



Solar Thermal Solutions for Fish Processing Industries



1. Industry Overview

Fish processing has thermal-energy requirements for washing, cleaning, blanching, cooking, steaming, drying, smoking, hot-water generation and sanitation. Energy may be supplied by electricity, LPG, diesel, biomass, natural gas or other fuels. Solar Heat for Industrial Processes (SHIP) can supply part of this demand, particularly for daytime operations, through hot-water systems, solar air heating/drying, heat exchangers, boiler-feedwater preheating and solar-assisted steam generation.

2. Typical Thermal Applications

Table 1: Fish processing sector applications, indicative temperature range and typical heat medium

Fish processing application	Indicative temperature	Typical heat medium
Washing / rinsing	40–70°C	Hot water
Cleaning / sanitation	60–85°C	Hot water / steam
Blanching	70–95°C	Hot water / steam
Cooking / steaming	80–100°C+	Hot water / steam
Fish drying	35–65°C	Hot air
Smoking / hot-air processing	50–90°C	Hot air
Process-water heating	40–90°C	Hot water
Boiler feedwater preheating	60–120°C	Hot water / suitable HTF

3. Solar Thermal Technology Options

The appropriate technology should be selected based on required process temperature, heat-load profile, available area, solar resource and integration point.

Table 2: Solar thermal technology options, indicative applications and temperature range

Solar thermal technology		Indicative application	Temperature range
Non-concentrating solar thermal	Flat Plate Collector (FPC)	Washing, cleaning and hot water	30 - 80°C
	Evacuated Tube Collector (ETC)	Hot water, cleaning and preheating	40 - 100°C
Non-imaging concentrating	CPC/evacuated-tube CPC/xCPC	Low/medium-temperature process heat	60 - 120°C
Concentrating Solar Thermal	Scheffler / parabolic dish	Steam, cooking, drying and process heating	100 - 250°C
	Parabolic Trough Collector (PTC)	Medium-temperature steam or thermal-oil duties	100 - 250°C
	Linear Fresnel Reflector (LFR)	Washing, cleaning and hot water	100 - 250°C
	Higher-temperature CST systems	Not applicable	Up to 400°C

Hot-water tanks are suitable for low-temperature washing, cleaning and process-water loads. Pressurised water can serve higher-temperature applications; thermal-oil storage and phase-change materials may be considered for selected medium-temperature duties. Storage is useful when solar availability does not coincide with the processing schedule.

4. How Solar Heat Can Be Integrated

A key principle in industrial solar thermal design is to identify the most technically and economically suitable integration point rather than simply connecting the solar field to the main boiler. IEA SHC specifically highlights process integration and selection of the appropriate integration concept as a critical part of SHIP project design.

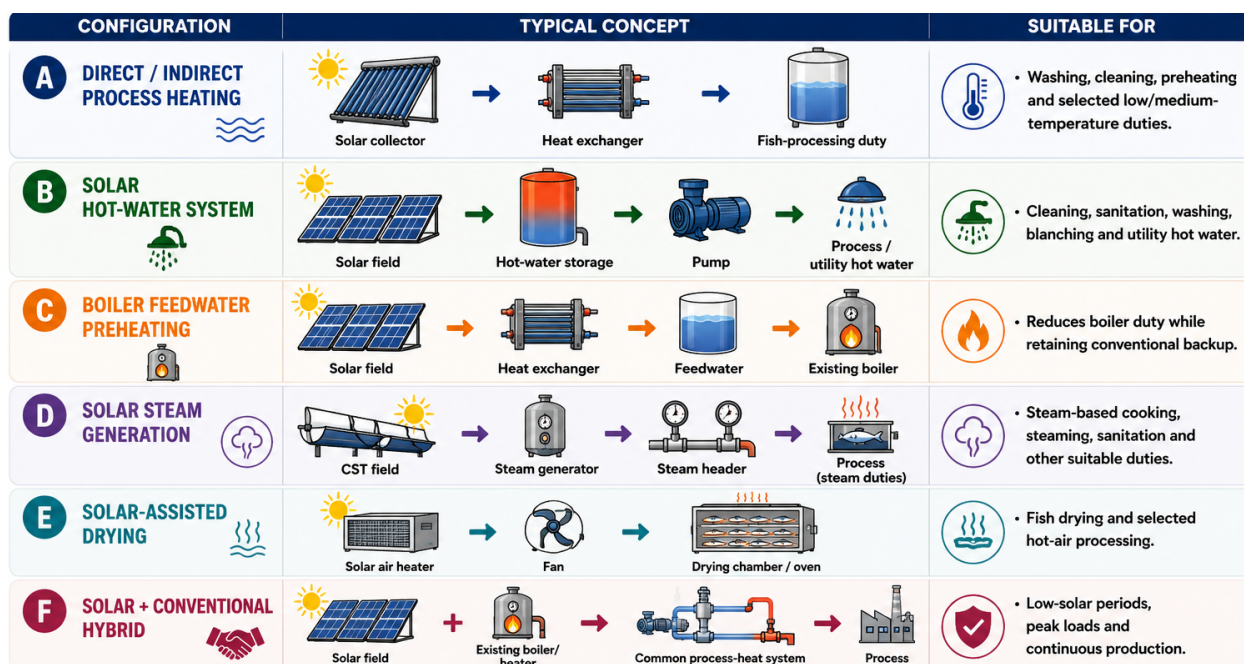


Figure 1: Illustration of solar heat integration to fish processing unit

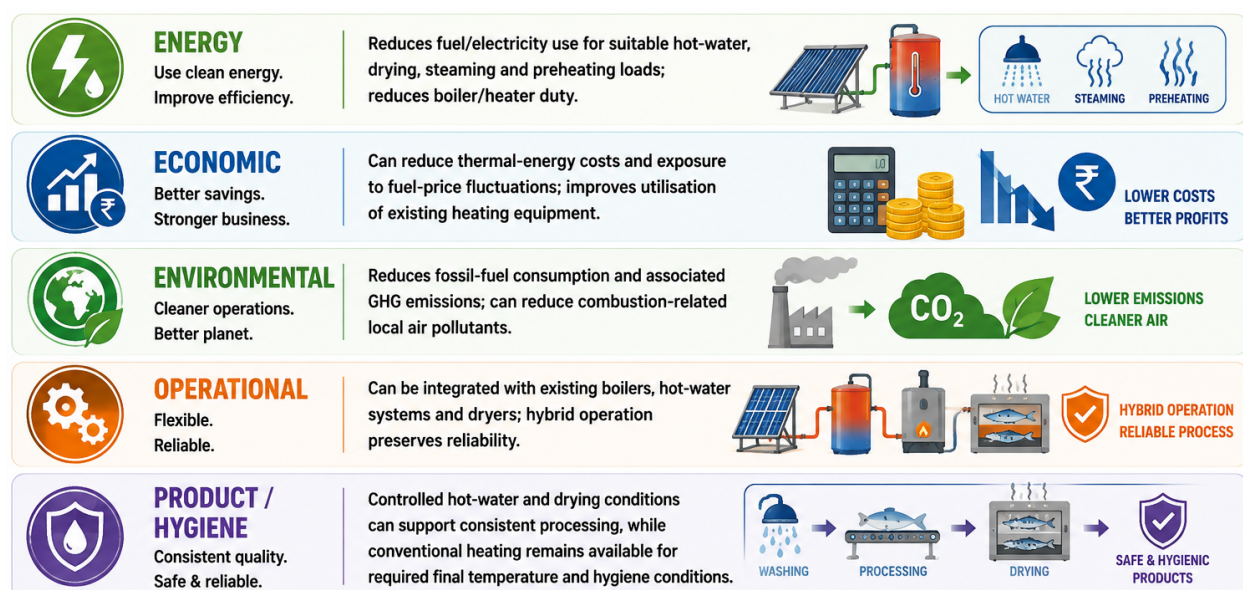
5. Key Benefits for Fish Processing MSMEs

Solar thermal is most attractive for fish processing where clean hot water, controlled drying air or moderate-temperature process heat is required during daylight hours. A hybrid configuration can balance solar utilisation, hygiene, product quality and production reliability.

A small fish-processing unit with daytime washing, sanitation and drying loads can use an ETC/FPC solar field to preheat process water, with hot-water storage supplying the process through a pump and heat exchanger. A conventional boiler/heater remains available for cloudy periods, peak demand and final temperature lift. Where drying is a major load, solar air heating can be integrated upstream of the existing dryer.

Table below presents key benefits for fish processing sector MSMEs.

Table 3: Key benefits for fish processing sector MSMEs



6. Indian Case Example

Solar Thermal Fish Drying system was installed at a fishing cooperative at Sagar Island, West Bengal to replace traditional open-sun drying, which was vulnerable to dust, insects, weather and contamination. The dryer incorporated an 80% UV cut-off film, improved airflow for more uniform drying, and a dismantlable structure to protect the system against storms and cyclones. Solar PV-powered dehumidifiers were also used to control humidity during night-time operation.

The Sagar Island experience demonstrates that solar thermal heat is particularly suitable for fish drying, where the objective is not necessarily to replace all conventional energy, but to provide controlled renewable heat for moisture removal while maintaining product quality and process continuity. Hybridisation with auxiliary electricity or conventional heating can further improve reliability during cloudy periods and night-time operation.

The study reported that the solar thermal dryer increased processing throughput and improved the quality of dried fish, thereby supporting improved livelihoods of the fishing community.

Parameter	Reported project information
Project	Solar Thermal Fish Drying at Sagar Island, West Bengal
Location	Sagar Island, South 24 Parganas, West Bengal
Application	Hygienic drying of fish by reducing exposure to dust, insects and other contaminants
Technology	Walk-in solar thermal dryer with solar-PV-assisted dehumidification
Installed capacity	600 kg per batch (300 kg × 2 dryers)
System Configuration	Solar thermal collector/dryer → Hot air → Fish drying chamber → Moisture removal → Dried fish

Parameter	Reported project information
Drying time	Less than 24 hours for a dried batch
Product quality	Improved appearance and more uniform drying
Weather resilience	Dismantlable structure designed for cyclone/storm conditions
Livelihood impact	Increased throughput and improved income potential for fisherfolk

7. Sources and References

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- 6) ICAR–Central Institute of Fisheries Technology (ICAR-CIFT). Solar Hybrid Dryer / Solar Fish Dryer.