# STEAM AUDIT – Greece, nr. 3
## FACTSHEET

**Companies connection to energy efficiency**

The company is certified according ISO 9001:2000.

**Steam system**

The enterprise was founded on August 1st 2005. Its main process is the production of biofuels from used cooking oils and vegetable. Biodiesel is produced from vegetable oils or animal fats and an alcohol, through the transesterification reaction. This chemical reaction converts an ester (vegetable oil or animal fat) into a mixture of esters of the fatty acids that makes up the oil (or fat). Biodiesel is obtained from the purification of the mixture of fatty acid methyl esters. A catalyst is used to accelerate the reaction. According to the catalyst used, transesterification can be basic, acidic or enzymatic, the former being the most frequently used.

**Steam boiler information**

Size: Steam Boiler: Steam Boiler 1: 5 MWth, Steam Boiler 2: 5 MWth
Nominal steam capacity: Steam Boiler 1: 8,000 kg/h @ 8 bar gauge, Steam Boiler 2: 8,000 kg/h @ 8 bar gauge
Boiler's operation: 8,000 hours/year
Kind of fuel: Steam Boiler 1: Methyl Ester Fatty Acids, Steam Boiler 2: Heavy Oil

**Steam system problems identified**

✓ The excess air (40,28 %) of steam boiler 1 is considered to be excessive and results in heat losses due to the heat transfer to the excess ambient air.
✓ A considerable amount of flash steam is vented from the condensate tank. This is probably due to improper design of the condensate tank entry and exit streams.
✓ The flue gas temperatures of both steam boilers are slightly higher than the normal operating conditions and this is a source of waste heat recovery.
✓ The steam boiler has some heat leakage areas on its envelope and pipework. The rear end of the boiler is partly insulated resulting in many heat losses.
✓ The steam condensate tank has a large area that is currently un-insulated.
✓ Some sections of the pipe network are un-insulated (mainly the hydraulic valves).

**Proposed energy saving measure(s), investments, and expected results (in figures)**

- Insulate un-insulated steam distribution: 110,400 kWh/year => Simple payback < 6 months, Energy savings in fuel consumption: 3,680 kWh/m.
- Insulate condensate lines: 48,000 kWh/year (steam condensate)=>Simple payback < 6 months, Energy savings in fuel consumption: 1,600 kWh/m.
- Insulate un-insulated hot surfaces (steam boiler, hydraulic valves, flanges etc.) 103,950 kWh/year => Simple payback < 1 year, Energy savings in fuel consumption: 14,.850 kWh/m.
- Flue-gas economizers for waste heat recovery: 310,147 kWh/year=> Simple payback = 5,7 years, Cost: 70,000€, Annual fuel savings: 12,243€.
- Install an automatic blow down control system: 134,847kWh/year. Simple payback = 3 years, Cost of measure: 16,000€ Annual fuel savings: 5,323 €.
- Waste heat recovery boiler blow down: 94,393 kWh/year=> Simple payback = 6,7 years. Cost of measure: 25,000€ Annual fuel savings: 3,726 €.
- Retrofit de-aerator on condensate tank: 269,693 kWh/year => Simple payback = 3,7 years, Cost of measure: 35,000€, Annual fuel savings: 10,646 €.
- Reduce excess air in steam boiler 1.
- Energy consumption monitoring system.

**Greece**

**Biofuels**

**Production of biodiesel (100%)**

**Number of employees: 20**

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**Total (estimated) Investment**

~€ 155,000

**Total (Estimated) Savings**

1,07 GWh/yr

**Non Energy Benefits**

Reduction of chemical agents

Reduced maintenance costs

Prediction and repair of

malfunction of the system

**Implemented proposed energy saving measure(s), investments and results achieved (in figures)**

The proposed measures are not yet implemented.

**Achieved and/or expected Non Energy Benefits (NEBs) as result of implemented and/or proposed measures and investments involved**

Expected NEBS as a result of proposed measures:
- ✓ Reduction of chemical agents by installing a retrofit de-aerator on the condensate tank.
- ✓ Improve steam quality.
- ✓ Reduce maintenance costs
- ✓ Prediction and repair of malfunction of the system
- ✓ Facilitation of the personnel to control and supervise  the system

**Involvement of internal stakeholders**
Centre for Renewable Energy Sources and Energy Saving

We were interested to find solution to decrease the energy cost and the STEAM UP programme was very interesting. The programme was proposed by CRES. Personel and auditors of CRES came then into the factory to make the necessary measurements.