



Austrian Biofuels Institute

www.biodiesel.at



UNIDO

United Nations Industrial Development
Organisation

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**“Survey
of Biodiesel
Process Technologies”**

Commissioned by the
International Energy Agency

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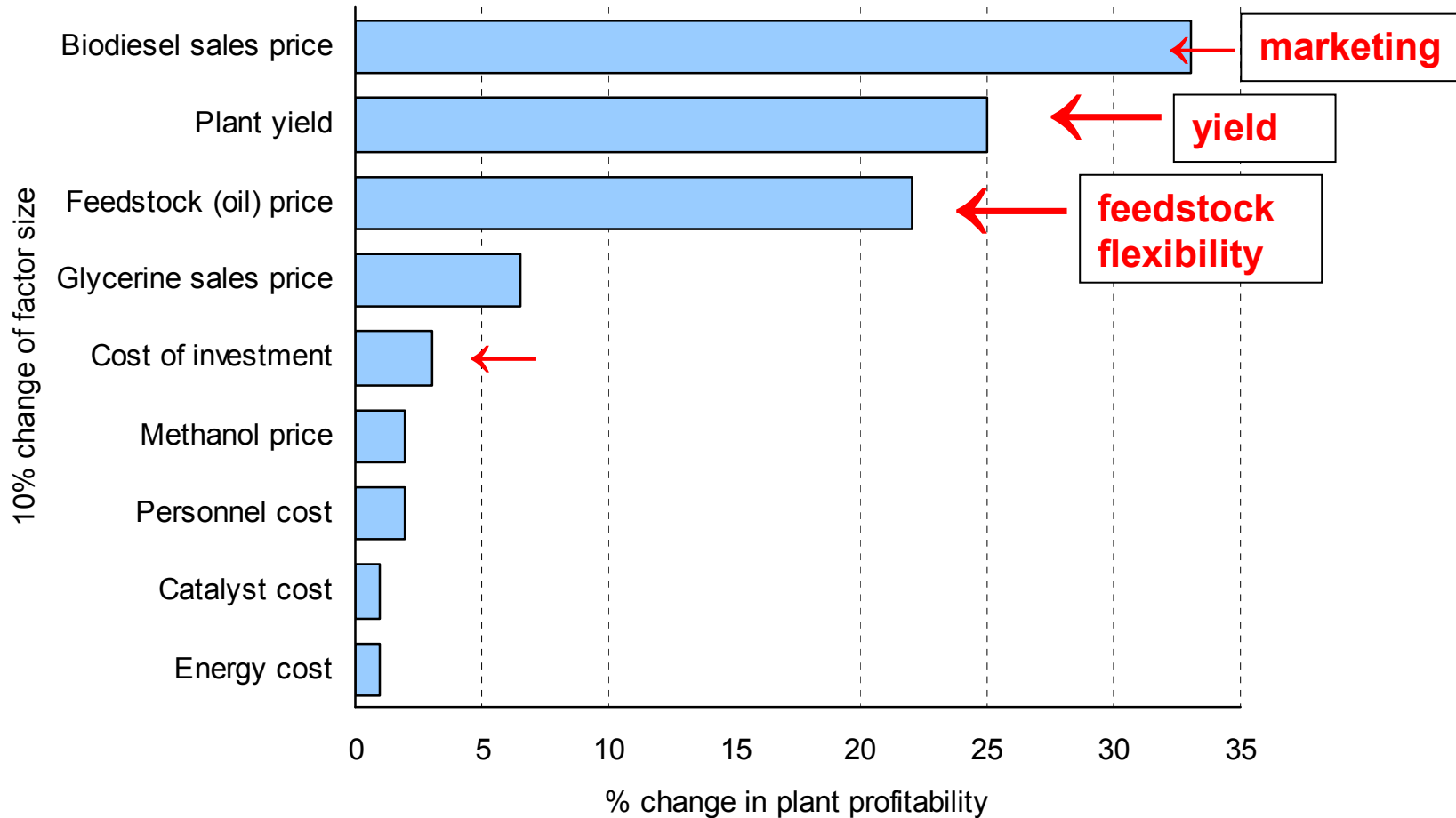
Process technology is a key criteria for defining “Best Practice”:

Priorities:

1. Definition of best marketing strategy (price)
- 2. **Selection of efficient process technology**
3. Concept for optimal feedstock supply (cost)
4. Selection of best site (cost)
5. Optimised financing models (cost)



Process technology influences 3 key criteria for profitability:





Assured high Biodiesel quality is to be or not to be for *any* process technology

The Biodiesel standard development has come a long way,

- it is not a static set of parameters, but changing according to ever increasing needs for lower emissions while maintaining a high performance of the diesel engine,
- the present **EN 14214** for FAME is going to be improved further,
- and a modern process technology will anticipate such changes and adapt accordingly.



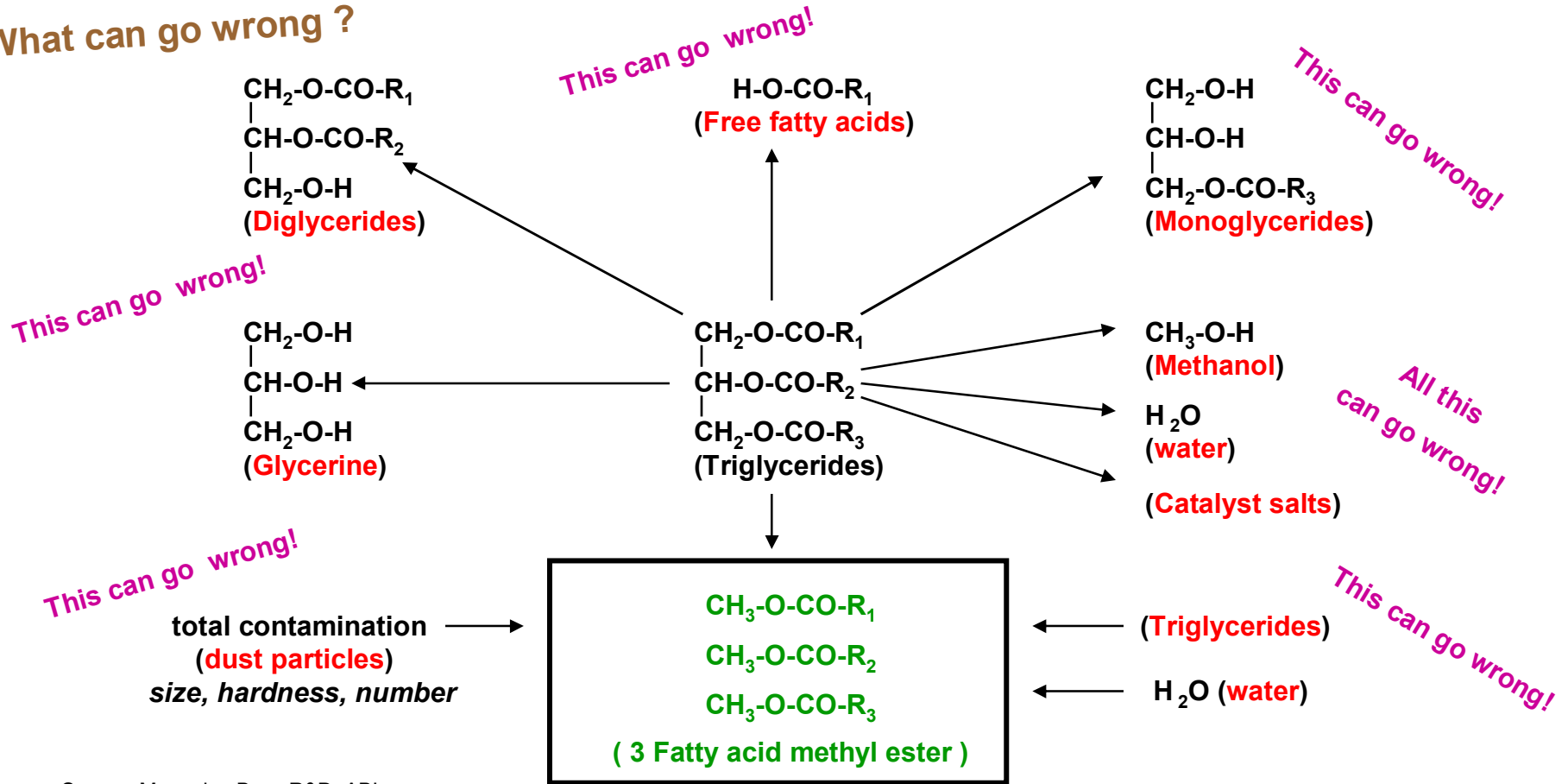
Criteria for defining a “Best Practice” process technology:

- Reliability in **quality assurance** (improved EN 14214)
- Highest possible **level of yield** obtained during the reaction (triglycerides *and* free fatty acids)
- High flexibility to purchase and **handle a broad variety of multi-feedstock oils and fats** e.g. high FFA at lowest market prices
- Flexible process and **multi-feedstock recipes control**
- An **uninterrupted production** for at least 48 weeks
- The **references** in number, size, feedstock flexibility,



Biodiesel is derived from virgin or used oils and fats of vegetable or animal origin - it must have highest purity without any harmful contaminations

What can go wrong ?





There is no single best biodiesel process technology

- ▶ There is only one best for each individual and complex investment
- ▶ All pros and cons have to be evaluated carefully case by case
- ▶ Price is the least, safe return on investment the most important criteria
- ▶ *The next slide about comparisons of various recognised biodiesel process technologies is an ambitious attempt*
 - ... to list and describe various criteria for selection,
 - ... which can have a different weight for each individual case;
 - ... it does not contain the aspects of engineering and construction,
 - ... and it is not a recommendation for one or the other process.



work in progress!

There is plenty of choice among biodiesel process suppliers

Process technology company	Yield: % of triglycerides and FFA 1)	Ability to process feedstock with						Reference plants in operation / firm orders approx.	Required acreage for 250.000 t unit in m ²	Plant sizes built / ordered in 1.000 t / y
		high 0 % Fully refined oil	< 1 % De-gummed oil	< 2	< 5 %	< 10 % Recycled oils and fats	low quality > 10 % Render- ing fats			
AT-Agrartechnik	96 - 97	yes	n.a.	n.a.	yes	no	no	4/26	n.a.	53 - 75/ 250
Axens	n.a.	yes	no	no	no	no	no	1/2	n.a.	160/ 165
BDI	99	yes	yes	yes	yes	yes	yes	9/11	n.a.	5 - 50/ 100
Christof MB	102 ²⁾	yes	yes	yes	yes	yes	yes	4/5	n.a.	5 - 30/ 250
Crown	n.a.	yes	n.a.	n.a.	n.a.	no	no	n.a.	n.a.	n.a./ 250
Desmet Ballestra	n.a.	yes	n.a.	n.a.	n.a.	n.a.	no	7/38	n.a.	100/ 250
Enegea	99	yes	yes	yes	yes	yes	yes	3/ n.a.	1.190	40 - 250
Lurgi	95 - 97	yes	yes	yes	yes	n.a.	n.a.	7/14	n.a.	40 - 100/ 200
Westfalia	95 - 97	yes	n.a.	n.a.	no	no	no	3/ n.a.	n.a.	100 - 120/ 350

1) Basis: chemically degummed oil 2) Starting with water degummed oil

Source: technology company interviews, published information, ABI analysis



A report to the
International Energy Agency
Bioenergy Task 39

***„BIODIESEL PRODUCTION:
PROVEN TECHNOLOGIES AND EUROPEAN PROCESS
TECHNOLOGY PROVIDERS“***

published in November 2007.

Authors:

Bacovsky, D., Körbitz, W., Mittelbach, M., Wörgetter, M.

Report T39-B6, 104 pp.



Equally important

The selection of the best technology is step 1

- for professional implementation it needs however :

- a perfect engineering team
- skilled construction companies
- efficient coordination of all activities
- an experienced start-up and training team
- an online support after start-up

.... last but not least a not unimportant question: is a technology company hungry for a contract or are their capacities fully occupied ?



Do not trust the “local hero inventor” ...

ABI’s observation world-wide is:

- **wherever the biodiesel-idea is landing – you will find the local hero with a self invented process technology,**
- **with a small scale batch plant in something like a lab,**
- **and a success record of a few hundred miles without problems.**

.... forget it!



A “local hero” Biodiesel production unit

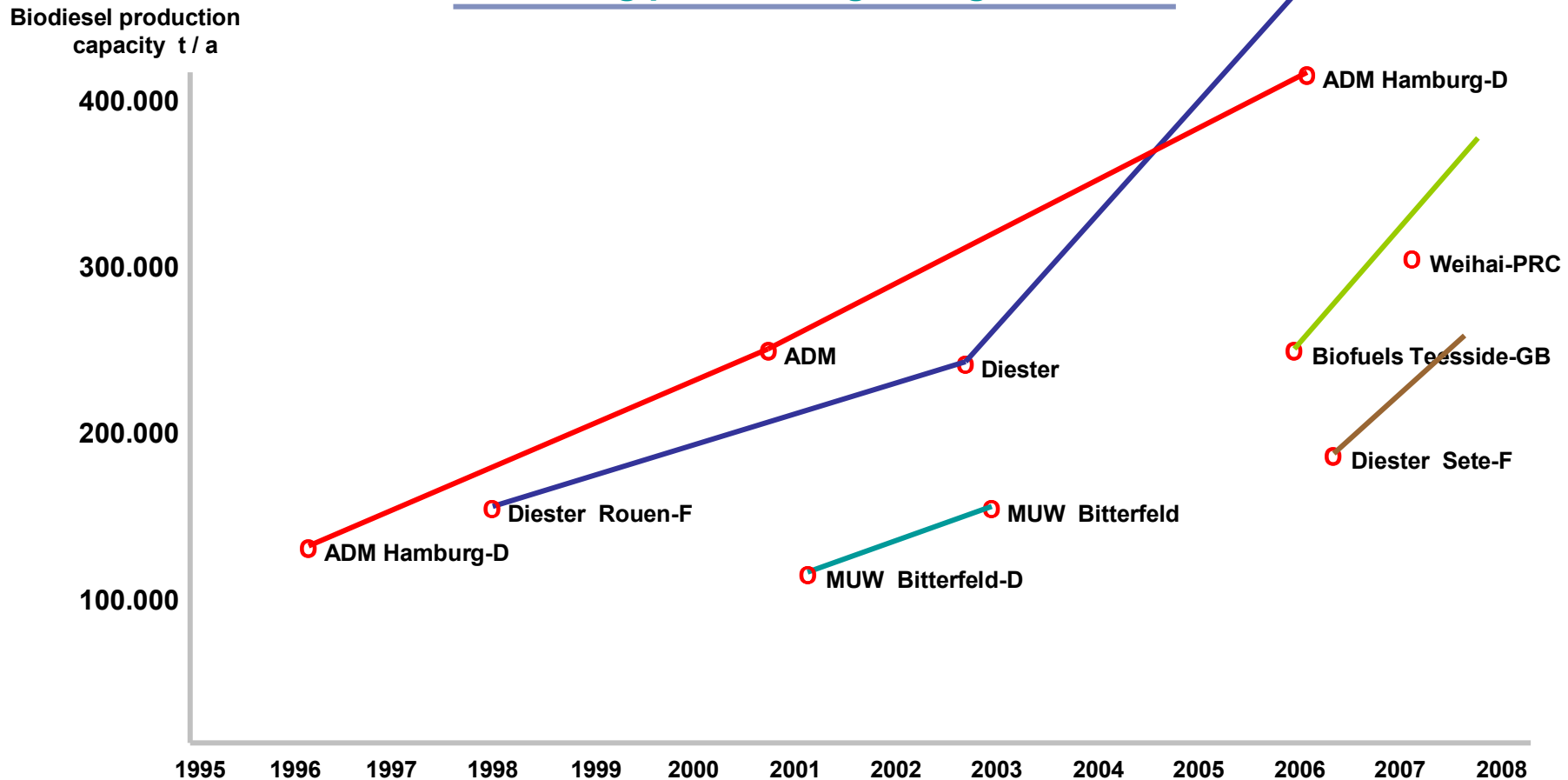


- ▶ Small is beautiful (?) but not efficient and not at all economic !



Challenge for process technology providers: dramatic increase in production capacity :

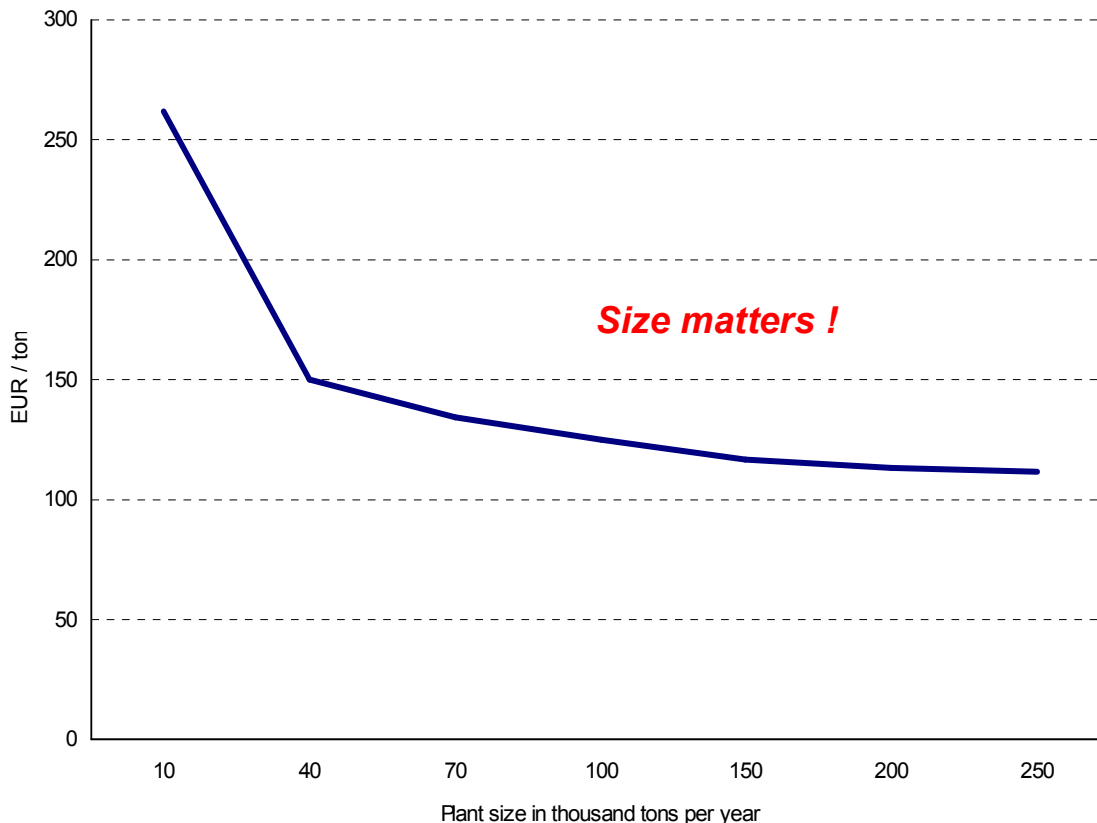
- * new plants starting with sizeable volumes
- * existing plants being enlarged further





The larger the plant, the lower the cost of production per liter tends to be

Estimated production cost per ton of biodiesel vs. plant capacity



Note

- Fully loaded production cost excluding feedstock oil cost. The feedstock oil price must be added to the production cost to determine the breakeven sales price for biodiesel per ton.
- As facility size increases, less fixed costs such as depreciation and interest are spread over each ton of product, so total production costs per ton approach the variable costs per ton.
- The kink from 10,000 to 40,000 tons capacity is due to the low number of plant offers ABI has seen at these sizes. If more offers were received, the curve would be smoother.



A few examples as “Best Practice”:

- Germany: MUW in Bitterfeld
- France: Diester in Grand Couronne
- Italy: Fox-Petroli in Vasto
- Austria: Energea in Zistersdorf
- Austria: Biodiesel Kärnten in Arnoldstein
- Czech Republic: Agropodnik in Jihlava
- Germany: Saria in Malchin



Germany: MUW Bitterfeld - 150.000 t (rapeseed)





Germany: Marl/ NEW – 150.000 t (rapeseed)





Italy: Fox-Petroli – 120.000 t MFS





Austria: Energea - 40.000 t FAME (recycled oils)





Austria: Arnoldstein - 25.000 t FAME





Czech Republic: Agropodnik / Jihlava – 25.000 t RME





Germany: Malchin / Fa. Saria – 12.000 t animal fats



Austrian Biofuels Institute



Our experience

Our competence

Our credibility

..... at your service

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