



EnergiGruppen
JYLLAND

Anaerobic Digestion of MSW



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OWSEP Workshop

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Development of AD plants and progress in selected countries

Germany has self made on-farm plants, many are co-digesting wastes adding the income with a gate-fee due to environmental taxes. Now there is a turn-key industry for on-farm plants. Germany have more than 1500 plants, some are using MSW.

Denmark has developed centralised AD plants (20 CAD plants). They have been set up by farmers associations for farmers flexibility and the easiest way full fill environmental rules. Today many new on-farm plants are built like the German model, app. 50 on-farm plants are running.

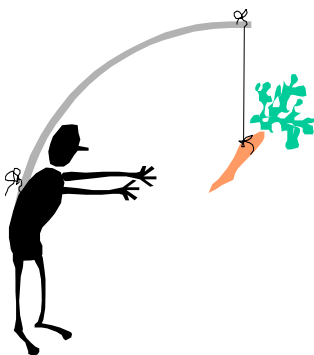
In **Sweden** the municipalities are building large AD plants to solve waste problems, some are treating MSW, but farmers are not involved. The biogas is used for vehicle fuel; for city busses or sold at filling station for private cars.

Italy is building low-cost and low-tech AD plants, often in covered slurry tanks (app. 70 plants).



Advantages of co-digestion organic wastes together with manure

- Increased gas production
- Gate fee
- Efficient digestion, synergetic effects
- Handling advantages
- Recircling of nutrients
- Cost of recircling and advantage of scale





Collection of MSW

Organic material from source separated garbage collection in 8 Danish cities.

	Flats (average 1,9 persons/flat)	Single family house (average 2,4 persons/house)
Restrictive source separation		
Kg/household/week	3,11	4,25
Kg/person/week	1,64	1,77
Less restrictive source separation		
Kg/household/week	4,15	5,18
Kg/person/week	2,18	2,16

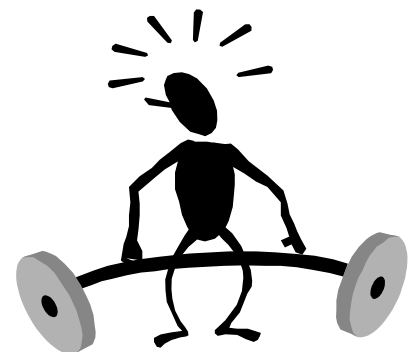
At the Household: Paperbags / plastic bags

Collection systems:

- Two Garbage bins / paper bags
- One bin - two Chambers
- Colored bags

Treatment system

- Simple presorting
- Pressing in screw press
- Optical sorting + one of the two



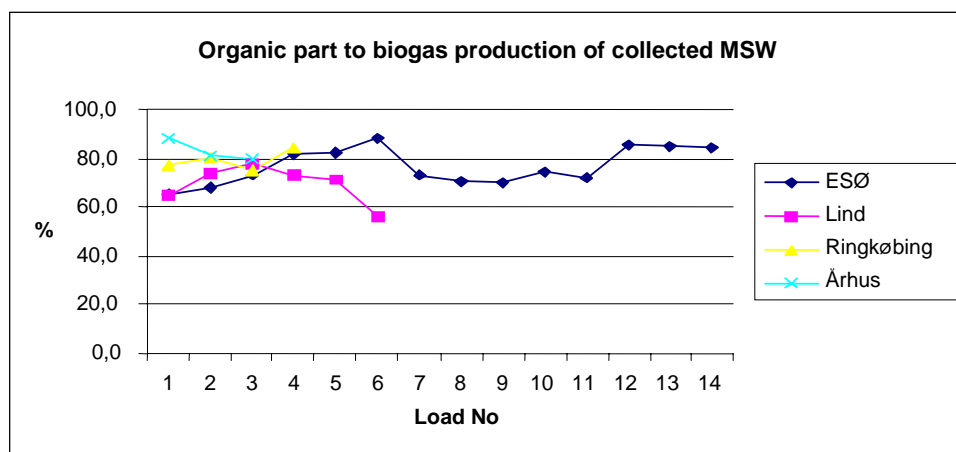


Experiences from MSW treatment

It is important to make a simple and uncomplicated system and logically criterias for sorting of MSW.

Information to the citizens. If they are in doubt, it gives problems later in the system.

Paying by weight - and taking in hand by showing a good example





Eksample: Studsgard biogas plant

The plant has been dimensioned to treat a total of 130,000 tons organic material per year.

- 110,000 tons/year of animal manure
- 15,000 tons/year of industrial wastes
- 5,000 tons/year of MSW.

The biogas plant consists of the following 4 main elements:

- Receiving and pre-treatment area.
- Hygienization and digestion area.
- Storage and separation.

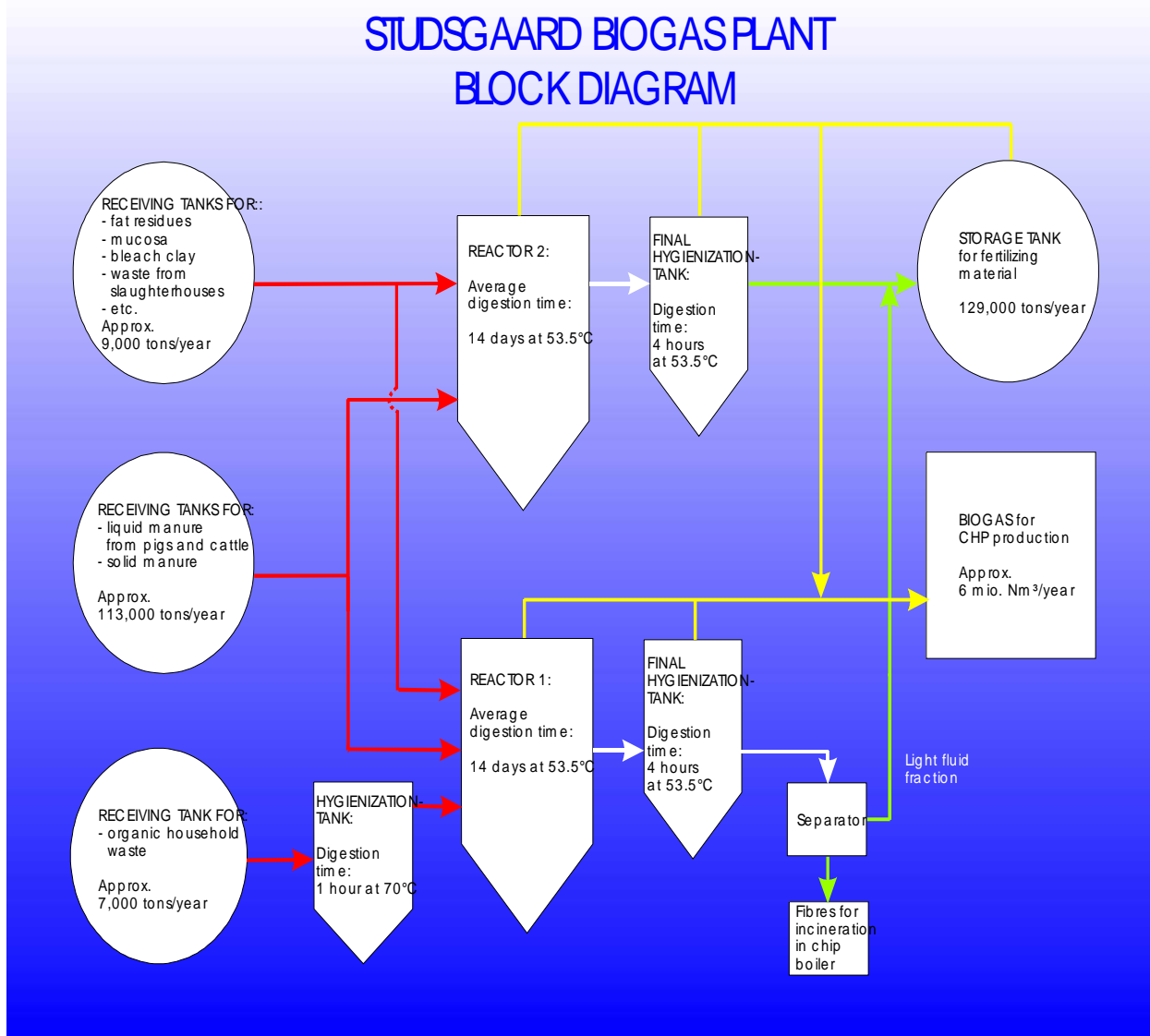
Gas plant including a purification and gas distribution system.

Production of biogas is app. 7 Mio. M3/year

- 65 m3/ tons biomass
- Gasengine on 2,7 MWe, 40 percent electricity efficiency
- 48 percent heat output

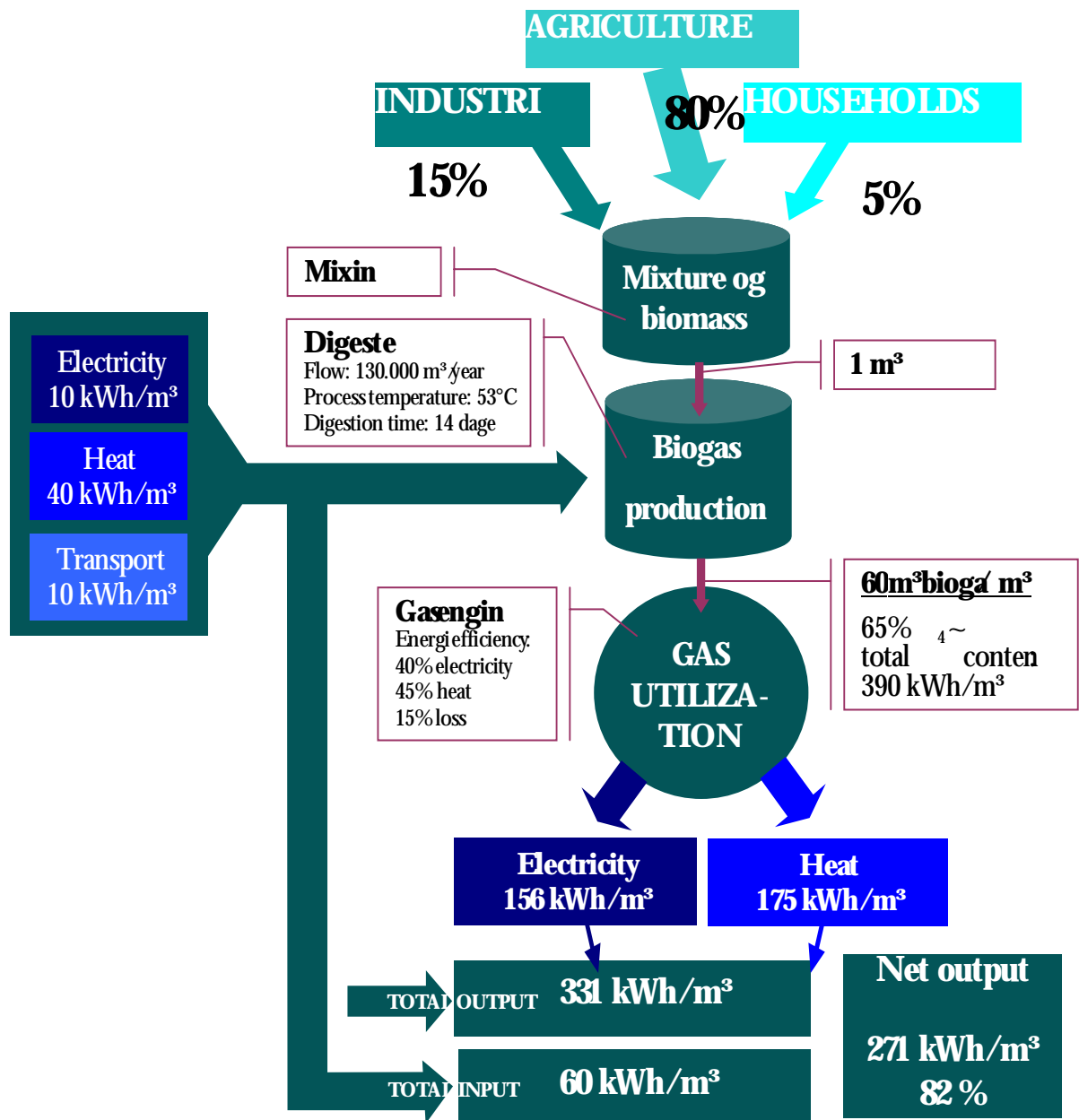


STUDSGAARD BIOGAS PLANT BLOCK DIAGRAM





Energy flow



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Agriculture

- First class organic fertiliser without restriction on landuse.
- New EU directive set rules on sanitation

Savings for Denmark by collection of 60 kg MSW/person/year,

- 2,500 tons of N, 250 tons of P and 520 tons of K
- equals 1 % of N, 1,4 % of P and 0,8 % of K in mineral fertilisers

Content and limit values for heavy metals and organic substances in MSW.

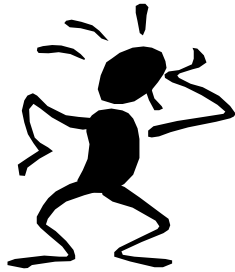
	Heavy metals (mg/kg DM)				Environmental foreign substances (mg/kg DM)			
	Lead	Cadmium	Mercury	Nickel	LAS ¹	PAH ²	NPE ³	DEHP ⁴
Found in pre-treated organic MSW (average)	10	0,2	0,1	5	<50	0,1	0,9	5
Limit value from	120	0,4	0,8	30	1.300	3	10	50

1) LAS: Linear alcybenzenesulfonates;

2) PAH: Polycyclic aromatic hydrocarbonates;

3) NPE: Nonylphenole (+ ethoxylates);

4) DEHP: di(2-ethylhexyl)phtalate.



Conclusions

- €It is possible to treat MSW in an AD plant and there is advantages compared with other treatment methods. Still running costs are high compared to co-digestion other waste products at AD plants
- €Both the pre-treatment and AD plant can be operated without working environment or environmental problems. Advantages have been proven focusing both in the planning stage
- €Physically placement of both plants is important concerning the environmental impacts, but also concerning logistics in collection of the MSW and distribution of the digestate
- €For process and operation it is essential to receive a homogeneous and high quality of MSW
- €Approx. 10 percent of the produced energy are used for processing in pre-treatment, sanitation and AD process
- €The digestate can be used as first class fertiliser without veterinarian restrictions
- €It is not easy to digest MSW, and lessons learned at existing plants must carefully be taken into account planning and building a new AD plant for MSW digestion

