

METHOD OF SMOKING



HAUZOUKIM

Types of Smoking :

- (i) Cold smoking :

- Conventional type of smoking using traditional chimney kilns.
- Smoke is passed over fish kept hung or spread in mesh inside the kiln.
- Max temp is 40° C.
- Initial stage, fish is moist & smoke is highly humid.
- High temp at this stage
- will cook the fish flesh.
- So, temp should not
- be raised to max.



- Wood is burnt at the bottom of kiln.
- Fish dries , also absorb aromatic substances from smoke.
- Smoke travels upward &
- imparts the flavor to fish.
- Fish does not get cooked.
- RH maintained below 70.
- Duration extends from
- 36–72 hrs.
- Cold smoked fish is more
- stable & have pleasant odour.
- Eg. haddock, cod fillet, kipper etc.



- (ii) Hot smoking :

- Smoking cooks the fish.
- Temp may go upto 80–100° C & fish temp upto 60°C.
- Eg. Sprats, eels, trouts, sardines, traditional smoking in tropical countries etc.
- Fuel is burnt either directly inside mechanical kiln or in movable trolleys or external hearths near tunnel.
- Fish is charged into tunnel.
- Chamber with metal frame str, & brick wall to hold a no. fish cages.

- “Torry kiln” designed & developed by Torry Research Station, Aberdeen is very popular & widely used in UK for smoking fish.
- It’s a horizontal flow kiln
- called mechanical kiln.
- Electric heaters are placed
- along the smoke path at diff
- points.
- electric fan draws smoke
- over fish.
- Uniform temp is maintained
- throughout chamber



- fish dried & cooked in kiln before it is smoked.
- Drying at a temp of 75 to 80° C by burning fire.
- Skin of fish becomes white & flesh cooked.
- Then smoke is produced by burning logs with saw dust & temp maintained at/above 100 °C.
- Schedule operation : drying at 75 to 80° C for an hr & then smoking at 95 to 100° C for 1 hr.
- Requirements vary depending on size & type of fish.
- Flesh of hot smoked fish is delicate, succulent, tasty & has a longer shelf life.

- **Electrostatic smoking :**

- Smoking by electro-kinetic properties of smoke in high voltage of 40 KW or more.
- Salted & rinsed fish passed through drying chamber.
- Heated by infrared lamps positioned on either sides of belts carrying fish for 3-4 min at 40 – 50° C.
- Then taken to electrostatic oven over conveyor.
- On either side, nichrome electrodes are placed, supplied with high voltage current at 30 to 70 KW.
- From smoke chamber fish are carried to baking oven, heated for 5-6 min to 30° C.
- loose 10 to 12 % moisture.

- **Advantages :**

- Considerable saving of time as whole process takes only about 20 mins.
- Consequent increased output.
- Reduction in losses as short processing time.
- Continuous process & carried out in mechanical equipment.

- **Liquid smoking :**

- Smoking liquid or concentrates derived from dry distillation of wood are used.

- Salted fish given a dip in smoke concentrate & then dried in an ordinary kiln dryer.
- Liquid thickens & coats fish & gives
- smoky flavor & color.
- wood -vinegar obtained from dry-
- Distillation Of wood.
- Several synthesized smoking liquor
- (water soluble/ oil soluble) are there
- based on kinds of food.
- Eg. Canned fish in oil, sausage, ham,
- whale meat, bacon etc.



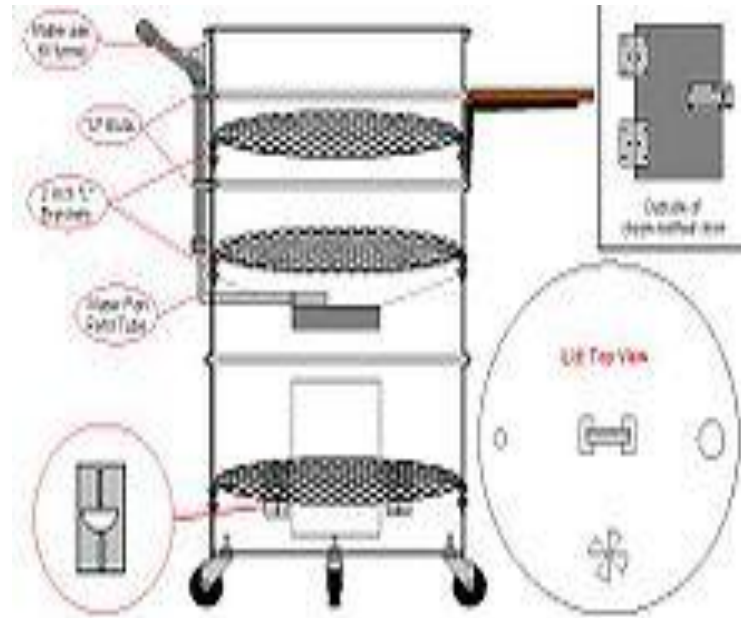
- **Post process handling :**
- Warm smoked fish is allowed to cool before grading & packing.
- Packing in warm condition will condense vapour and moisture deposit inside pack.
- Situation conducive for microbial growth.

- **Types of smokers used :**

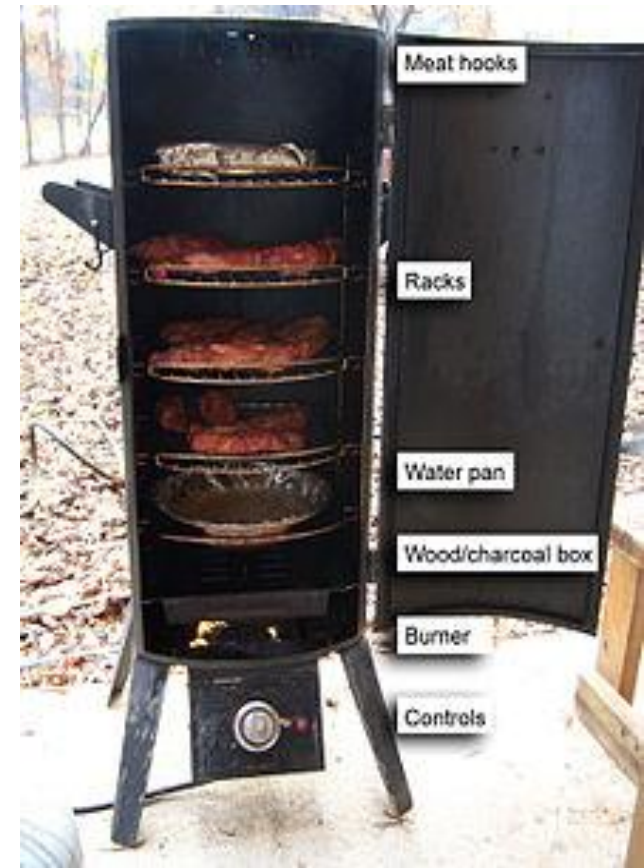
- (i) Offset smokers:
- Cylindrical shape cooking chamber.
- airflow is tightly controlled
- The heat and smoke from the fire is drawn through connecting pipe to Cooking chamber.
- Heat and smoke cook and flavor the
- meat before escaping through an
- exhaust vent.



- (ii) Upright drum smoker :
- An upright steel drum.
- A basket to hold charcoal,
- cooking racks at top covered by
- vented lid.



- (iii) Vertical water smoker/bullet smoker :
- It uses charcoal or wood to generate smoke and heat
- Vertical water smokers are extremely temp stable & require little adjustments.



- (iv) Propane smoker :
- Heat generated by gas burner directly under a steel or iron box containing the wood or charcoal that provides the smoke.

- (v) Smoke box method :
- Traditional method uses two box, Fire box & food box.
- Heat and smoke from the fire box exhausts into the food box, where it cooks & smokes the meat.
- (vi) Commercial smoke house :
- Smoke generators use friction, an electric coil or a small flame to ignite sawdust on demand.
- Heat from steam coils or gas flames is balanced with live steam or water sprays to control the temperature and humidity.

Smoked products in India

• MASMIN :

- Maximum priced smoked fish in India.
- Traditional smoke cured product of Lakshadweep island & Maldives.
- Prepared from skipjack tuna. Tuna preferred as it has large amt of myoglobin in flesh.
- Fresh tuna → bleached, gutted, washed
- → made into fillet
- → fillets wound with ribbon like split green coconut leaves (prevent breaking of meat)
- → boiled in 3% salt solution(1 hr.) /sea water

- → boiled by immersing entire fish in brine until red color of meat turns light pink
- → arranged in smoking trays in kiln.
- → Smoked for 2–3 hrs. until color is golden brown
→ coconut leaf winding is removed
- → then dried under sun to reach a consistency of wood & dark brown color
- → stored in polythene bags/ polythene gunny bags & marketed.

- **Smoked sardine flakes :**

- Sardine → beheaded, gutted & cleaned in running water
- → gutted fish dipped in saturated brine (with 3% sod propionate & 0.1% BHA for 15 min)
- → drained for 10 min
- → smoked for 6 hrs. at 70 -80° C using coconut husk & saw dust
- → cooled
- → skin peeled & flesh flaked from both sides of backbone
- → packed in polythene sheets.

CARCINOGENIC COMPOUNDS IN WOOD

- Wood smoke contains a wide range of chemicals such as phenols, aldehydes, acetic acid and a range of polycyclic aromatic hydrocarbons
- Polycyclic aromatic hydrocarbons (PAHs) are a group of compounds that have been the subject of much concern in the recent years due to their toxic potential.
- (PAH) constitute a large class of organic compounds containing two or more fused aromatic rings made up of carbon and hydrogen atoms.

- Hundreds of individual PAH may be formed and released during incomplete combustion.
- Smoke production is based on a process of incomplete combustion.
- When wood is completely combusted only carbon dioxide (CO₂), water and ash are produced,
- but incomplete combustion via thermal pyrolysis of higher molecular organic compounds produces compounds of lower molecular weight, this is the case with PAHs, which are volatile in the gas phase.
- The potentially carcinogenic PAH is benzo(a)pyrene, often used as an indicator for the presence of PAHs.

- **Carcinogenic compound in wood smoke :**
- Smoke has carcinogenic property due to the presence of 3,4-benzopyrene.
- It is a polynuclear aromatic hydrocarbon and its formula is $C_{20}H_{10}$.
- Depending on the method of smoking the amount of carcinogenic compound in smoke varies.
- In a residential area where wood burning for domestic heating is common, significantly higher indoor levels of 1,3-butadiene, benzene, and several PAHs, such as benzo(a)pyrene were found in homes using wood-burning appliances compared to homes without.

- **Polycyclic Aromatic Hydrocarbons (PAH) :**
- Residential wood burning is the source of 50% of airborne Polynuclear Organic Material.
- **Dioxin :**
- **Carbon Monoxide :** An odorless gas resulting from all burning but produced in large amounts when burning takes place with reduced oxygen, such as in wood stoves.
- **Respiratory Irritants and Toxins:**
- chemicals known to be toxic such as formaldehyde, propionaldehyde, acetaldehyde, isobutyraldehyde, phenol, cresols.

- **Control :**

- Wood smoke contains appreciable amounts of carcinogenic PAHs, which are the main cause of concern regarding its toxicity.
- However, this process is controlled by the manual handling of the smoking conditions, which depends on the experience of the personnel.
- To prevent the carcinogenic compound, electrostatic precipitation is used through which smoke is allowed to pass.
- The electrostatic precipitation can absorb the carcinogenic compound and we can get pure smoke.

