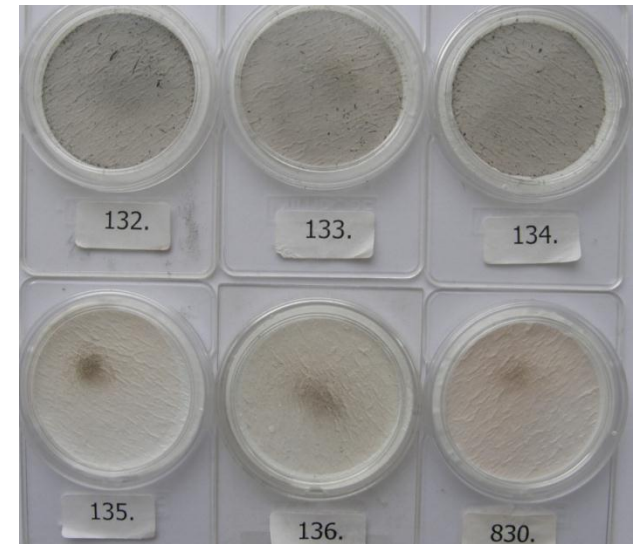
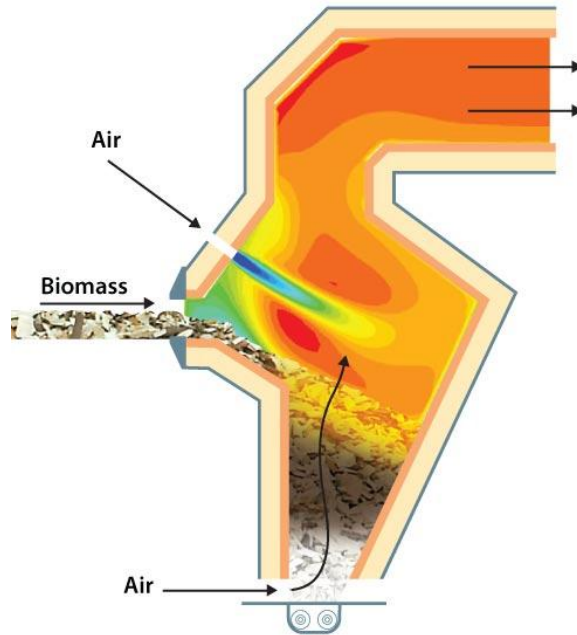


Prisbelønnet og ETV-verificeret forbrændingsanlæg

Jens Dall Bentzen, Dall Energy



Dagsorden

- **Introduktion til Dall Energy**
- **Dall Energy forbrændingsovn**
- **Verifikations projekt**
- **ETV måling**
- **Marked for prisbelønnet ovn**
- **Priser**



Baggrund for Dall Energy

Gasification for power production

Prof of concept

Upscale

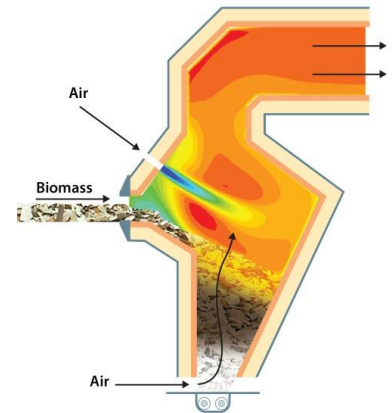


Patent and verification

Biomass Combustion

COWI
Consultancy
(+ license)

Dall Energy
License
(+consultancy)



DTU

COWI

Dall Energy

1995

2000

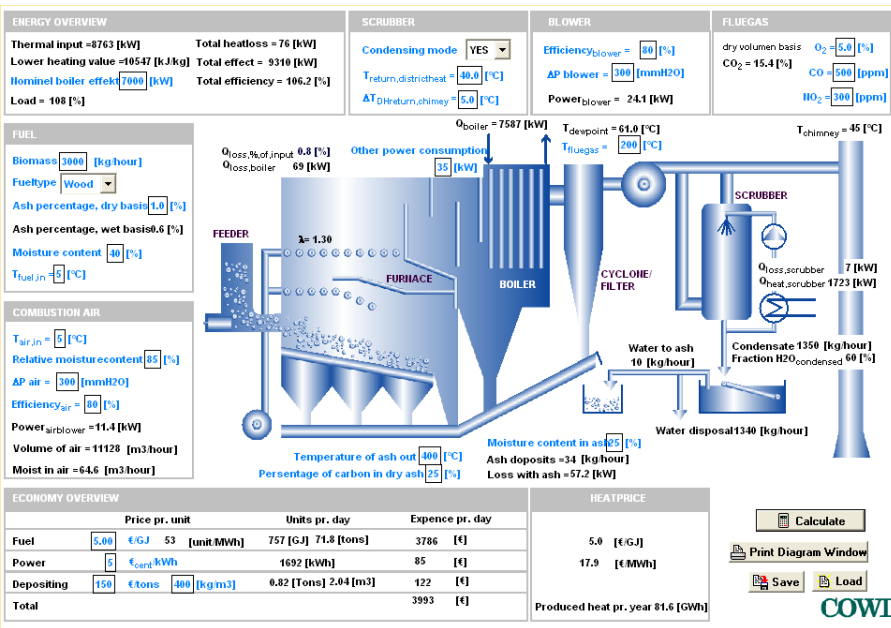
2005

2010



Fordampningskøling til fjernvarme

- Patent ansøgt Marts 2006



	Standard	Dall Energy
Efficiency (LHV): wood / waste	105 %	115%
Efficiency (LHV): straw / pellets / coal	90%	105%
Corrosion boiler	Yes	No
Fouling boiler	Yes	No
Water system	Complex	Simple
NO _x reduction	No	Yes
Slagging in furnace	Yes	Less



Patent ansøgning

WO 2007/036236

PCT/DK2006/050049

13

Claims

1. A method for recovery of heat from hot gas produced in a thermal reactor fuelled with solid fuel (1), said method comprising

5 injecting water into in the gas at one or more injection zones (4) in such an amount and such a way that due to water evaporation the flue gas temperature is reduced to below 400°C , and the gas dew point becomes at least 60°C , subsequently passing the gas through a condensing heat exchanger unit (8), where at least some of the content of water vapour is condensed, and utilising the condensing heat for heating of a stream of fluid, mainly water.

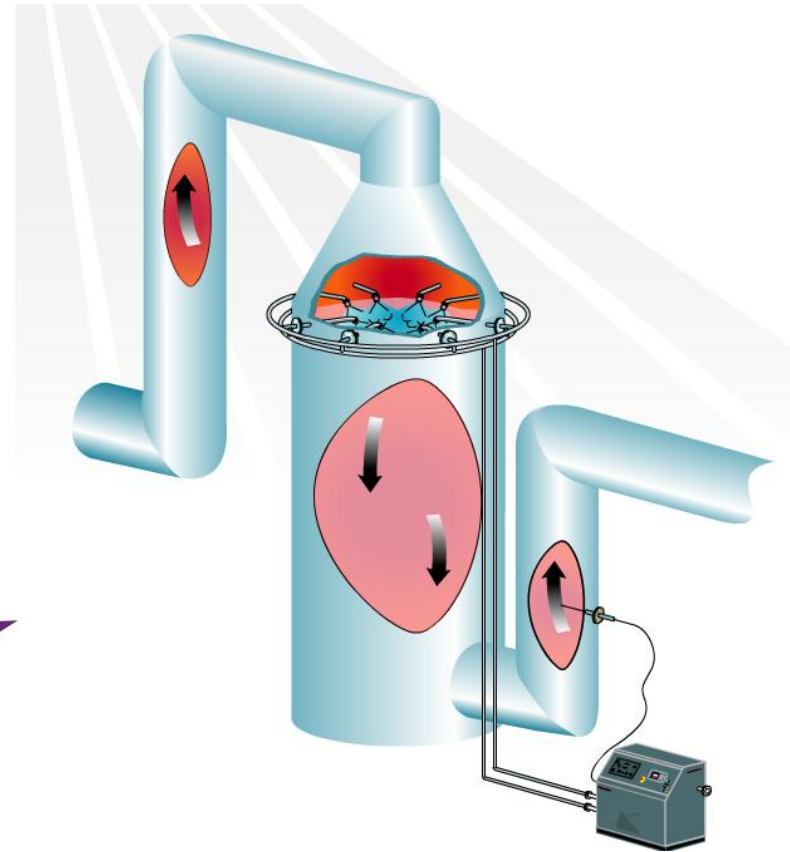
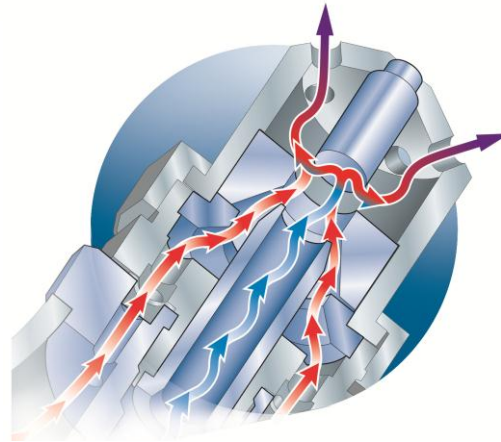
Søgning efter licenstagere

- Global leaders of spray application:

AutoJet[®]
TECHNOLOGIES



Spraying Systems Co.[®]



Efter diskussioner om licensaftale

Spraying Systems investerer in Dall Energy

Dall Energy køber patent ansøgning af COWI

December 2007: Dall Energy startes



Dall Energy forretningsmodel

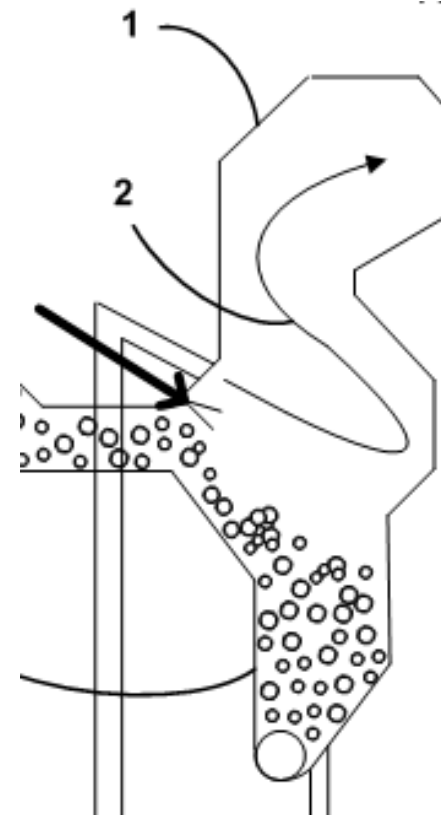
- **Design / opfinde nye biomasse teknologier**
- **Lave patenter**
- **Finde industrielle partnere / licenstagere**
- **Finde værter til demonstrationsanlæg**
- **Søge tilskud til R&D + dokumentation**



2008:

Nyt koncept for biomasse ovn

	Standard	Dall Energy
Fuel	Wet <u>or</u> dry	Wet <u>and</u> dry
CO 100% (mg/Nm ³)	100-500	0
CO 10% (mg/Nm ³)	N.A.	0
Dust (mg/Nm ³)	500-1000	20-50
NO _x (mg/Nm ³)	250-300	150-175
carbon in ash (%)	20-50%	<5%
Maintenance	High Renovation of grate	Low No hot moving parts



2009-2010:

Dall Energy vandt EUDP tilskud til pilot anlæg.

Pilot-ovn bygget og testet med godt resultat:

95% støv reduktion

Content in mg/Nm ³ (Dry)			
Sample no.	1	2	3
Position	Outlet combustion chamber	Outlet combustion chamber	Outlet combustion chamber
Date	09-12-2009	09-12-2009	09-12-2009
Sampling period	10:48-11:48	12:02-13:02	13:09-14:09
Particles, mg/Nm ³ (Dry)	18,5	32,6	26,8
O ₂ -concentration, % (V, D)	7,7	7,4	7,1
Particles, mg/Nm ³ (Dry) at 10 % O ₂	15,3	26,5	21,2



2010: MST program

TILSKUDSORDNING TIL MILJØEFFEKTIV TEKNOLOGI 2010

Projektet	Oplysningerne anføres i denne kolonne
Angiv hvilket hovedemne projektet omhandler: <ul style="list-style-type: none">• Vand• Luftforurening• Affald• ”Internationalt”	Hovedemnet er <u>Luftforurening</u> a) Reduktioner af luftforureningen fra energiproducerende anlæg, der fyrer med biomasse
Journalnummer (udfyldes af Miljøstyrelsen):	
Projektets titel:	Verifikation af multibrændsel ovn med meget lav <u>NOx</u> og støv emissioner.



2010-12

EUDP tilskud til demonstration søgt og vundet

Aftale om demonstrationsprojekt med Bogense og Weiss.

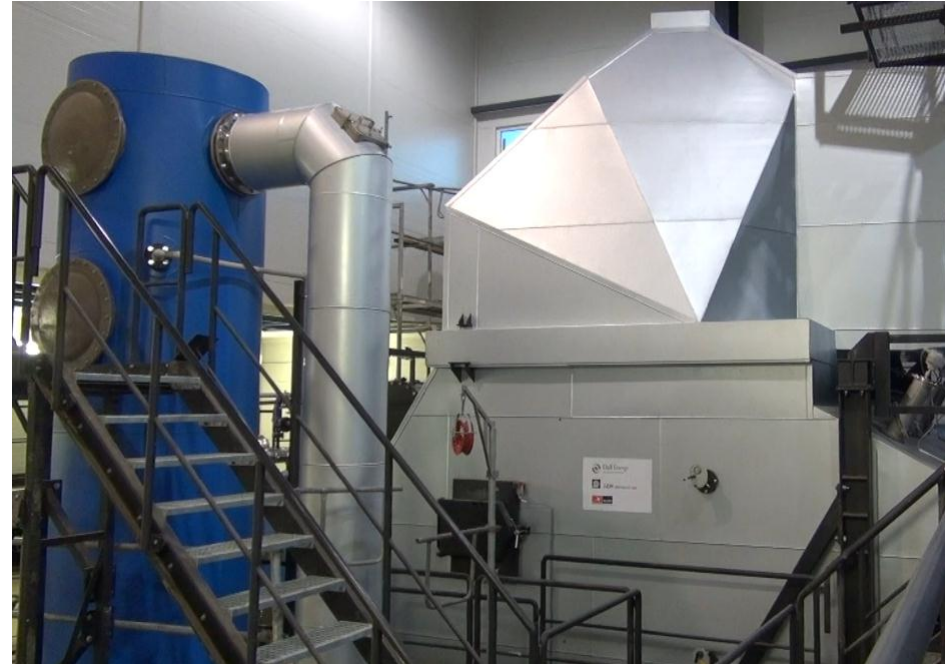
Demo-anlæg indkørt og verificeret



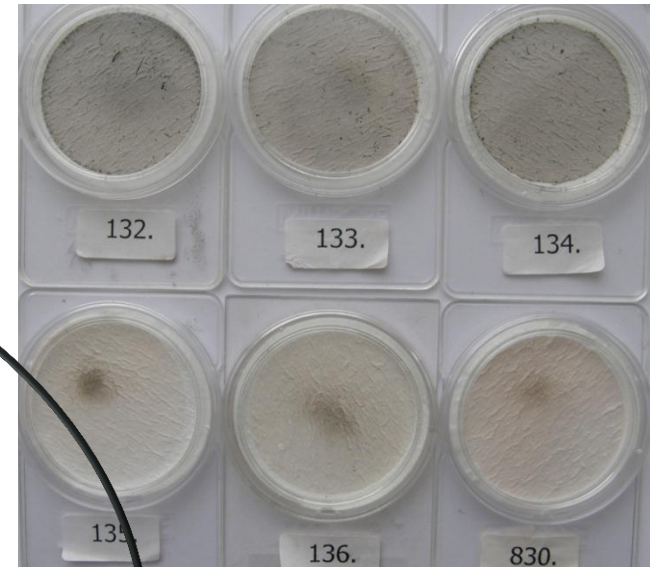
2011-12

**Diskussion med FORCE
om ETV program =>**

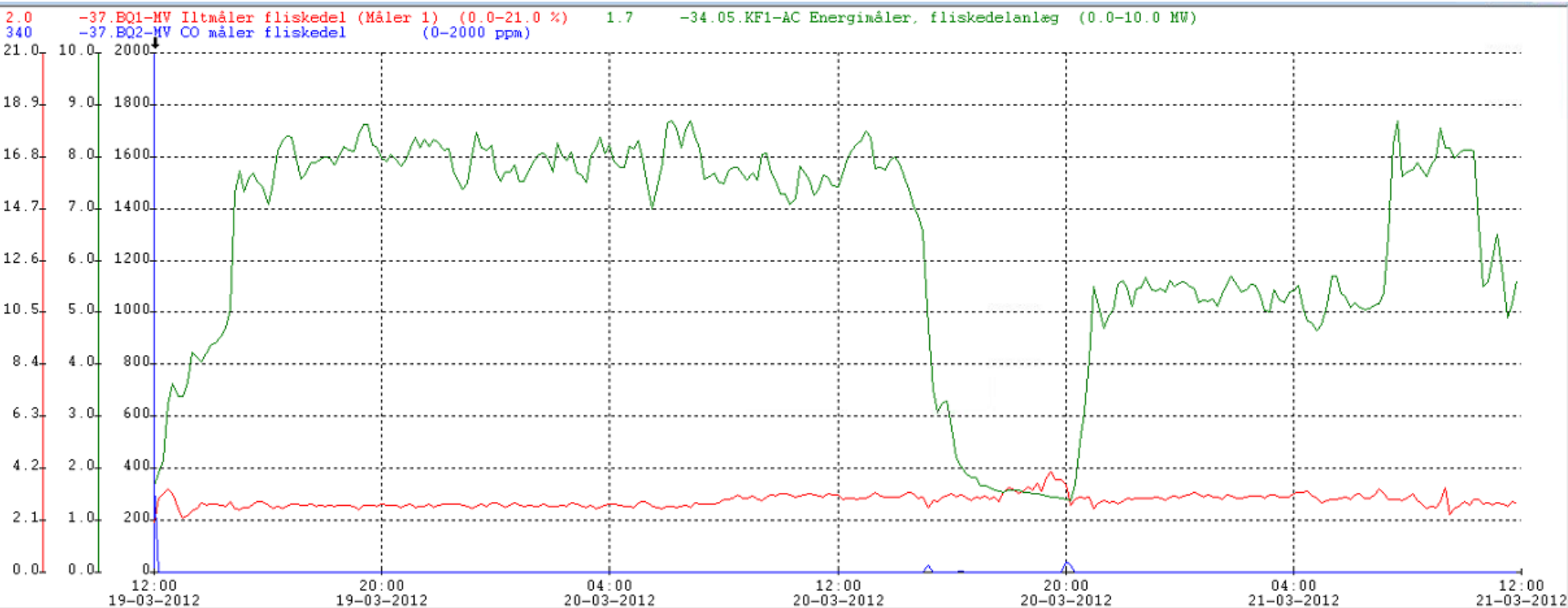
**Aftale med MST:
FORCE laver ETV som
del af verifikations
projekt.**



Marts 2012: ETV Måleprogram gennemføres



ETV-Måleprogram Bogense – energi, O2, CO



ETV-Måleprogram Bogense - aske



ETV-Måleprogram Bogense – røg før skorsten



Marked for prisbelønnet Dall Energy ovn

Lande med progressive krav til emissioner :

- **Sverige**
- **Østrig**
- **USA**

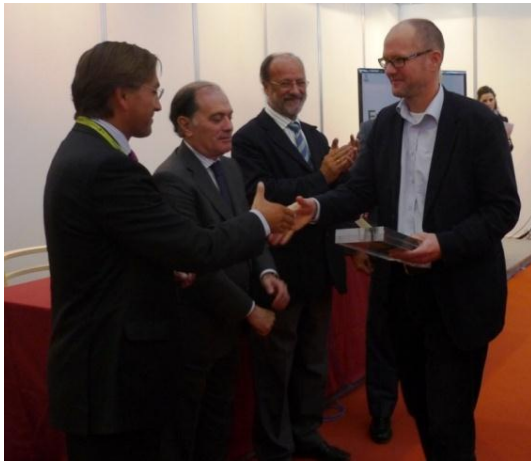
Det danske marked: Pris på anlæg foran miljø krav.

CO: 625 mg/Nm³

NO_x: 300 mg/Nm³

Priser

Innovation price, Spain, October 2010



European Inventor Award, Budapest, May 2011



Clean Tech Price, Denmark, September 2011

