Subject of presentation

ENERGY-SAVING TOBACCO BARN
Introduction

The activity of the company is:

- implementation of patented drying system in production of energy-saving tobacco barns
- to develop more efficient curing schedules in order to achieve higher quality of dry leaf with low energy consumption
- to apply new drying system on various agricultural products such as fruits, vegetables, mushrooms, medical herbs etc.
- presentation of tobacco barn to the potential customers

Our goals are:

- to make our dryers be recognizable for their characteristics and quality
- to encourage the use of renewable energy sources
- to introduce our tobacco barns to overseas markets
Tobacco bulk curing technology

- Virginia type tobacco to be cured in tobacco barn
- Barn consists of energy chamber with air heating generating equipment and tobacco drying chamber
- Fresh tobacco leaves are compactly packed in metal racks and placed within drying chamber
- Heated air, forced by the fan, continuously circulates through the fresh tobacco taking away a moisture from green tobacco
- There are 3 main stages during tobacco bulk curing:
  • I stage - yellowing (air recirculation without moisture removal)
  • II stage - leaf drying (air circulation with recuperation and moisture removal from the barn)
  • III stage - stem drying (air circulation with recuperation and moisture removal from the barn)
- Conditioning of tobacco is the last phase where moisture is added to allow easily handling
- Adequate moisture, temperature and air flow pressure are maintained during each stage of curing process
Tobacco curing schedule

Tobacco drying air

Temperature

Relative humidity

°C

th %

0

5

10

15

20

25

30

35

40

45

50

55

60

65

70

75

80

85

90

max. 123 h
From field to dried tobacco 1

tobacco field

tobacco leaves compactly packed in racks

metal rack

tobacco arrives from the fields
From field to dried tobacco 2

- Tobacco barn / 60 racks
- Tobacco leaf loading
- Filled barn with green tobacco / 60 racks
- Dried tobacco
1. Recovery of heat energy from hot and wet exhaust air by using air-to-air plate heat exchanger
2. Hot-water boiler produces hot water with temperature below 90°C which is used for heating the drying air
3. Continuous supply of energy to water-to-air heat exchanger and maintaining the drying air temperature before being introduced into the drying chamber
4. Simple control of all stages of curing process due to automatic regulation of temperature, moisture and air flow volume
5. Tobacco moistening is performed by over-heated water steam
Tobacco curing station scheme

GREENHOUSE
2000 - 2500 m²

SOLAR COLLECTORS
(optional)

HEATING 20 HOUSES

HOT WATER 80 °C
Advantages over existing tobacco barns

- Huge fuel conservation
- Improved quality of dried tobacco leaf
- Reduced labor costs
- Reduced emissions of greenhouse gases
- Other advantages
Huge fuel conservation

- natural gas, 32.4 MJ/m³, consumption is 0.32 m³ per 1.0 kg of dried tobacco
- **1 barn saves 4900 m³ of natural gas per season**
- energy savings is achieved by using only heat recovery from hot and wet exhaust air
- by adding of solar collectors and heat pump significant fuel reduction will be achieved
- by choosing appropriate hot-water boiler our tobacco barns can use:
  - a) fossile fuels: coal, diesel oil, natural gas, LPG, LNG
  - b) renewable energy sources: log wood, pellets or briquettes made of wood, rice husks, straw, corn stalk, tobacco stalk and other locally available biomass
Fuel consumed per 1 kg of dried tobacco

- **Natural gas / 0,32 m³**
  - 32,4 MJ/m³

- **Coal / 0,88 kg**
  - 13,4 MJ/kg

- **Fuel oil / 0,26 kg**
  - 41,2 MJ/kg

- **Straw in bales / 1,05 kg**
  - 13,0 MJ/kg

- **Tobacco stalk / 0,85 kg**
  - 16,0 MJ/kg

- **Corn stalk / 0,94 kg**
  - 14,5 MJ/kg

- **Straw pellets / 0,85 kg**
  - 15,0 MJ/kg

- **Wood pellets / 0,69 kg**
  - 17,5 MJ/kg

- **Log woods / 0,85 kg**
  - 15,0 MJ/kg
Significant higher quality of dry tobacco leaf is possible due to applied patent solution which guarantees:

- continuous supply of energy to water-to-air heat exchanger for evenly heating of drying air
- humidity, temperature and air flow volume of drying air exactly as per set value during each stage of curing process
- easy programming of set values depending on leaf maturity and position, climatic conditions and varieties of flu-cured tobacco
- gradually increasing of temperature without oscillation in temperature
- simultaneously cooling and moistening of tobacco leaf
- moistening of tobacco is done by over-heated water steam
lower fuel consumption = lower CO2, SO2 and NOx emissions

This will allow:
- minimum environmental pollution
- support of Kyoto Protocol
- participation in carbon trading market on local Emissions Trading Scheme (ETS)

1 barn saves 4900 m3 of natural gas per season
1 barn = 8,82 tons of CO2 emission less per season
Other advantages

The most advanced bulk curing technology is applied which enables:

- increased curing capacity
- reduced curing time
- reduced time of cooling and moistening
- much longer period of exploitation due to low working temperature
- modular production providing easy assembling/disassembling with further dislocation
- boiler room can be built for one or more tobacco barns
- easy operation and simple control
- excluding possibility of fire
# Tobacco barn features

<table>
<thead>
<tr>
<th>Construction</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>overall barn dimensions, m</td>
<td>2.7 x 3.1 x 6.1</td>
</tr>
<tr>
<td>drying chamber dimensions, m</td>
<td>2.7 x 3.1 x 4.1</td>
</tr>
<tr>
<td>walls and roof</td>
<td>insulated metal panels</td>
</tr>
<tr>
<td>period of exploitation, years, min</td>
<td>30</td>
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</tbody>
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<thead>
<tr>
<th>Curing capacity</th>
<th></th>
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<tbody>
<tr>
<td>average loaded green tobacco, kg</td>
<td>5200</td>
</tr>
<tr>
<td>average dried tobacco per batch, kg</td>
<td>650</td>
</tr>
<tr>
<td>average batches per seasons</td>
<td>13</td>
</tr>
<tr>
<td>average dried tobacco per season, kg</td>
<td>8450</td>
</tr>
<tr>
<td>average curing time per batch, hours</td>
<td>110-120</td>
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<th>Energy consumption / with heat recovery</th>
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<tr>
<td>fuel, netto calorific value, MJ/m3</td>
<td>natural gas, 32.4</td>
</tr>
<tr>
<td>natural gas consumption, m3/per 1,0 kg of dried tobacco</td>
<td>0.32</td>
</tr>
<tr>
<td>hot-water boiler power, kW</td>
<td>35</td>
</tr>
<tr>
<td>heat energy utilization in hot-water boiler, %</td>
<td>92</td>
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<tr>
<td>fan motor power, kW</td>
<td>3</td>
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Economical effects - summary

a) tobacco growers:
- savings on fuel costs and on necessary operating capital
- increased income and sale price due to higher dry leaf quality
- reduced labor costs - one central hot-water boiler
- very low maintenance costs
- hot-water boilers can be used for heating of greenhouses or buildings
- sale of CO2 on local Emission Trading Scheme (ETS)

b) local tobacco import/export companies
- improved dry leaf quality will enhance
  • the competitiveness of locally produced tobacco on the international market
  • substitution of imported tobacco with domestic produced high-quality tobacco

c) local producers of tobacco equipment and construction materials
- all materials and equipment necessary for barn’s construction will be produced locally
Recognize your interest

- promote modern tobacco agriculture
- strengthen your market position immediately
- secure the future business and protect yourself against your competitors
- earn more profit
- make your environment more clear and healthy

Because

- we have ready-made solutions which meet all tobacco growers requirements
- our barns are the best replacement for currently used tobacco barns
- you will be able to apply the most advanced bulk curing technology
- you will not spend money on expensive research programs
- still in 1975, we produced the first modern Yugoslav bulk curing tobacco barn
Conclusions

Adesco energy-saving tobacco barns:

- belong to the new generation of tobacco bulk curing barns
- promote advanced and innovated technology
- have huge fuel conservation
- guarantee the highest quality of dried tobacco leaf
- reduce labor costs
- reduce emissions of greenhouse gases
- help tobacco growers to secure higher profits
Are You ready for new technology ?
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THANK YOU!