle, hung on speats and hot smoked for 3 hours at 100°C. and then force-cooled for 1 to 2 hours. The product is packed in 2½ kg. wooden boxes with paper liners.

The smoke curing plant consisted of three identical units each comprising a smoke kiln, external fire boxes and a cooling chamber. Close to each smoking kiln and running parallel to its length was a line of seven separate smoke boxes held together in one brick structure. Each box, provided with a metal door with adjustable draught inlets at the bottom was about 5 ft. high, 6 ft. deep and 4 ft. wide, with a metal grid on the floor to permit ash to fall through. Smoke ducts from the fire boxes coalesced into one broad trunk from which smoke was introduced at the bottom of the smoking kiln. There was no forced draught, control being by louvres at the top of the smoking kiln. The smoke was "over" - not "through" - blown at the fire box. Hard wood chips - typically of beech - was the fuel, producing a hot, flaming fire. Above the smoke boxes was a row of 6 dial (distant reading) thermometers showing temperatures in the kiln and observed by the man controlling the fires.

Each smoking kiln was about 12 metres high, 6 metres long and 2 metres broad (40 x 20 x 6½ feet) and passed vertically from ground floor to the roof on the second and top floors of the building.

The speats of herrings are introduced into the kiln (parallel to its breadth) at ground floor level by placing them in threes horizontally side by side on a pair of endless chains moving slowly and vertically upwards and carrying notches to engage the ends of the speats. Underneath each three speats is a metal trough which catches any fat that may drip from the hot fish. By an arrangement of sprocket wheels the chains move the fish successively up and down the full height of the kiln some eighteen times in the length of the kiln. The speats of fish are removed after 3 hours at the ground floor level at the side of the kiln opposite to that through which they were fed in and are transferred by hand to the adjacent cooling chamber which is of the same height and breadth as the kiln, but only of about half its length. In the cooler the speats of fish are carried by a similar chain mechanism up and down for 1 to 2 hours through continually changing cold air which is in circulation with an external air cooler, refrigerated by a small CO₂ compressor. Haberle did not know the air temperature normally used in the cooler.

On removal from the cooler at the second floor level, the fish were taken by hand to packing tables which ran right round the room in the space surrounding the three smoking and cooling units and along side which a hand operated railway was arranged carrying hanging platforms for delivering empty and taking away filled boxes.

Each kiln puts through 400 Ztr. or 20,000 kg. of herrings per 24 hours. The whole plant can thus deal with 60,000 kg. of fish i.e. about 336 crans or almost

60 tons per day. The kiln was very rusty and in poor condition having lain unused for most of the war. Haberle was satisfied with its performance for Bucklinge production.

He declared it would be impossible to make typical English cold smoked kippers in it. It was a hot smoking kiln and as such could not be used for kipper production. It was difficult to understand from his imperfect English the reason why. He seemed to mean that it would be difficult to get a low enough temperature and at the same time a great enough concentration of smoke.

In addition to the special automatic kiln, G.F.G. had some 33 smoking ovens used both for hot and cold smoking. Such ovens were a common feature of most smoke curing establishments in Germany. "Bucklinge" made in these small brick ovens over a hot fire of beechwood were hung on frames holding about 13 speats, each bearing about 20 fish. Two frames, one above the other, were put into each oven and turned round and interchanged in position half way through the curing period.

Besides herrings, medium, unsplit haddocks and steaks of large saithe after pickling for 2 hours in 6 per cent brine were being hot smoked for about 3 hours in these small ovens on the occasion of our visit.

This firm (and others we were told) produces a cure known as "Lachshering". This is made from herring that have been stored in brine. After a desired degree of desalting has been reached, the fish is speated and cold smoked in the ovens for about 48 hours or for about 24 hours, if previously dyed.

The Buttner Werke Smoking Kiln (Kahler and Nordland)

The firm of Kahler, a large one of its kind, makes products of many kinds, e.g. smoke cures, Marinaden, and canned preparations. Bucklinge were being made in small ovens as described above. There were about 84 of these - taking 3 racks each or about 100 kg. of herrings. The method of making "Bucklinge" and "Lachshering" were much the same as already described.

A special line was canned 'kippers'. The split, boned herrings (prepared by Nordischer Maschinenbau machines) are hot smoked and then canned in oil.

For hot smoking these fish, a special turbo-kiln, made by the Buttner Werke, Uerdingen by Krefeld, was in course of reconstruction and almost completed. Blue prints and specifications were not available either at Kahler's or at the Nordland factory at Kiel where there was a similar kiln and Mr. Johnston, Central Fisheries Office, Hamburg has been asked to obtain these from the maker and to forward them to B.I.O.S. in London. These will be particularly necessary since it was difficult to see the internal arrangements.

The split fish are carried on perforated aluminium trays (39 in. x 36 in.) in double tier on a moving endless belt (carrying in all 750 double tiers) i.e. 1,500 trays, which rises at a slant and enters the top of the cylindrical kiln and wends its way spirally downwards, the loops being very nearly horizontal. The fish emerge from the kiln under a cooling fan after about $1\frac{1}{2}$ to $1\frac{3}{4}$ hours and are carried up from the bottom of the kiln, which is below floor level, to the packing room where the trays are removed and new ones are put on the belt. Smoke is admitted from external fire boxes through ports placed at intervals round

the bottom of the kiln. In the centre of the kiln and the spiral of trays are 4 turbo-fans one on the top of the other, which circulate the air rapidly through the stack of trays through banks of steam heaters on the circumference of the kiln and back into the fans. There are arrangements for ventilation i.e. ejection of cold air and intake of fresh, and thus for control of humidity.

A temperature of 80°C. is maintained for hot smoking the kippers, the fish undergoing a loss of weight of about 25 to 30 per cent.

The very similar kiln seen at the "Nordland" factory of H. Gunkel at Kiel was used in normal times for similar hot smoked cures of herring and sprats. During the war, however, it had been successfully used for dehydrating vegetables (cabbage, carrots and onions) down to water content of about 8 per cent. The heating had been arranged in three zones, 80°C. at the top, 60° to 70°C. in the middle, and lower temperature still at the bottom of the spiral. The time of travel through the kiln had been increased, (e.g. to 4½ hours in the case of cabbage). The daily output of the kiln for cabbage was 15 tons (raw) = 1,250 kg. dried, pressed in 600 g. cubes.

The cost of the kiln entire with brick structure was stated to be RM. 60,000 or £3,000. This does not include the cost of the trays which must be quite a large item.

.....

The following information was gathered during a conversation at the Wesermunde Institut.

The species of fish normally smoked in Germany are herring, cod, haddock, flat fish, rays and dogfish. By far the bulk is "hot smoked" the air temperature in one and the same smoking oven being far from uniform, varying from 80° to 140° C. The smoking period varies from 2 to 3 hours. Prior to hot smoking the fish are brined, but usually in much weaker salt solution than is the case in the U.K. with cold smoked cures, e.g. the brine is frequently no stronger than an approximately isotonic solution. 2 per cent salt was cited as a commonly used strength of brine. The only types of apparatus for controlled smoking in use in Germany were said to be the kiln installed at the premises of G.F.G. Hamburg and that used by Kahler, Hamburg, and Nordland of Kiel.

Recommendations

So far as the British Fish Industry is concerned (whether on the herring or white fish side), both of the special kilns described reflect the pioneer work being done both in Germany and the British Empire to put smoke curing on a more controlled and scientific basis than it has been in the past. We find it difficult however, to make concrete recommendations as regards them.

One thing is certain, the existence of these kilns in Germany should be brought to the notice of the Herring Industry Board because in our view they merit further investigation. As far as we can see neither is immediately suitable for cold smoking herrings ('kippering') or white fish, but it may be that nothing more than minor adaptation is necessary to make them useful for these purposes.

We hesitate at the present date to suggest that, even if available, installations should be set up in this country, but we give it as our opinion that arrangements might be made for the Herring Industry Board to have these kilns tried out on the spot for products that appeal in the British Market.
