MÒRe MARKET OF OLIVE RESIDUES FOR ENERGY

BUSINESS PLAN

BUSINESS PLAN FOR THE TRUŠKE INN

Comparative Feasibility Study of Heating with Olive Pits and Extra Light Fuel Oil

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Koper, February 2010

Intelligent Energy Europe

1 CONTENTS

2 INTRODUCTION

Each major change in the heating system of a certain building or facility requires an economic analysis to envisage the scope of investment and to establish its economic justification.

The business plan includes the following contents:

- Exploitation of olive pomace and pits for energy production
- Evaluation of transportation costs
- Savings in thermal energy supply

In the Republic of Slovenia (RS), there operate twelve registered olive mills processing around 1200 tons of olives per year (depending on the harvest). According to the 2007 Statistical Yearbook of the RS, in 2006 Slovenia boasted 781 ha of intensive olive orchards owned by a number of olive growers (in 2006, their number amounted to 1,639). Owing to ownership fragmentation, it is rather difficult to gather large quantities of pomace and to supply them to interested users who would use them for heating. In order to implement an automatic heating microsystem or a CHP (combined heat and power) system, one needs large quantities of olive pomace, which under given circumstances individual olive growers find them hard to supply.

The data on average annual volume of olives processed in the region of Slovene Istria between 2005–2007 are shown beneath. Table 1 shows annual olive processing by technique.

(Source: *Sonaravno ravnanje z ostanki predelave oljk [Sustainable Management of Olive Residue]*, Annales Publishing House, 2008)

Table 1: Data on olive processing by processing technique

Technique	Olives processed (t) per year	Olive oil produced (t)	Olive residue (t)	Vegetable water (t)
Olive press	284.8	53.81	121	227-284
2-phase process	250.8	48.92	141	200-250
2.5-phase process	688.6	141.87	390	550-688
TOTAL	1224.2	244.6	653	978-1223

Source: Sonaravno ravnanje z ostanki predelave oljk, Annales Publishing House, 2008

Table 2 shows moisture content in olive pomace. Moisture contents in olive pomace obtained through the 2-phase and 2.5-phase systems are considerably higher than that in pomace obtained through the traditional method (27.29%).

Table 2: Moisture content in olive pomace and olive residue in tons

Olive processing technique	Moisture content %	Residue with 12% moisture content (t)
Traditional method	27.29	109
2-phase system	65.03	103
2.5 phase system	55.4	297

Olive pomace can be used for heating once it has been dried when its moisture content does not exceed 15%. If not dried, pomace exhibits a lower heating value. To provide an example by analogy with wood: each 10% of water in wood reduce its heating value by 12%, with the difference in energy being used for water evaporation.

In the present business plan, all data on the amount of potential energy are given for heating materials with a 12% moisture content. The same moisture content was exhibited by samples subjected to the measurement of the energy value of olive residue obtained through different olive processing technique. The data obtained were used for all further calculations.

Table 3: Energy value of olive residue

Olive processing technique	Energy value (kWh/kg)
Traditional method	5.15
2.5-phase system	4.56
Olive pits	4.88

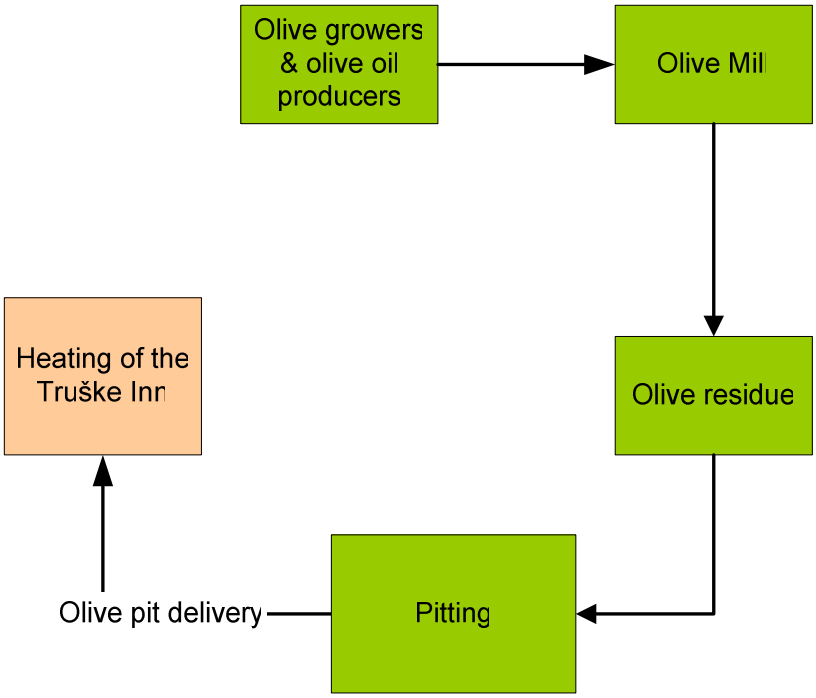
Theoretically, the total energy potential of all olive residue in Slovenia is 2,015 MWh, which equals the energy potential of 196,614 l of heating oil. Unfortunately, this huge potential is only poorly exploited. Currently, only around 5% of olive residue is used as a source of thermal energy. According to the data available, only three Slovene olive mills use olive pomace for space heating and sanitary hot water production. Supposing all residue was used for heating and a household (a family house) needed 2,000 l of heating oil per year, the Slovene olive residue would suffice for heating 98 households. At the time being, 95% of residue is returned to olive growers who use it as a fertilizer.

3 ANALYSIS – TRUŠKE INN

3.1 SUPPLY ANALYSIS

The Truške Inn currently uses extra light fuel oil for heating the entire facility. Its owner is interested in replacing it with olive pits.

Figure 1: Chain of olive pit supply for heating purposes

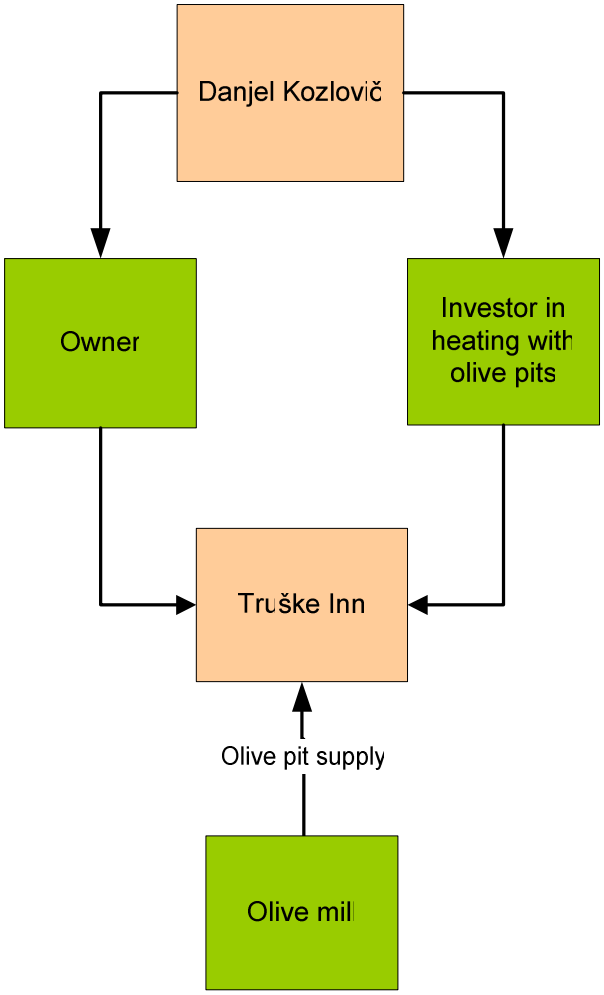


3.2 ORGANIZATIONAL AND OWNERSHIP STRUCTURE

The Truške Inn is privately owned, and so one and the same person is:

- The owner of the building and the heated space
- The investor in the implementation of the new heating technique

Figure 2: Ownership structure



3.3 HEATING TECHNIQUE

3.3.1 Technique Currently Used: Heating with Extra Light Fuel Oil (Variant 1)

The tourist facility currently uses extra light fuel oil for heating. The total heated surface area covers 350 $m^{2,}$ which includes six rooms and two apartments for tourists, a storehouse, a kitchen, a dining hall, bathrooms and toilets. The power of the boiler currently in use is estimated to be 100 kW (the estimation was done on the spot as the boiler has no specification with technical characteristics).

Figure 3: Truške Inn and the boiler with the burner currently used

In the last few years, the average annual consumption of fuel oil (for heating the entire facility) amounted to 4,400 l or 45 MWh of thermal energy.

3.3.2 Heating with Extra Light Fuel Oil and Boiler Room Renovation (Variant 2)

In future, the facility could still be heated with extra light fuel oil on condition that it witnessed the installation of a new boiler of a lower maximum power, a new burner and an automatic regulation system. The calculation of the thermal energy needed for heating the facility was made on the basis of the average energy consumption in the last few years.

The new heating system would be composed of:

- Boiler using ELFO
- Burner using ELFO
- Automatic regulation system

3.3.3 Heating with Olive Pits (Variant 3)

In future, olive pits could be used for heating the facility. Dried pits would be supplied by an olive mill operating in the vicinity. Currently active only in the field of olive oil production, the mill generates a large quantity of olive residue, which is returned to olive orchards as mulch. The calculation of the thermal energy needed for heating the facility was made on the basis of the average energy consumption in the last few years.

The new heating system would be composed of:

- Olive pit burner

- Olive pit storage tank
- Olive pit feeder (snail) and
- Automatic regulation system

3.4 TRANSPORTATION

According to the agreement between the owner of the facility (who intends to use olive pits for heating purposes) and the supplier of dried olive pits, the transportation costs will be included in the price of pit supply. The owner of the heated facility will therefore have no direct transportation costs. In view of that, the business plan envisages no transportation costs.

3.5 ECONOMIC AND FINANCIAL ASPECTS

3.5.1 Technical Data

Table 4 shows the comparison of main technical data related to both heat generating variants.

Table 4: Comparison of technical data – Truške Inn

	Variant 1 (ELFO)	Variant 2 (ELFO)	Variant 3 (Olive pits)
Thermal energy consumption (MWh/year)	34	34	34
Boilers	Extra light fuel oil: 90kW	Extra light fuel oil: 50kW	Olive pits: 90 kW
Boiler efficiency (%)	70–75%	90%	70 -75%
ELFO consumption (l)	4,400	3,960	0
Olive pit consumption (t/year)	/	/	9.6

Heat generation with the technique currently used (Variant 1) requires 6,500 l of fuel oil per year, while heat generation in accordance with Variants 2 and 3 would require 3,960 l of fuel oil and 9.6 ton of dried olive pits respectively.

3.5.2 Investment

The costs arising from the renovation of the boiler room are shown in Table 5. The costs of boiler room renovation envisaged by Variant 2 would amount to €3,100. If Variant 3 was implemented, the purchase of a new burner would cost €5,800, while the boiler would not need to be replaced. Additional costs in the amount of €1,200 would arise from the installation of the burner and from minor renovation works of the building related to olive pit delivery.

Table 5: Investment – Truške Inn

	Boiler with equipment	Installation	Total
Variant 2 (ELFO)	€2,600	€500	**€3,100**
Variant 3 (Olive pits)	€5,800	€1,200	**€7,000**

3.5.3 Cost of Energy-Generating Substances

The facility consumes 67 MWh of thermal energy per year. Table 6 shows the costs of energy-generating substance for all the three variants: heating with extra light fuel oil with or without boiler room renovation and heating with olive pits. In case of Variant 1, the annual costs of heating amount to around €2,890, in case of Variant 2 to €2,610, and in case of Variant 3 to €1,280. The estimation was made on the basis of the current price of fuel oil and the price of olive pits (€26/MWh). The pits will be supplied by the Hrvatin's Olive Mill, with the price being already determined.

Table 6: Annual costs of energy-generating substance – Truške Inn

Annual costs	Variant 1 (ELFO)	Variant 2 (ELKO-renovation)	Variant 3 (Olive pits)
Olive pit price	/	/	26 €/MWh
ELFO price	€62/MWh	€62/MWh	/
Fuel price	€2,800	€2,520	€1,170
Costs of electric energy	€90	€90	€110
Total costs of energy-generating substance	**€2,890**	**€2,610**	**€1,280**

3.5.4 Operating and Maintenance Costs

Smooth operation of the heating system requires occasional minor repairs. Operating and maintenance costs are slightly higher in the case of heating with olive pits (Variant 3). Higher costs arise from the fact that such a heating system needs more frequent maintenance since it is composed of a different type of feeder (the snail operates on machine drive) and a bigger number of components.

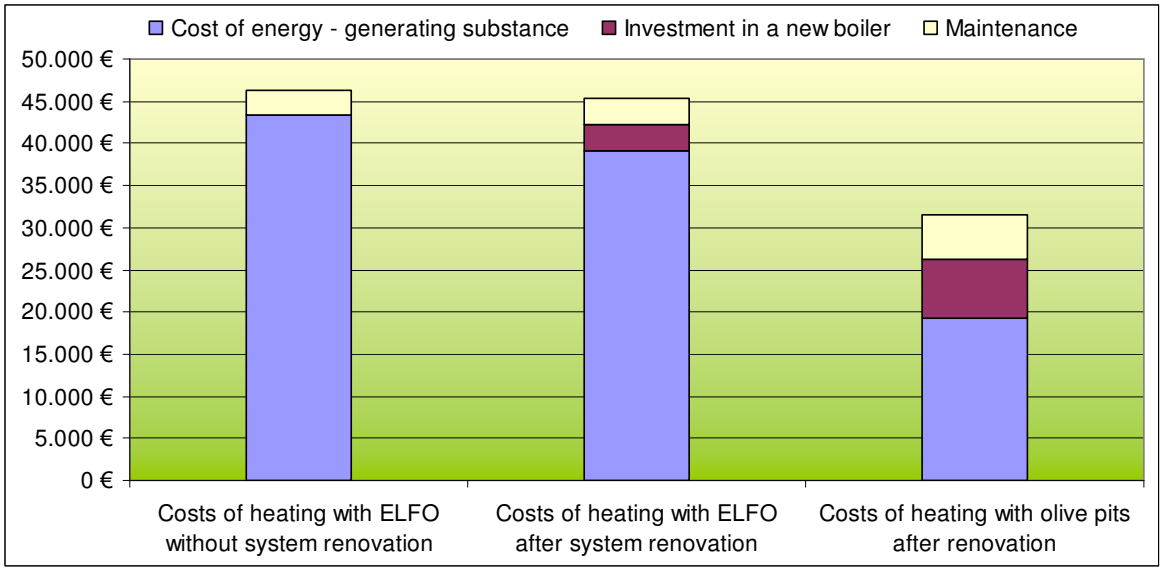
Table 7: Operating costs and labour costs – Truške Inn

Annual costs	Variant 1 (Boiler currently used - ELFO)	Variant 2 (New boiler- ELFO)	Variant 2 (Olive pits)
Total annual operating and maintenance costs	**€200**	**€200**	**€350**

3.6 COST-BENEFIT ANALYSIS

Diagram 1 shows annual costs of heating for all the three variants (heating with extra light fuel oil with or without boiler room renovation vs. heating with olive pits after renovation) for the next 15 years. Variant 1 envisages that the existing system of heating with extra light fuel oil will stay in use. The costs of heating and maintenance within the next 15 years would then amount to €46,350. Variant 2 envisages the replacement of the boiler and the burner and the use of fuel oil; in the next 15 years, total heating costs would then amount to €45.250. Variant 3 (heating with olive pits) envisages the purchase of a new burner and its installation on the existing boiler. In this case, total costs for the same period would amount to €31,450. The calculation was made on the basis of the current price of fuel oil and the current price of olive pomace (26 €/MWh).

Diagram 1: Heating costs within 15 years – Truške Inn



For the envisaged period of 15 years, the difference between total costs of heating with extra light fuel oil after boiler room renovation and heating with olive pits amounts to €13,800, with the latter being more economical than the former. The calculation was made on the basis of the current prices of the two energy-generating substances and regular maintenance of the heating systems. However, it has to be stressed that an increase in the price of fossil fuels would automatically lead to an increase in the price of renewable energy sources (RES). In this case, the RES prices would change in accordance with the situation on the market.

4 CONCLUSION

In conclusion, it has to be emphasized that in future large quantities of olive pomace obtained through olive oil processing will pose a major problem to olive oil producers. The pomace will still be partly deposited over the soil in olive orchards, while the rest could be carted away to the nearest dumping area, which however is not reasonable. (Relevant Slovene legislation still regards olive pomace as waste and does not encourage new investments.) Therefore it is highly recommendable to encourage the exploitation of olive pomace and pits for energy-generating purposes. Thus we will not only diminish the use of fossil fuels and decrease the quantity of waste deposited in dumping areas, but also protect the environment from pollution. Successful implementation of the project proposed will be the best promotion of the use of olive pits as a RES.

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5 LIST OF TABLES, DIAGRAMS AND FIGURES

5.1 LIST OF DIAGRAMS

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