

# New technologies for production of (wood chips and) pellets

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# Upgrading to pellets gives

- Higher energy content in biofuel
- More well defined composition
- More efficient transports
- Better storage characteristics



## Pellets

Domestic energy source, more than 30 pellet production plants in Sweden



# Short history

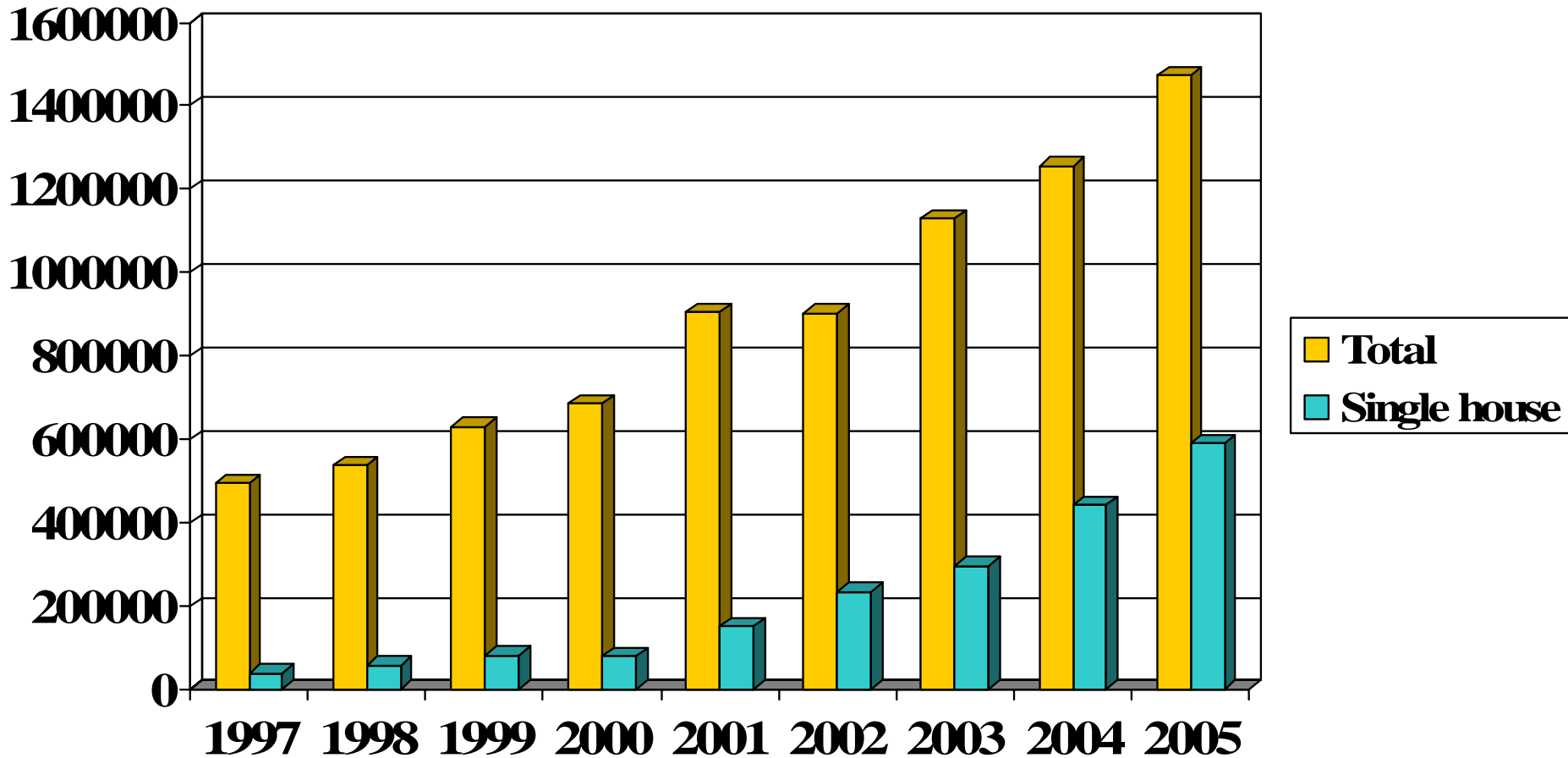
- 1910: First pellet-press like machine
- 1920: First press with cylindrical die
- 1930s: Modern type pellet press (feed)
- 1959: First commercial bark pellet op.  
(Knoxville, Tennessee - waste)
- 1977: First commercial wood pellet op.  
(Brownsville, Oregon – fuel)
- 2001: Small-scale comm. wood pelletising

# Swedish pellet standard SS187120

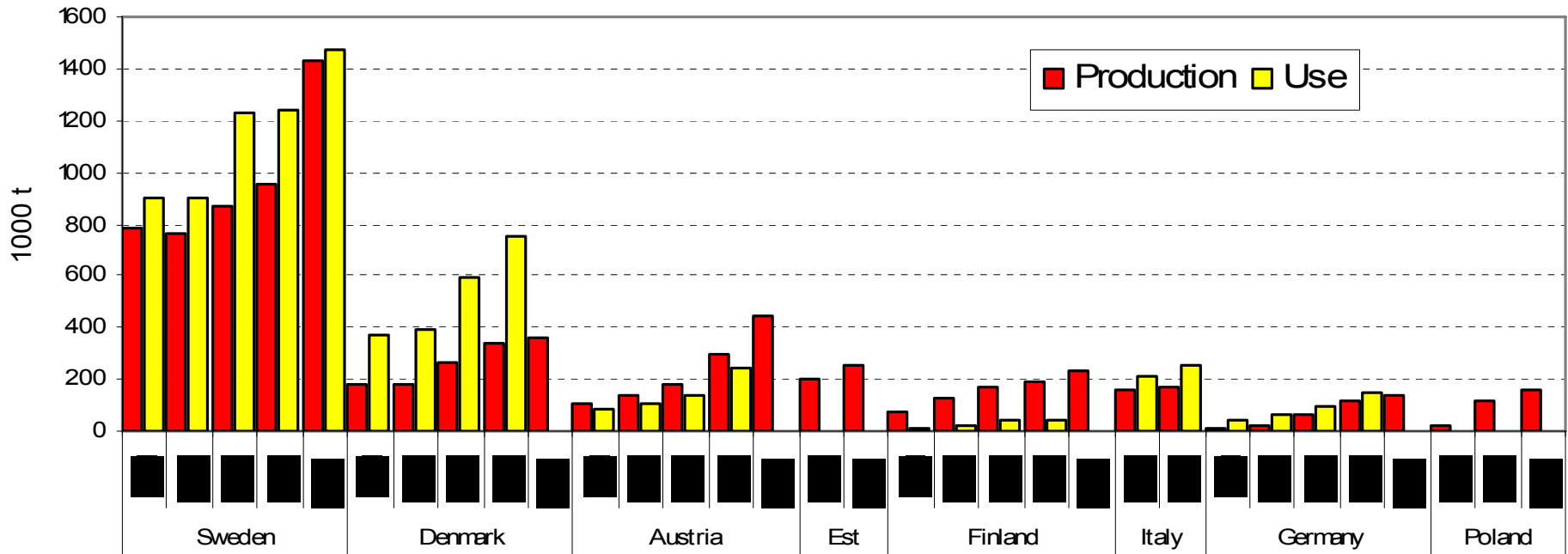
## Class 1

- Dimension: Length max 4 x diam
- Bulk density:  $\geq 600 \text{ kg/m}^3$
- Durability: fine fraction ( $< 3 \text{ mm}$ ) weight  $\leq 0.8\%$
- Energy contents:  $\geq 4.7 \text{ MWh/tonne}$
- Ash cont.:  $\leq 0.7\%$
- Moisture cont.:  $\leq 10\%$
- Sulphur cont.:  $\leq 0.08\%$
- Additives: Percentage and type must be stated
- Chlorides:  $\leq 0.03\%$
- Ash melting point: Initial temperature must be stated

# The Swedish pellet market (tonnes/year)



# Pellet production and use in EU



Note: Figures for 2005\* are estimations

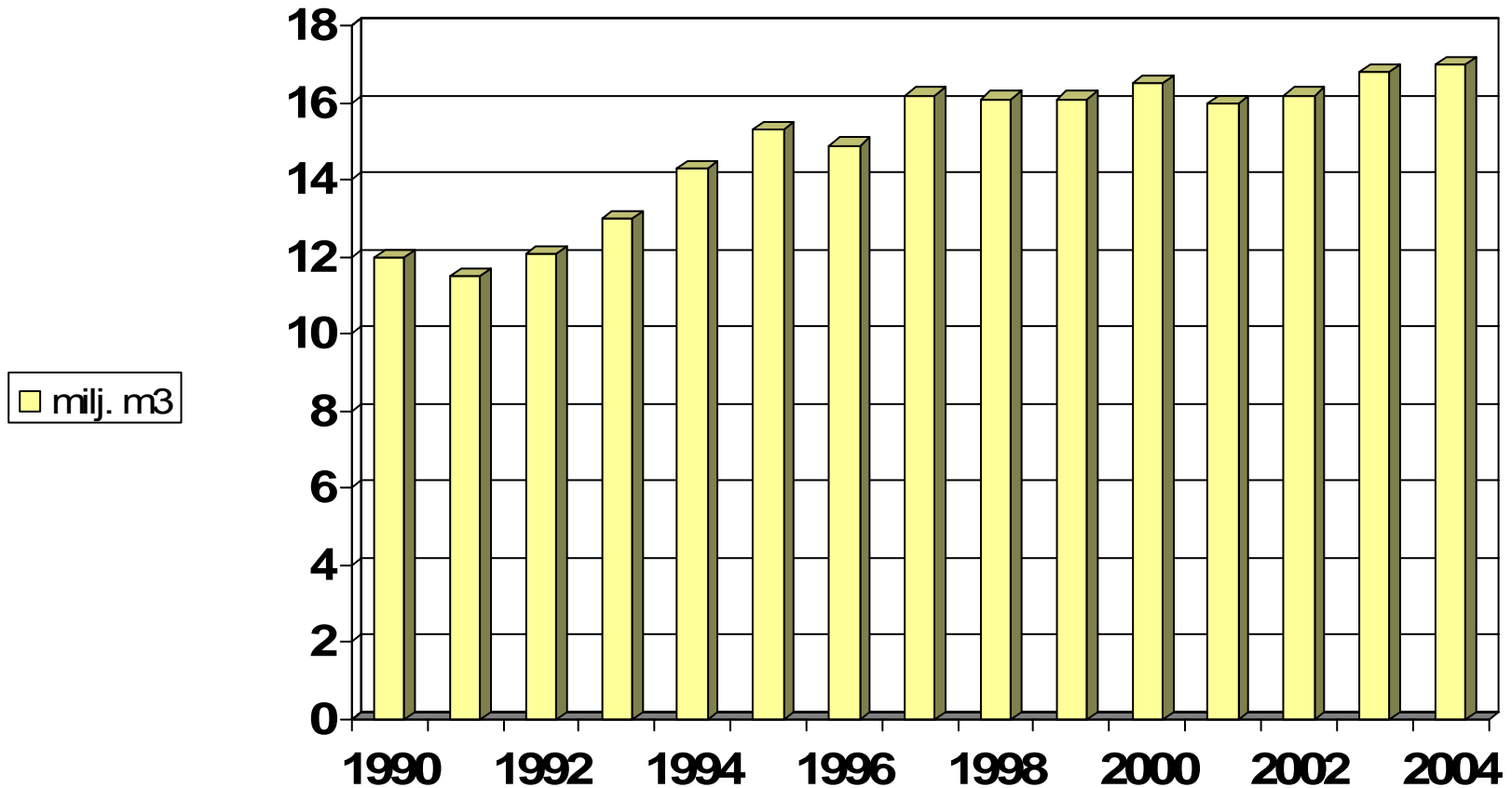
# European demand for pellets

- Today 5 million tonnes
- Tomorrow 50 million tonnes?  
When?  
Can we handle it?

# Traditional raw materials for pellet production

- Byproducts from sawmills and wood-working industry: Planer shavings, dry chips, sawdust
- Bark (for larger furnaces)

# Production of sawnwood in Sweden 1990-2004



# Production potential for pellets made from by-products from the Swedish sawmilling industry

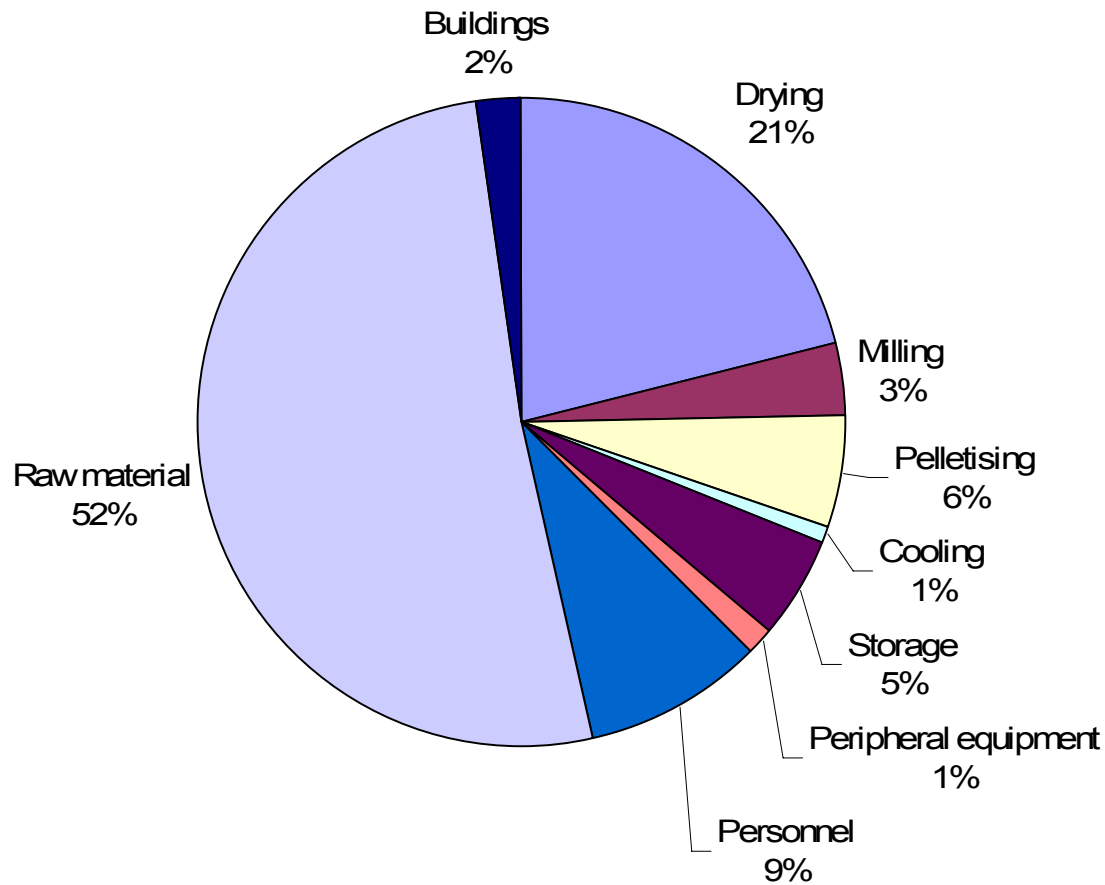
	Sawmills >5 000 m <sup>3</sup> sw/year <sup>C</sup>		Sawmills >1 000 m <sup>3</sup> sw/year <sup>C</sup>	
	tonnes pellets	TWh	tonnes pellets	TWh
<b>Bark<sup>A</sup></b>	1 458 000	7.3	1 472 000	7.4
<b>Sawdust<sup>B</sup></b>	1 146 000	5.5	1 165 000	5.6
<b>Wet chips<sup>B</sup></b>	3 871 000	18.6	3 916 000	18.8
<b>Edges &amp; clamps<sup>B</sup></b>	13 000	0.06	18 000	0.09
<b>Dry chips<sup>B</sup></b>	367 000	1.8	371 000	1.8
<b>Planer shavings<sup>B</sup></b>	n.d.		486 000	2.3
<b>Sum</b>	6 855 000	33.2	7 428 000	35.9

Notes: A: Lower heating value 5.0 MWh/tonne.

B: Lower heating value 4.8 MWh/tonne.

C: Total sawmill production was about 10% higher in 2004 compared to 1995.

# Cost distribution for pellet production



# Development lines in pellet production

- Connection to district heating grids
- Development of pellet mill design
- More small-scale units
- Large pellet plants grow larger
- Extension of raw material basis
- Bioenergy combines: Pellets & CHP
- Hydrolysis – gives lignin residues  
Norwegian pilot plant

# District heating connection:

Delivery of excess heat to a nearby district heating network, examples

- SBE Svensk BrikettEnergi AB, Norberg
- SBE Svensk BrikettEnergi AB, Ulricehamn
- BioNorr – Bioenergi i Norrland AB, Härnösand

# Development of pellet mill design:

## Pellet mill producers

- Sprout-Matador A/S, USA/Denmark
- California Pellet Mill, USA
- Bühler AG, Switzerland
- Kahl GmbH, Germany
- Promill, France
- Sweden Power Chippers – small-scale units
- ...
- EcoTre, Slovakia (Italy) – development project
- Kerry Die, Ireland – development project

# More small-scale units: Integrated small-scale pellet production



Sweden Power Chippers presses at Wilhelmsons Trävaru AB, Sweden  
5 000 tonnes of pellets annually

# Large pellet plants grow larger



SÅBI Pellets AB, Vaggeryd, Sweden.

Annual pellet production today: 80 000 tonnes, will double next year

# Extension of raw material basis

## Possible new raw materials for pellet production

- Energy forests
- Energy wood
- Wood from early thinnings
- Forestry residues (lops & tops)
- Straw
- Peat
- Energy grass
- Waste paper
- Lignin residues from ethanol production
- Lignin residues from black liquor

# Swedish industrial pellet research programme – SLUP, 2003-2006

- Studies on fundamental mechanisms in wood pelletising
- Optimisation of present pelletising technology and initial studies of new pelletising technology
- New raw materials for pelletising – mixes for pellet production
- Pellet quality during storage
- NIR spectroscopy for process control in pellet production
- Extension of life length for critical components in production equipment for wood pellets
- Systems and logistics for increased bioenergy upgrading to pellets in Northern Sweden
- Wood fuel characterisation
- Total budget: 3 million €

# Pellet production technology submissions to Pellets 2006 1/2

- Application of on-line NIR spectroscopy in fuel pellet production
- NIR techniques create added values for the pellet and biofuel industry
- Materials selection for sawmill dust cutter blades
- Hygroscopicity of wood pellets
- Pellet quality optimisation
- Increased production capacity with new drying system
- Determination of volatile organic compounds emitted from softwood pellets during storage
- Effect of sawdust characteristics on pelletizing properties and pellet quality

# Pellet production technology

## submissions to Pellets 2006 2/2

- Pelletizing of pine and spruce sawdust to fuel pellets – a basic study
- A comparison of existing and new pelletising technologies
- Hyperspectral imaging of biomaterials and application to pellets
- Drying parameter variations and wood fuel pellets quality - pilot study with a new pelleting equipment set up
- Influence of the size reduction of pine logging residues on the pelleting process and on the physical properties of pellets obtained
- Drying of biomass: Selection of drying systems
- Method of biomaterials processing into energy carrier
- Investigations of the fundamental mechanisms of biomass fuel pellets production
- Mechanical evaluation for the quality control of biomass pellets and briquettes
- Development and characteristics of a cold biomass pelletizing technology in China

# Conclusions

- There are several ways to get good economy in pellet production, e.g. by external delivery of excess heat, integrated small-scale production or economy of scale
- Raw material cost and availability is of utmost importance for pellet producers
- By-products from sawmills and woodworking industry are most suitable as raw materials for residential pellets
- Several new raw material assortments could be interesting for production of pellets for both large-scale and residential markets
- At sight, lignin from ethanol production might be interesting for pellet production (also residential)

Thank you for your attention!

If you have questions, please contact

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# WORLD BIOENERGY & PELLETS 30 MAY-1 JUNE 2006



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