



Modified boiler

Subhash Ola
Alwar, Rajasthan



Background

Subhash (39) hails from a farming family of Alwar and has three siblings. Though he was very good in studies, he had to drop out to assist his father. Apart from farming, his father also used to drill bore wells. Subhash was initially engaged in bore well digging, after which he took up

farming and also tried his hands at computer assembling. He got married early and has two daughters and a son. He was very keen to use the natural resources very efficiently since his childhood. As a child, looking at the silencer of vehicles, he used to wonder whether the hot air emitted by silencer could be used in any way. He had



Subhash is making machines with capacity ranging from 40 litres/h to 3000 litres/h (Costing Rs 60,000 to 10 lakh) depending on demand of customers. He has sold over 200 machines in different parts of the country.

The modified boiler can replace the conventional boilers. It can reduce the fuel consumption and water consumption significantly (over 30 % saving in fuel and over 700 % saving in water consumption as compared to conventional boiler). It has found application in leather industry, plywood industry, textile, etc other than food industry. Subhash Ola is currently heading his own

company, *Geniusenergy Critical Innovation Pvt. Ltd.* based at Sotanala, Behror, Rajasthan. His endeavours were recognized at the 8th National Grassroots Innovation Awards of NIF (2015).

He was also selected as an In-Residence scholar of the Rashtrapati Bhawan in 2017 (Fourth Batch). *Geniusenergy Critical Innovation Pvt. Ltd.*, is recognised as a start-up by DIPP (Reg No. 7757). The company is selling more than 100 units of boilers per year. Recently, the Innovator got an award from the Association for Rising and Talented Personalities.

deep interest in steam based technology. In class 8th, he developed a small steam turbine of ½ kW which could light a bulb of 6W with a mechanism of recycling steam. With time, his interest in steam technology grew further and he devoted a lot of time for research on steam technology. In 2000, he developed a 2 kW engine with a modified design. Later in 2013, he designed an efficient heat exchanger for exhaust of a steam engine and the feed water (economiser).

Genesis

Traditionally, mawa is being made in kadai on an open stove by burning fire wood. An improved technique for the commercial production of mawa is by making use of steam for heating milk. In place of direct flame heating, the wood is burned in the boiler and steam produced is distributed to a number of kadai fitted with steam jacket. After heating the milk, exhaust steam is collected at bottom and condensed in open tank. As the systems are not properly fitted, a lot of steam escapes from various joints. These leakages reduce the efficiency of the system, which results in higher steam consumption, more wood consumption and also a lot of water. As the water used in steam generation is normal (untreated) water, higher throughput of steam causes more scaling in boiler, further reducing the heat transfer efficiency and also the life of the boiler.

Subhash saw a boiler based mawa making machine at an industry in Jaipur. At that point of time, he was trying to design improved boilers. After interacting with the industry person he got perturbed by the amount of wood and water consumed to make mawa. The machine uses over 100kg of wood and 4000litres of water to extract mawa from 100 lit of milk. It also consumed considerable amount of electricity for running chiller pump to condense the rejected steam, making the whole process very costly.

He started to improve the design of boiler in the mawa

making machine and after almost ten years of hard work, he successfully developed the improved boiler based machine for making mawa in year 2009.

Modified boiler for making mawa

The boiler used in mawa making was developed in such a way that the steam circuit (boiler, kadai, condenser, pipes) has been made as a closed leak proof design resulting in better fuel efficiency and minimal wastage.

The used steam is also fed to the boiler along with condensate water through gravity. The close circuit design stops leakages, thereby reducing the additional water requirement (reducing from 1ton per hour to few litres per hour). Also the wood consumption has reduced drastically using redesigned boiler with horizontal fire tubes, preheating of air with flue gases, and recycling of the steam back to boiler without condensation. The water filled in the boiler can be continuously used for a long time unlike traditional mawa machines, where it has to be filled almost every half an hour.

Further to reduce human efforts, he has made the stirring operation automatic. In conventional practice of mawa making in kadai, continuous stirring is needed to prevent milk fat from sticking to the walls of container. For this, at least one person is needed at each kadai. Subhash has designed an automatic machine, which can process 10-12 litres milk in a single batch with mechanized stirring and unloading of the mawa prepared. The heating requirements are accomplished by steam supplied from a wood fired horizontal fire tube boiler in closed circuit. The boiler is supplied with preheated air (heated using flue gases) by a blower, which is connected via a pressure actuated switch. The automatic operation of the boiler and machine reduces the wood consumption per unit of mawa produced, while saving labour costs. This concept can also be used for efficient heating in dairy & food processing, textiles, rubber, plastic industries.