

## THE PRACTICE OF DRY DIGESTION OF ORGANIC WASTE IN THE EUROPEAN CONTEXT

LUC DE BAERE  
 ORGANIC WASTE SYSTEMS

PRESENTED AT  
 ECN WORKSHOP “THE FUTURE OF ANAEROBIC DIGESTION OF ORGANIC WASTE IN EUROPE”  
 NUREMBERG, GERMANY  
 16 JANUARY 2008

## WHAT IS THE STATE-OF-THE-ART OF ANAEROBIC DIGESTION OF MUNICIPAL SOLID WASTE IN EUROPE ?

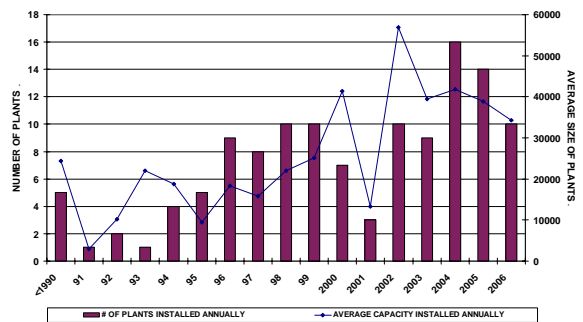
### CAPACITY IN EUROPE

- 124 PLANTS IDENTIFIED IN 13 COUNTRIES (END 2006)
- 3 905 000 T/YEAR CAPACITY IN 2006

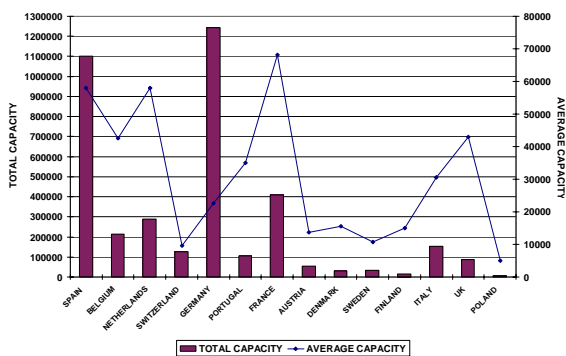
#### CAPACITY DEVELOPMENT

PERIOD	INCREASE	AVERAGE SIZE	PLANTS/YEAR
91 - 95	33 KT/Y	13 KT/Y	2.6
96 - 00	186 KT/Y	21 KT/Y	8.8
01 - 05	428 KT/Y	43 KT/Y	10.4

### ANNUAL SIZE AND NUMBER OF PLANTS IN EUROPE



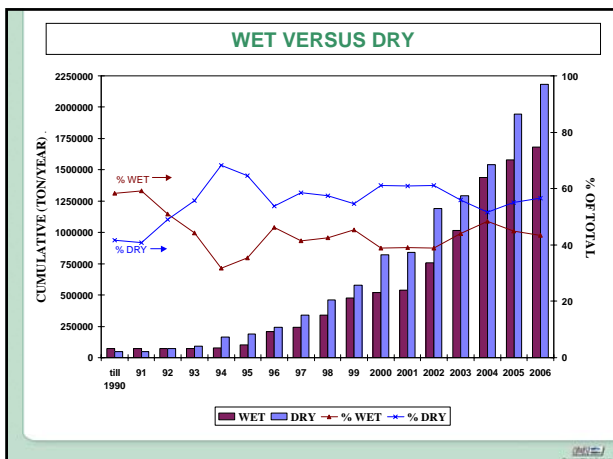
### CAPACITY PER COUNTRY



### CURRENT ROLE OF DRY DIGESTION

**DRY DIGESTION:**

**OPERATION AT A DRY MATTER OF MORE THAN 15% IN DIGESTER**



- ### WET VERSUS DRY
- DRY 57% , WET 43%
  - IN 2003 - 2004: 60% WET  
34% DRY
  - LAST 2 YEARS: 54% DRY
  - 96% OF THERMOPHILICALLY OPERATING CAPACITY IS DRY

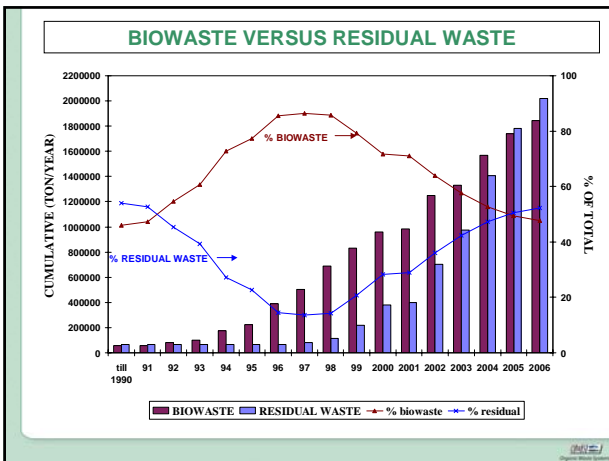
### WET VERSUS DRY

MIXED/ RESIDUAL WASTE		BIOWASTE	
DRY	WET	DRY	WET
59 %	41 %	46 %	54 %

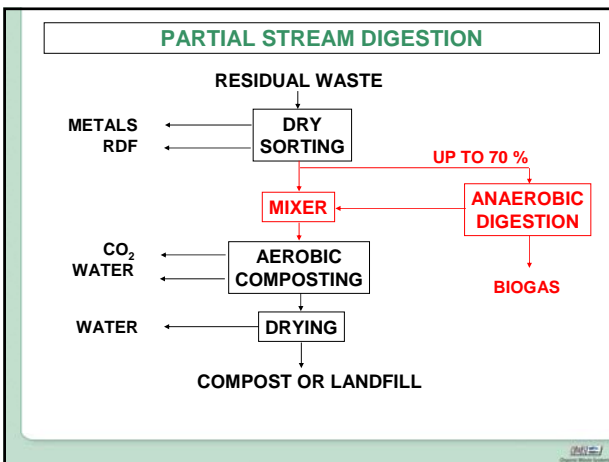
- ### SUPPLIERS
- 27 DIFFERENT SUPPLIERS (21 WET AND 6 DRY)
  - 3 SUPPLIERS HAVE MORE THAN 15 PLANTS OF SAME SYSTEM: VALORGA, KOMPOGAS AND DRANCO
  - STRABAG: DRY AND WET SYSTEM  $\pm$  10 OF EACH
  - FIVE COMPANIES: > 2/3 OF PLANTS AND 70% OF CAPACITY
  - 22 COMPANIES FOR 30% OF CAPACITY, 12 COMPANIES HAVE NOT SOLD A PLANT SINCE 2002

- ### SUPPLIERS
- LARGEST SUPPLIERS ARE DRY
    - \* LESS COMPETITION
    - \* DEVELOPMENT IS MUCH MORE COSTLY:  
NEED TO PROVE SYSTEM
    - \* MORE PATENTABLE BECAUSE DRY DIGESTION IS MORE NOVEL
- BUT MORE DIVERSITY IN SUPPLIERS OF DRY DIGESTION IS COMING**

- ### ASPECTS THAT MAY INCREASE THE IMPORTANCE OF DRY DIGESTION
1. MORE RESIDUAL WASTE
  2. PARTIAL STREAM DIGESTION
    - NO WASTEWATER
    - EXPANSION OF CAPACITY OF EXISTING SITE
  3. INTEGRATION WITH YARD WASTE COMPOSTING
  4. INTEGRATION WITH HEAT RECOVERY FOR DRYING



- ### PARTIAL STREAM DIGESTION
- ONLY PART OF THE ORGANICS IS DIGESTED (UP TO 70%)
  - OTHER 30% OR MORE OF ORGANIC FRACTION IS BYPASSED AND IS NOT SUBJECTED TO DIGESTION
  - DIGESTATE IS DIRECTLY MIXED WITH BYPASSED ORGANIC FRACTION WITHOUT DEWATERING
  - NON-DIGESTED ORGANICS PROVIDE EXOTHERMIC ENERGY AND NEEDED STRUCTURE FOR AEROBIC POSTTREATMENT AND DRYING



- ### PARTIAL STREAM DIGESTION VERSUS FULL-STREAM DIGESTION
- ADVANTAGES**
- AVOIDS COSTLY DEWATERING STEP : INVESTMENT – OPERATION
  - AVOIDS TREATMENT OF EXCESS WASTEWATER
- DISADVANTAGES**
- LESS ENERGY RECOVERY
  - LONGER AEROBIC TREATMENT REQUIRED



**DRY DIGESTION  
 CAN BE MORE EASILY INSERTED  
 INTO EXISTING COMPOSTING SITES**

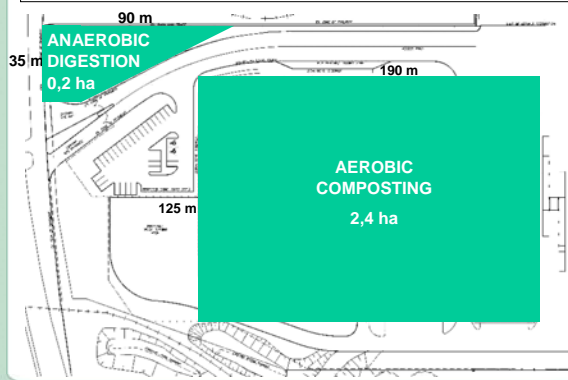
**EXPANSION OF EXISTING COMPOSTING SITES**

- MANY COMPOSTING SITES HAVE MORE WASTE BUT SITES HAVE NO ROOM FOR ADDITIONAL COMPOSTING AREA
- INSERTION OF PARTIAL STREAM ANAEROBIC DIGESTION CAN INCREASE EXISTING CAPACITY BY UP TO 50% WITH MINIMAL SURFACE REQUIREMENT
- ECONOMICALLY VERY ATTRACTIVE
- WATER BALANCE IS CRUCIAL

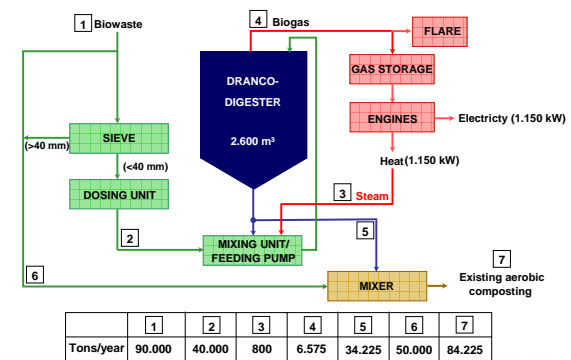
**CASE STUDY: INSERTION OF PARTIAL STREAM DIGESTION INTO EXISTING AEROBIC PLANT**

- EXISTING AEROBIC COMPOSTING FACILITY
- CURRENT CAPACITY: 60.000 TPY OF BIOWASTE
- LOOKING FOR OPPORTUNITIES: COSTS, CAPACITY,...
- INSERTION OF AD PLANT FOR 40.000 TPY THROUGH PARTIAL STREAM DIGESTION
- USE OF EXISTING EQUIPMENT FOR AEROBIC TREATMENT  
 → CONSEQUENCES?

**CASE STUDY: LAYOUT SITE**



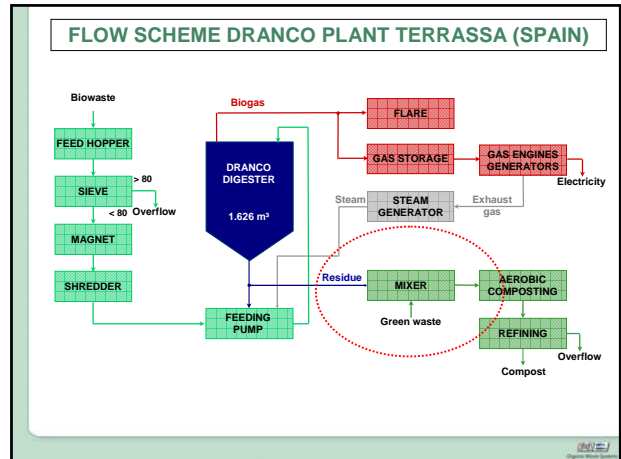
**CASE STUDY: NEW PROCESS SCHEME**



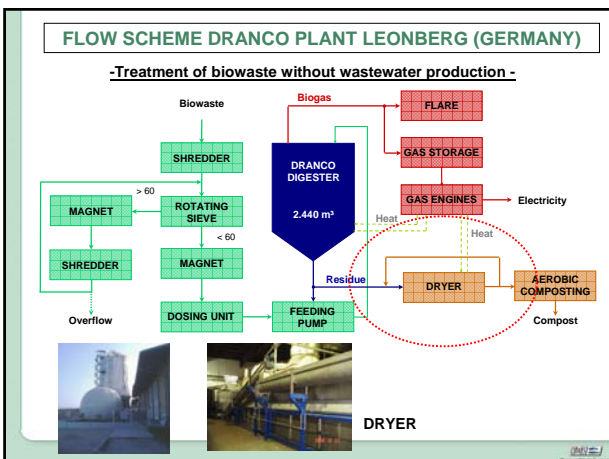
**CASE STUDY: RESULTS**

- NEW SITE CAPACITY = ca. 90.000 TON PER YEAR (DEPENDING ON TOTAL SOLIDS CONTENT OF THE SUBSTRATE)
- AD ON ONLY 10% OF THE SURFACE AREA OF THE AEROBIC COMPOSTING INCREASES SITE CAPACITY WITH ABOUT 50%
- AD PLANT PRODUCES ENOUGH ENERGY FOR THE WHOLE SITE
- DESPITE HIGHER CAPACITY, ODOR EMISSIONS ARE LOWER
- NET PROFIT OF AD PLANT POSSIBLE, DEPENDING ON LOCAL REVENUES FOR GREEN POWER OR ENERGY PRICES.

**DRY DIGESTION OFFERS  
 POTENTIAL INTEGRATION  
 WITH YARD WASTE COMPOSTING**



**DRY DIGESTION  
 CAN BE MORE EASILY COMBINED WITH DRYING  
 USING WASTE HEAT OF ENGINES**



**CONCLUSIONS**

- DRY DIGESTION PROVIDES MOST OF EUROPEAN CAPACITY FOR ORGANICS DERIVED FROM MSW, ESPECIALLY FOR MIXED/RESIDUAL WASTE ORGANICS
- DRY DIGESTION CAN:
  - AVOID WASTEWATER PRODUCTION THROUGH PARTIAL STREAM DIGESTION
  - EXPAND CAPACITY ON EXISTING COMPOSTING SITES
  - BE INTEGRATED WITH YARD WASTE COMPOSTING AND DRYING

**BUT FURTHER GROWTH OF DRY DIGESTION WILL ALSO DEPEND ON RELIABILITY OF EXISTING PLANTS**