Problematic

The Hammam, or Moorish Bath, is a social and cultural tradition, of public hygiene in Morocco. A privileged place of socialization. In the same way as the Medersa or the Mosque, the Moorish bath is a major component of the architectural whole of the Moroccan city.

Morocco counts close to 5000 hammams, consuming about 1.5 million tons of wood per year, placing hammams among the principal factors of deforestation in the country.

Goals to Achieve

The main goal is to conceive a hammam archetype with high energy performance, which future owners of hammams could use as a reference before conceiving it.

This Moorish bath call upon an optimization of construction, heating and functioning techniques:
- Water economic management;
- Architectural design and construction quality (insulation, heat diffusion...);
- Energy effectiveness of hot water production;
- Forest wood restraint of use;
- Thereby, exploitation costs and access prices decrease.

Means & Techniques

1- Improved Boiler: A cylindrical bunker of 9 m³ (2 m³, 3 m high)
- A hot water efficiency of 50.5% (on average), with a maximum of 81.3% and a minimum of 46.6%.
- Biogas use, with a combustible economy of 57.8% in comparison of the initial consumption.
- About 2,000 tons per year of CO2 emission avoided.

2- Solar panels: in industrial or traditional form (galvanized steel sheets)
- An economy of 50% of combustible consumption.
- Insufficient to provide 100% energy needs.

3- Re-use of raw sewage: by recuperating the energy that could be lost via hot raw sewage (42°C heat) to pre-heat cold water before sending it to the boiler for the heating. This technique will also help to reduce combustible consumption and improve the efficiency.

4- Copper coils under the floor: heats the Moorish bath instantaneously, only when needed and keeps energy consumption to a minimum.
- One boiler is usually enough for the functioning. Copper coils can then be connected in the existing heating system.
- It can reduce heating costs by up to 30%
- Copper coils transfers thermal energy to the floor, heating the different rooms of the Moorish bath.

Architectural Concept

The purpose of these researches is to conceive a pilot scheme that future builders of Moorish baths would use as a reference, with innovative techniques. This pilot scheme can also be used by current owners and managers of Moorish baths to improve the efficiency of it.

By combining these techniques (improved boilers, solar panels,...) the result would be to reduce combustible consumption of more than 80%.

Walls and slabs are insulated with cork panels, low-cost and available locally.

A first block, south oriented, with a roofing system consisting in rotating solar panels, a system allowing a better ventilation of the Moorish bath and a second block, with vaulted ceiling.

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