

APROVIS ENERGY SYSTEMS

***Gas treatment systems and heat recovery solutions
for Thailand***

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COMPANY PROFILE



APROVIS PRODUCT DIVISIONS

Fuel Gas Treatment APROVIS

biogas, landfill gas, sewage gas, mine gas, flare gas, ...



Engine / Turbine

natural gas, biogas, diesel, heavy fuel oil

Customer

CHP = Combined Heat Power



 APROVIS

Exhaust Gas Heat Recovery

Hot Water, Steam, Thermal oil

WHY WE ARE LOOKING TO THAILAND?

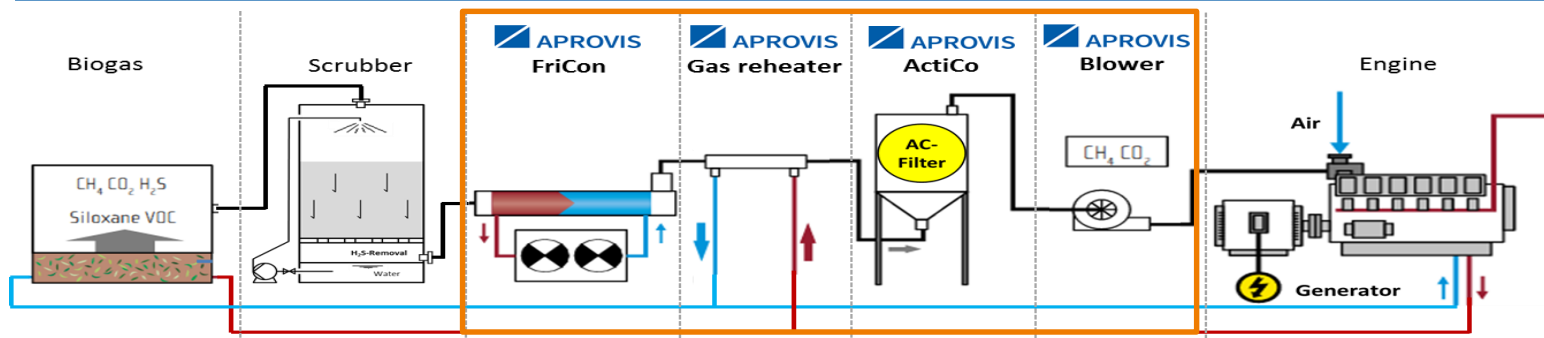
- **Biogas market (biogas, landfill, sewage gas..)**

- “Green Potential”: Sugar, Ethanol, Starch, ...
- Energy Crops = Biogas = production of electricity (gas engines or gas turbines)
 - Every biogas engine must have a **gas treatment = FriCon**
 - Potential to use the exhaust heat of the engine to heat up thermal oil or produce steam
- **Gas treatment systems** for Landfills and sewage gas treatment plant

- **CHP - Exhaust heat recovery systems for gas engines**

- Production of starch, sugar, palm oil needs thermal power
- Gas engines / gas turbines **with heat recovery = higher efficiency and reduced costs**
- Product of APROVIS:
 - **Heat recovery:** Steam boiler, hot water heat exchanger, thermal oil heat exchanger
 - Silencer, bypass system, catalyst

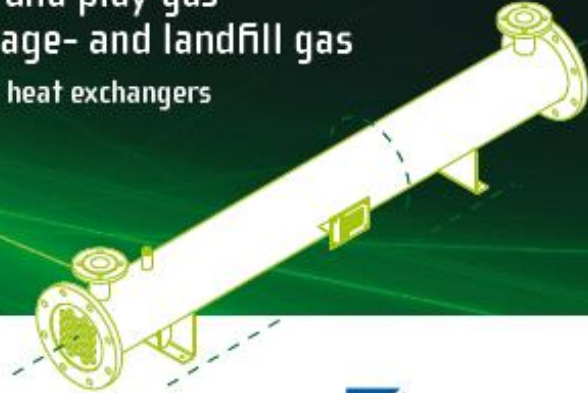
APROVIS – GAS TREATMENT PRODUCTS



1. **Digester:** Production of Biogas (Palm oil, Tapioca, ...)
2. **Bio-Scrubber:** Partial removal of H_2S < 200 ppm
3. **Gas cooling system *FriCon*:** Removal of humidity
4. **Gas-Reheating:** Adjusting the relative humidity
5. **Activated Carbon Filter *ActiCo*:** Removal of H_2S or Siloxane
6. **Gas booster / blower:** Delivery of biogas to the engine
7. **CHP-unit:** Electricity and Heat to customer

FRICON – GAS DEHUMIDIFICATION

Gas heat exchangers and plug and play gas treatment plants for bio-, sewage- and landfill gas
by the market leader for CHP exhaust gas heat exchangers



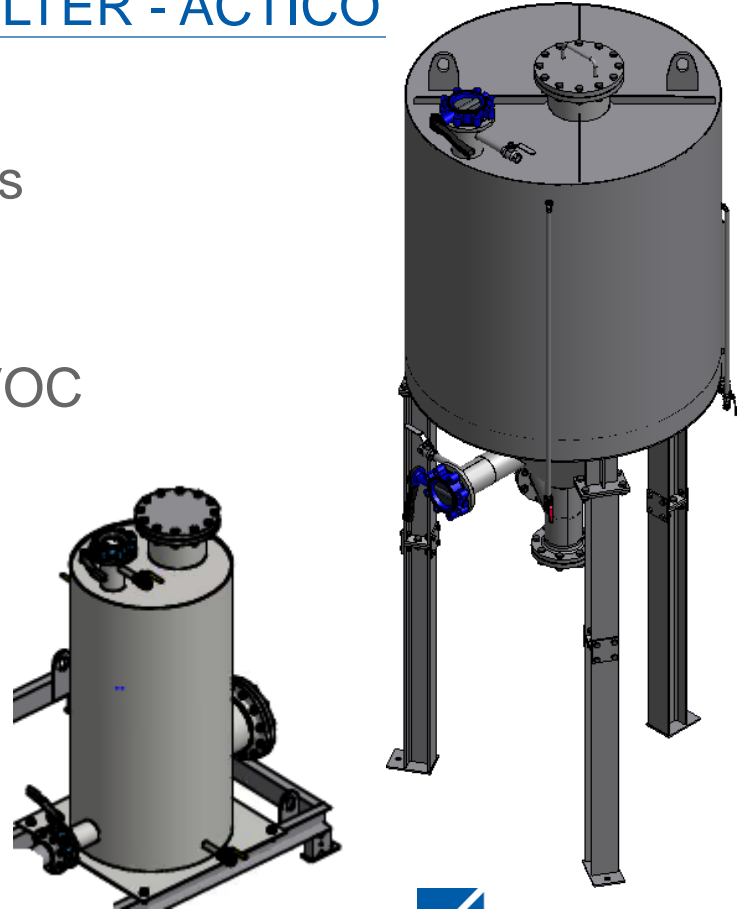
- Range 50 -10,000 Nm³/hr
- Outdoor installations
- Ready to connect system
- Mounted on a base frame

BENEFIT OF GAS DRYING

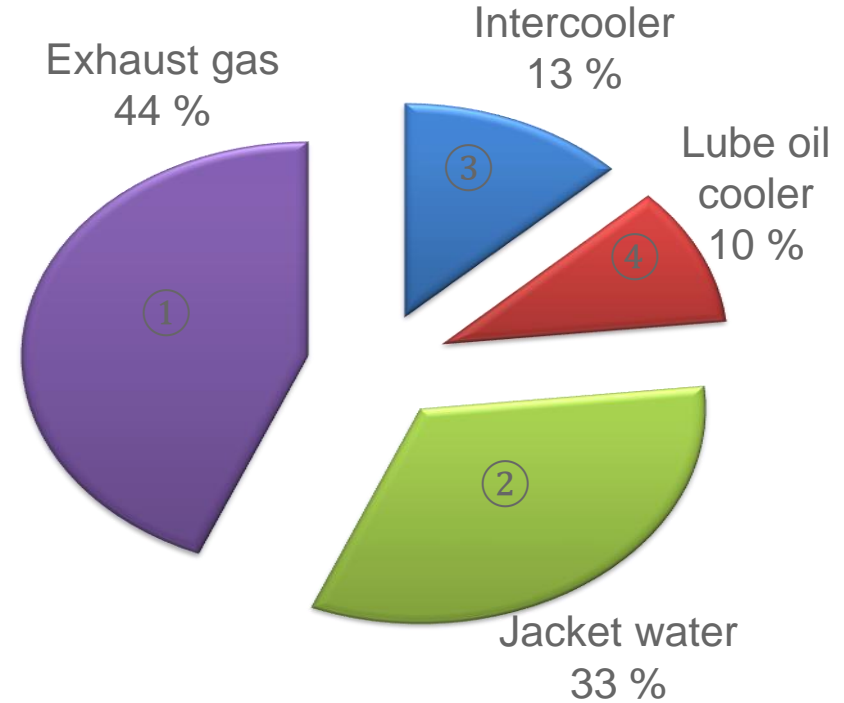
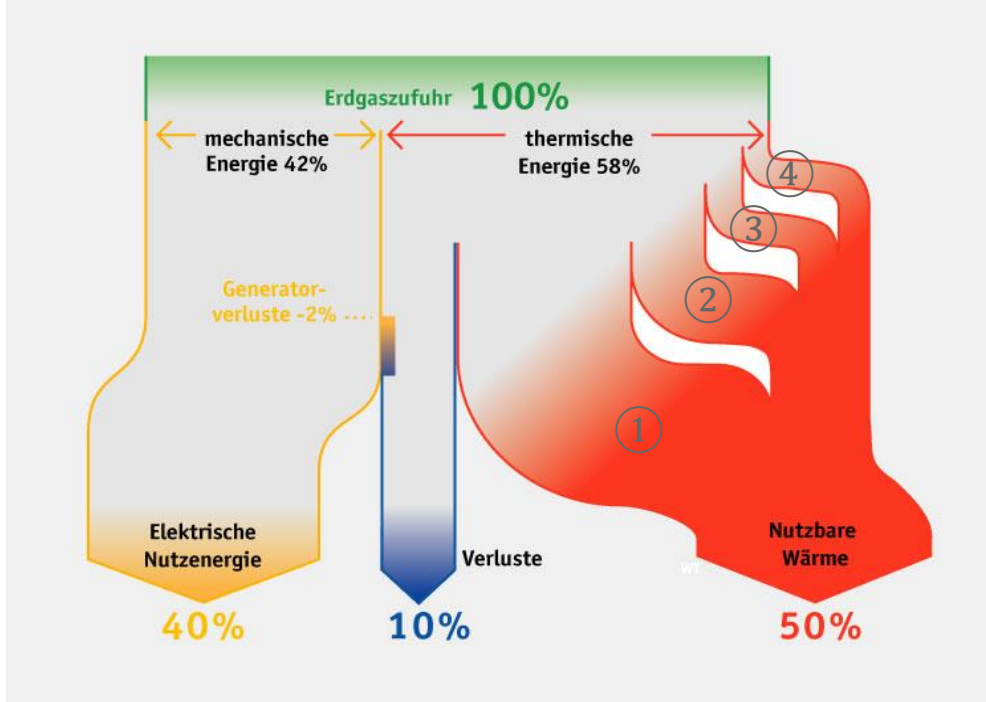
- Avoiding condensation in the following gas pipes and inlet section of the gas engine
- Gas is optimally conditioned for further cleaning steps (e.g. activated carbon)
- Partial separation of H_2S
- Separation of solid particles
- Optimizes the combustion process in the engine
- Improvement of the caloric value (less water content)

BENEFIT OF ACTIVATED CARBON FILTER - ACTICO

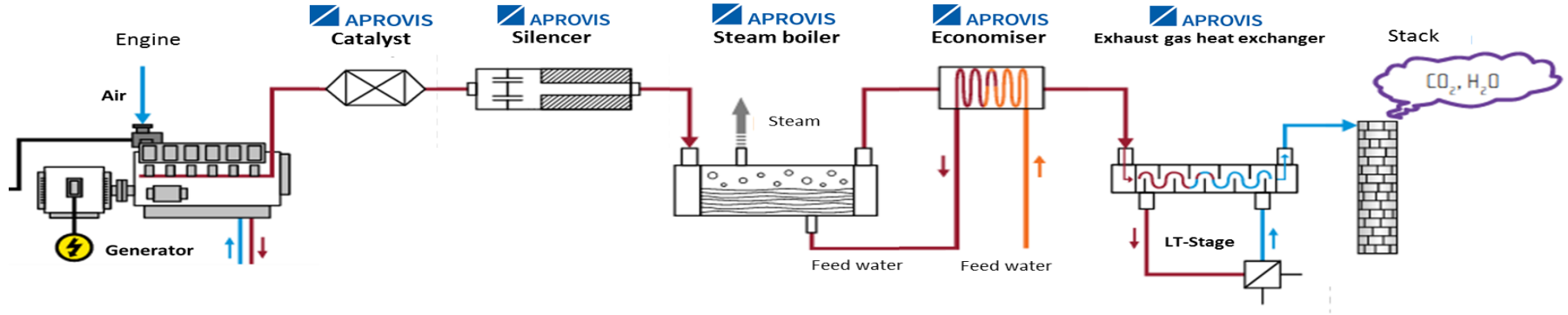
- Active carbon can adsorb harmful substances from inflammable gases because of its porous structure
- Removal of hydrogen sulfide and VOC by chemisorption
- Removal of siloxanes and VOC by physisorption



HEAT SOURCES FROM CHP



APROVIS – HEAT RECOVERY PRODUCTS



1. **Engine / Turbine:**

Electrical and thermal power (customer)

2. **Catalyst:**

Emission reduction (CO , NO_x , ...)

3. **Silencer:**

Noise reduction

4. **Steam Boiler:**

Saturated steam production (up to 30 barg)

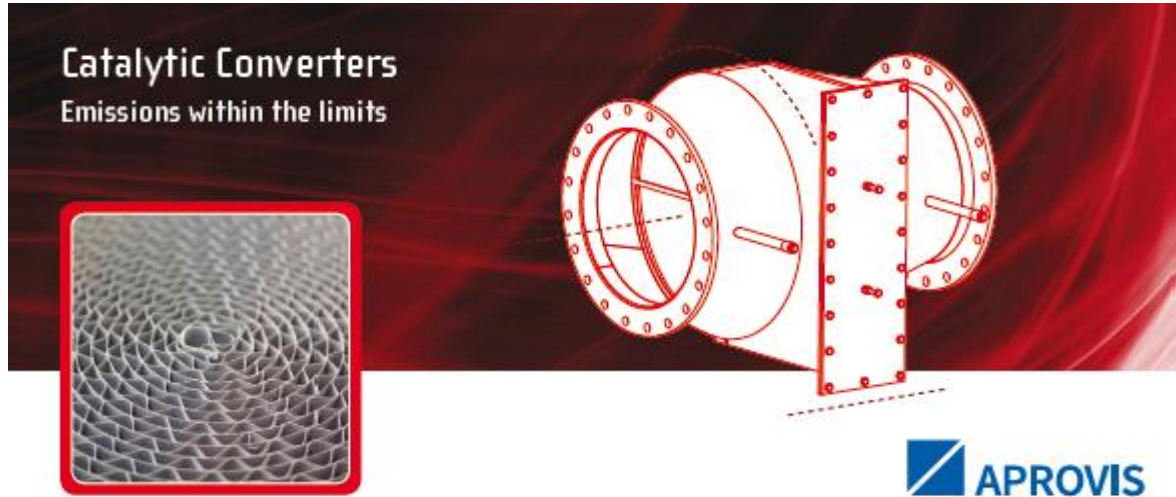
5. **Economiser:**

preheating of feed-water (higher efficiency)

6. **Exhaust gas heat exchanger:**

hot water (VAM) / thermal oil

CATALYTIC CONVERTERS



- **Oxidations catalyst:**
 - Reduction of Carbon monoxide (CO), Hydrocarbons (HC) and Formaldehyde (CH₂O)
- **Three-way-catalyst:**
 - Reduction of CO, HC (incl. CH₂O) and NO_x (only if $\lambda=1$)
- **SCR-catalyst**
 - NO_x and CO reduction

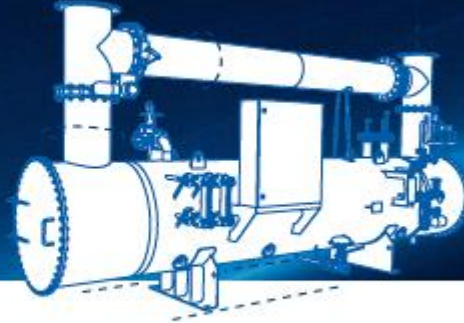
SILENCERS



- Consists usually of a reflective and an absorptive part
- reflective part reduces mainly low frequencies
- absorptive part reduces mainly high frequencies
- reflective part needs most of the pressure loss

STEAM BOILER / ECONOMISER

Heat Recovery Steam Generators and Accessories
from the expert in exhaust gas heat recovery

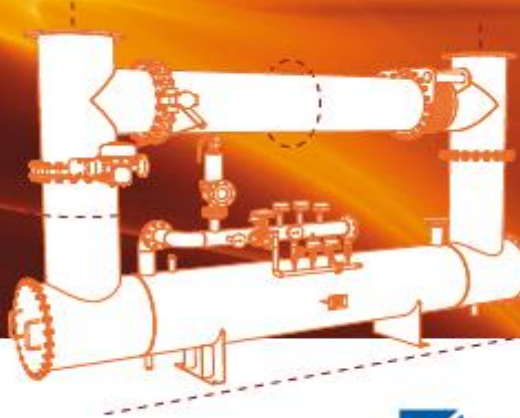


- Experience in more than 600 HRSG projects worldwide
- Range: 1 to 26 barg, 200 kg/hr – 26 to/hr
- Diameter up to 3,5m



EXHAUST GAS HEAT EXCHANGERS

Exhaust gas heat exchanger
from market leader in exhaust gas
heat recovery



- Exhaust gas heat exchanger
- Condenser
- Hot Water Boiler
- Thermal Oil Heat Exchanger
- Water Tube Heat Exchanger
- Air to air Heat Exchanger
- Water / water Heat Exchanger



EXAMPLES OF OUR OEM-CUSTOMERS



B35:40L



20V34SGD



J920



20V4000



TCG2020V20



G3516A

APROVIS COMPANY PROFILE:

Expertise

APROVIS is specialised in heat recovery and gas cooling systems for CHP applications

Competence

The APROVIS Group employs 300 people in engineering, design, production, logistics and service

Experience

Wide experience as OEM supplier for all major engine manufacturers

Worldwide

More than 70% export in 35 countries throughout the EU and worldwide

Certainty

Above 20,000 successful installations of Exhaust Gas Heat Exchangers & 600 projects with Steam Boilers



Thank you!

