

OTPAD U RH

**Kako ispravno , brzo i ekonomski opravdano riješiti problem
i pri tome ostati nekažnjen od EU i sačuvanog okoliša ?**

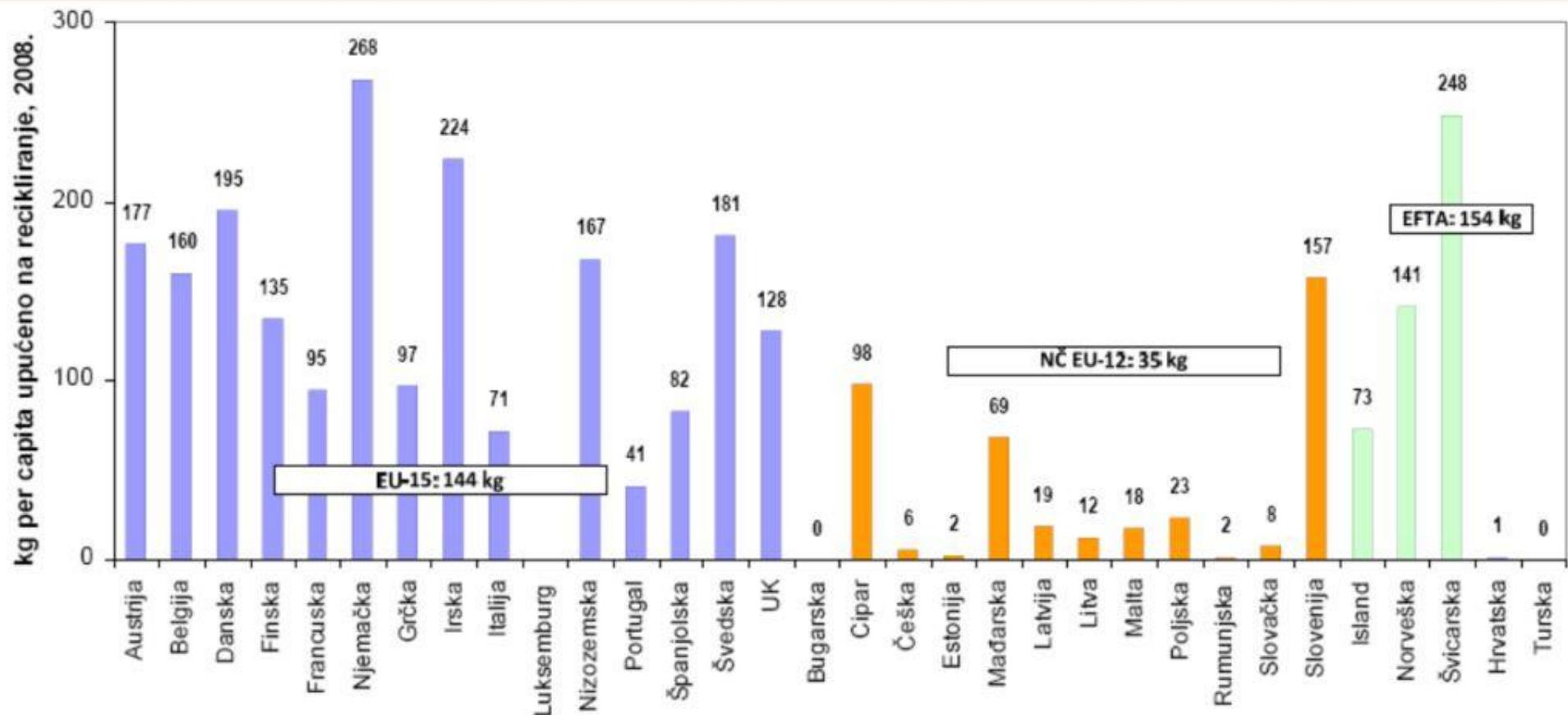
PREDAVAČ:
Davor Petračić dipl.ing.građ.
ovlašteni inženjer i sudski vještak

Pregled načina postupanja s komunalnim otpadom u EU

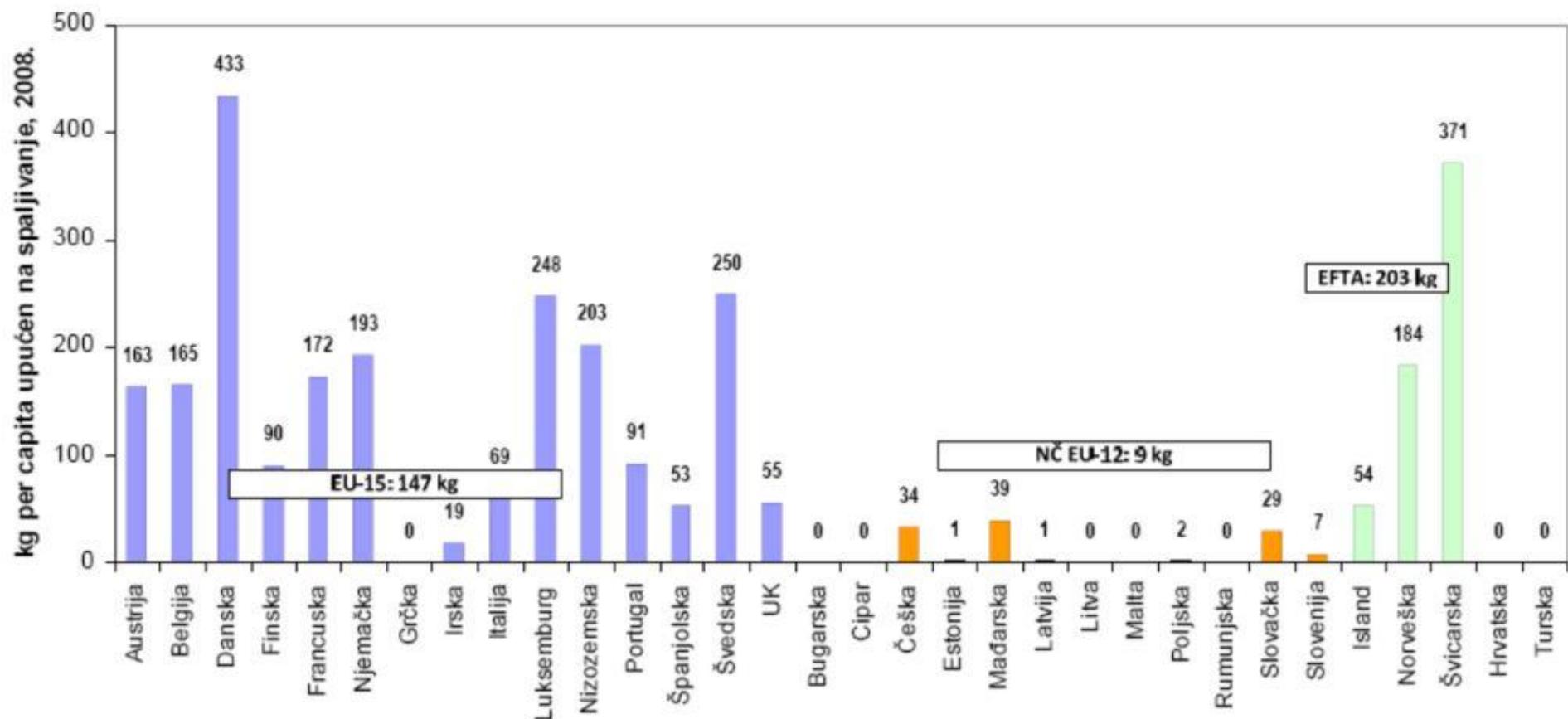
Količine otpada u EU: ~2 500 mil. t otpada/god →
260 mil. t komunalnog otpada → 528 kg per capita



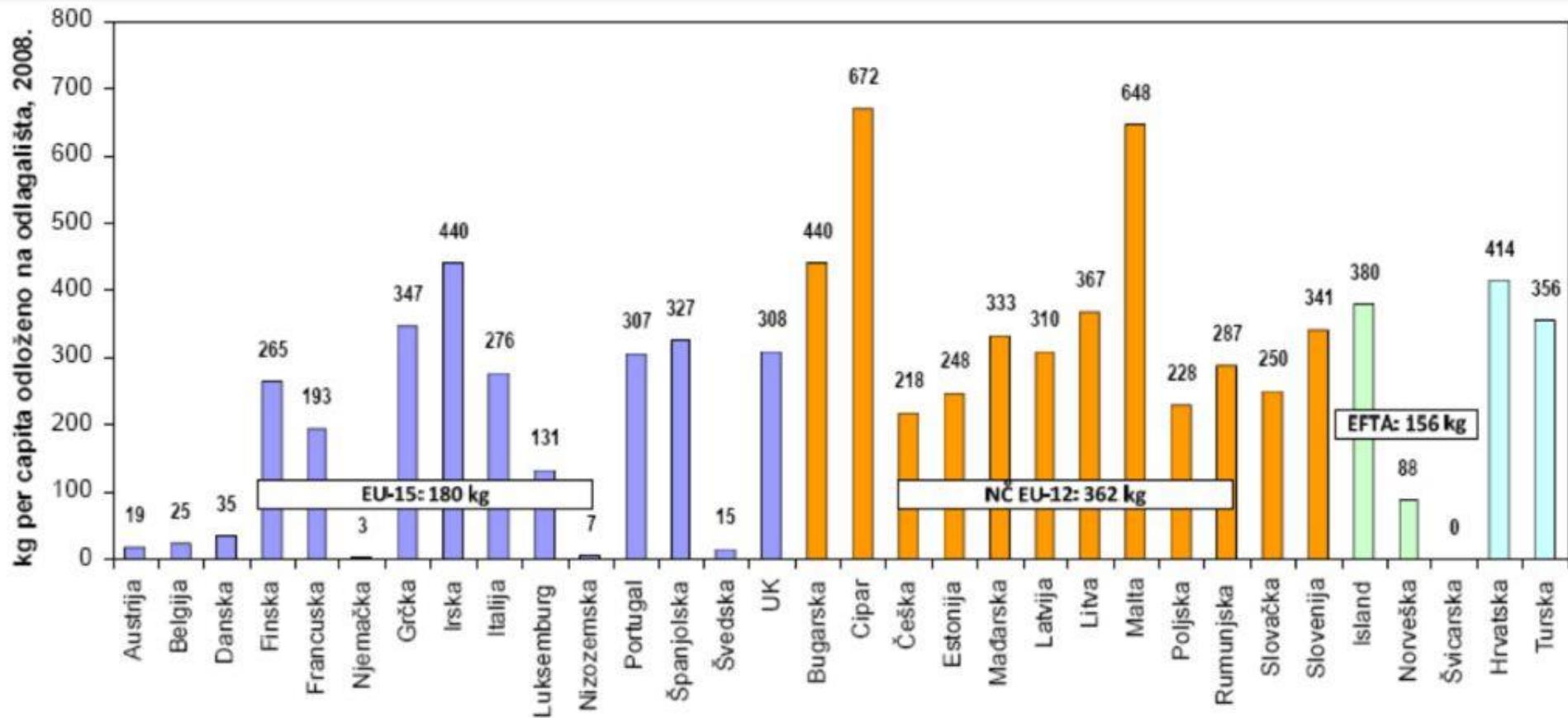
Recikliranje



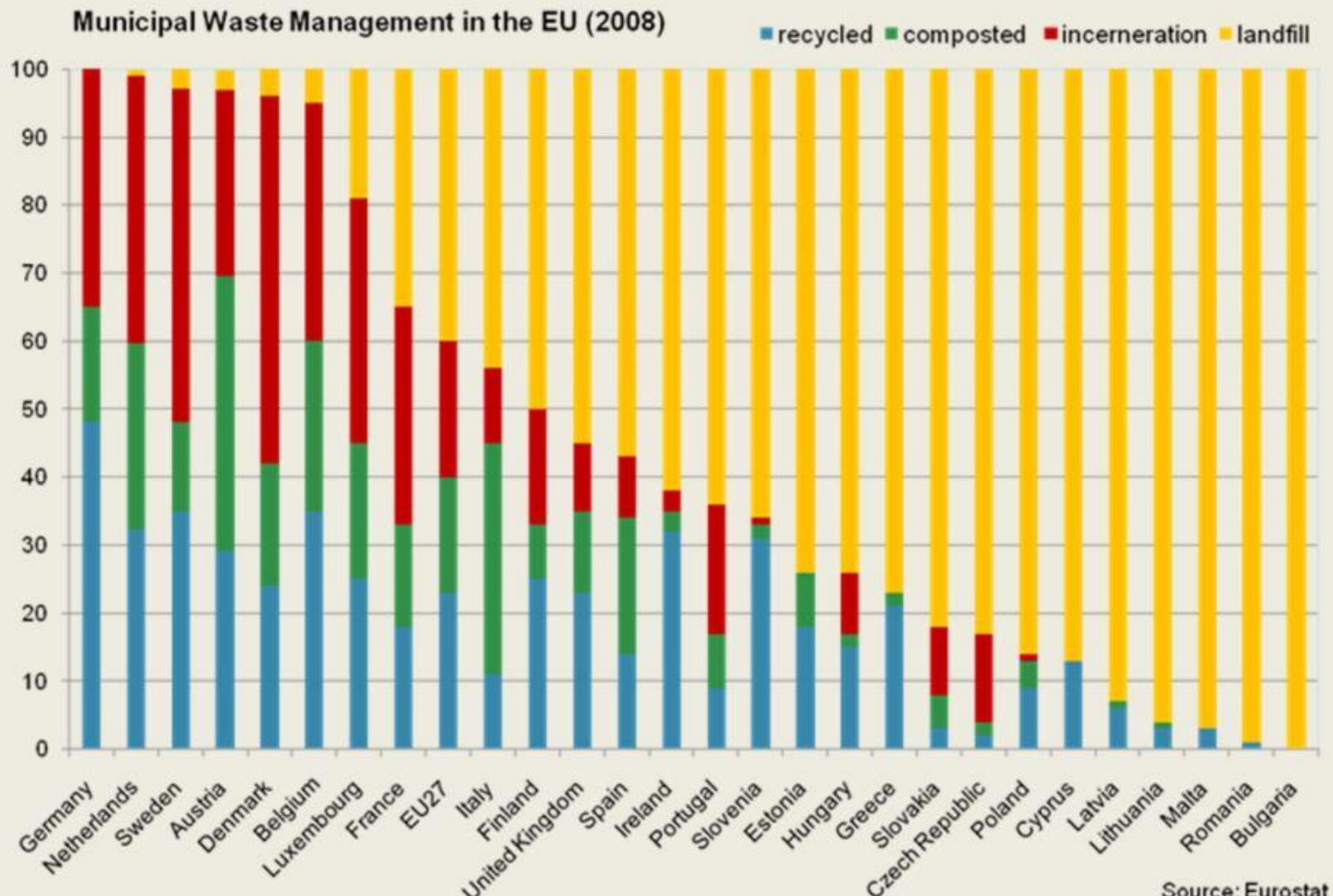
Spaljivanje



Odlaganje

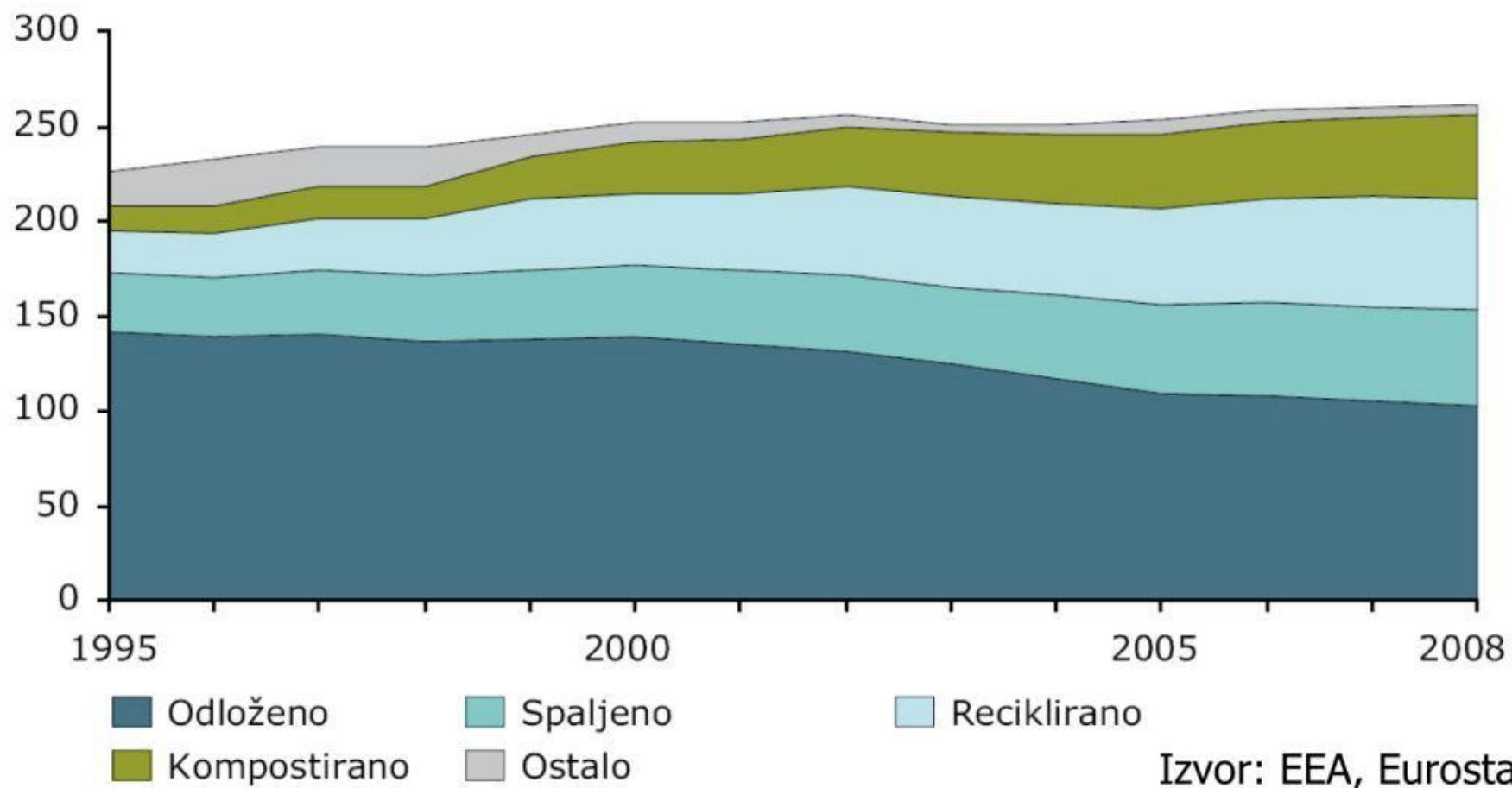


OBRADA KOMUNALNOG OTPADA U EU



Razvoj gospodarenja komunalnim otpadom u EU

Milijuni tona



KAKO IZGLEDA GOSPODARENJE OTPADOM U RH ?

KOLIČINE OTPADA U RH

Otpad	Količina (mil. t/god)
Komunalni	1,2
Građevinski i otpad od rušenja	2,6
Proizvodni i rudarski	1,6
Poljoprivredni i šumarsko-drvni	7,1
Opasni	0,1
Odvojeno skupljeni	0,2
Drugi	0,4
Ukupno	13,2

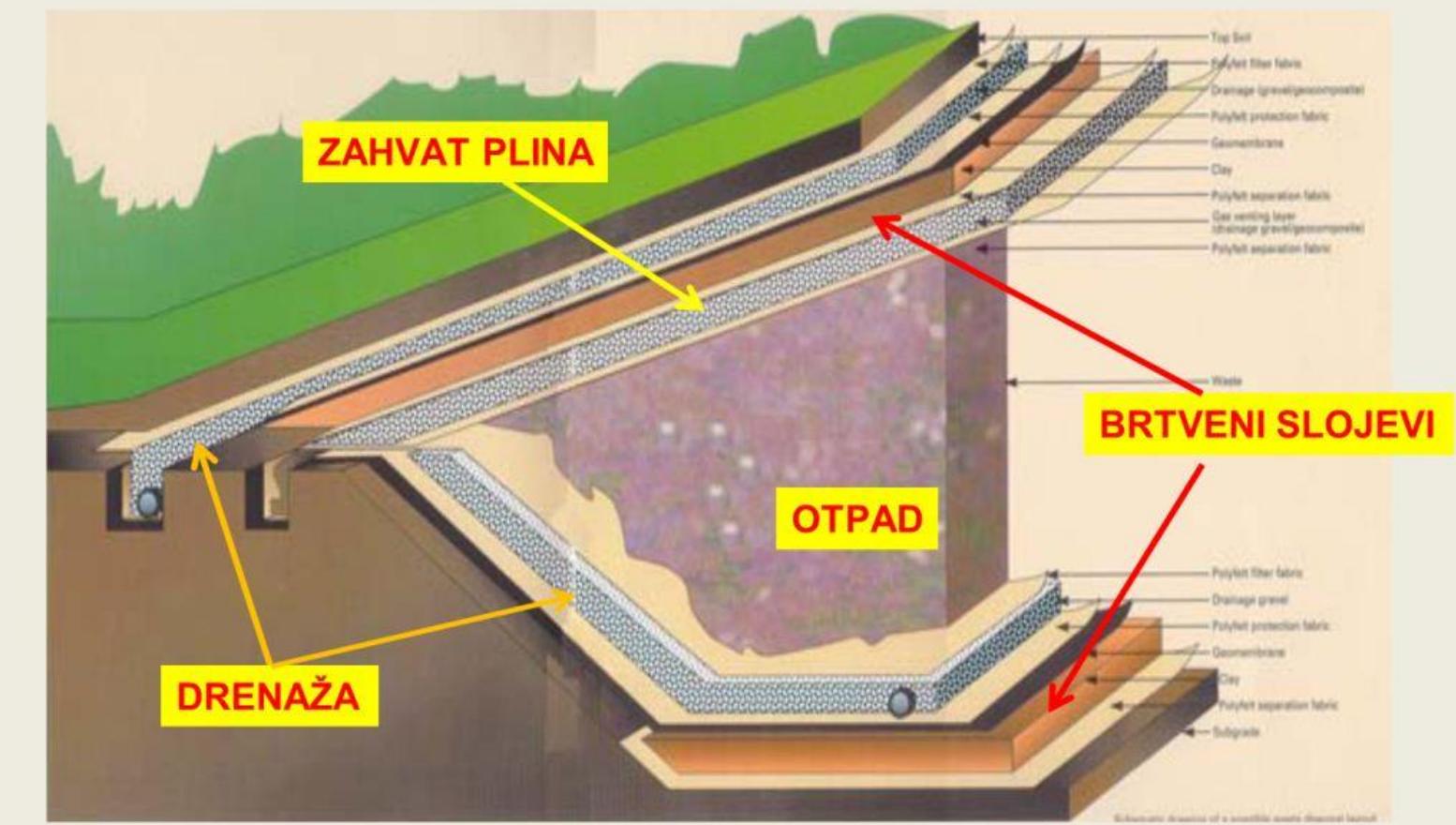
Postupanje s komunalnim otpadom u RH

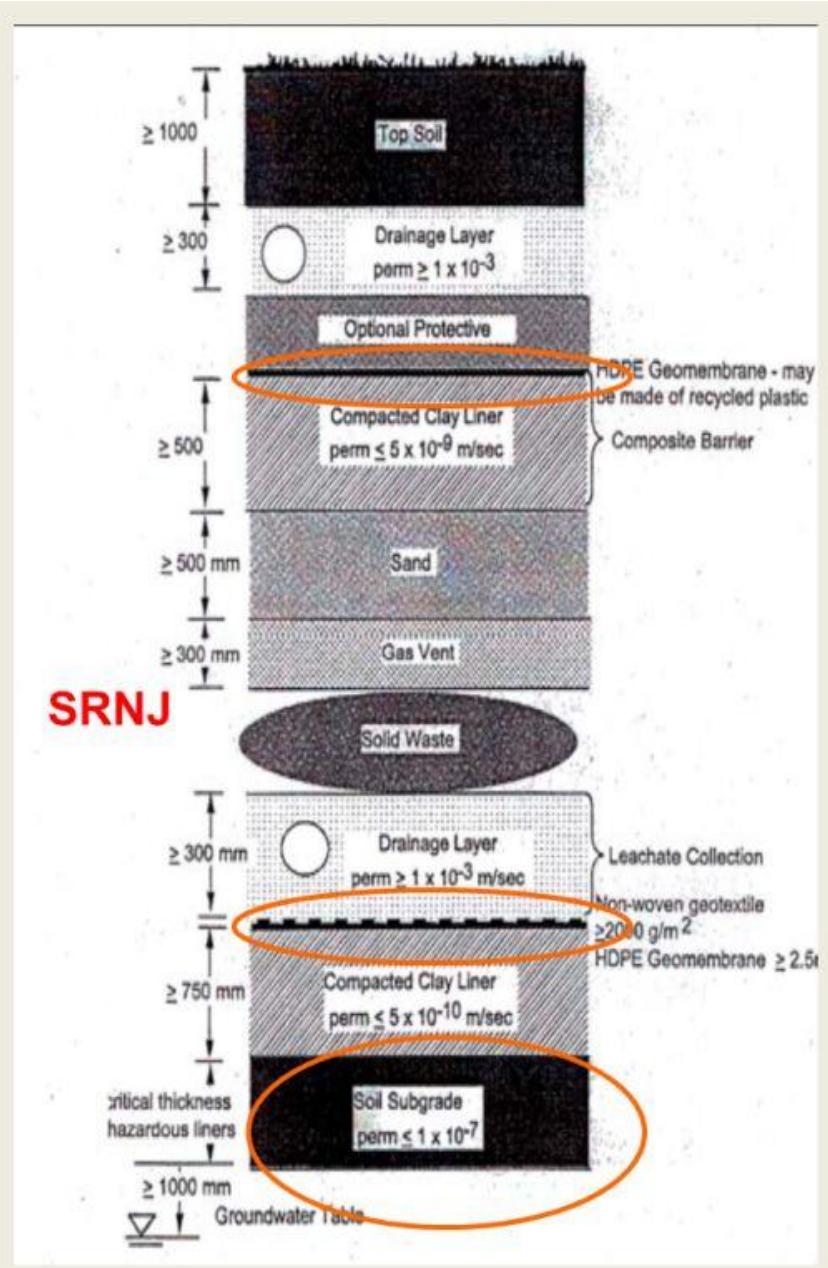
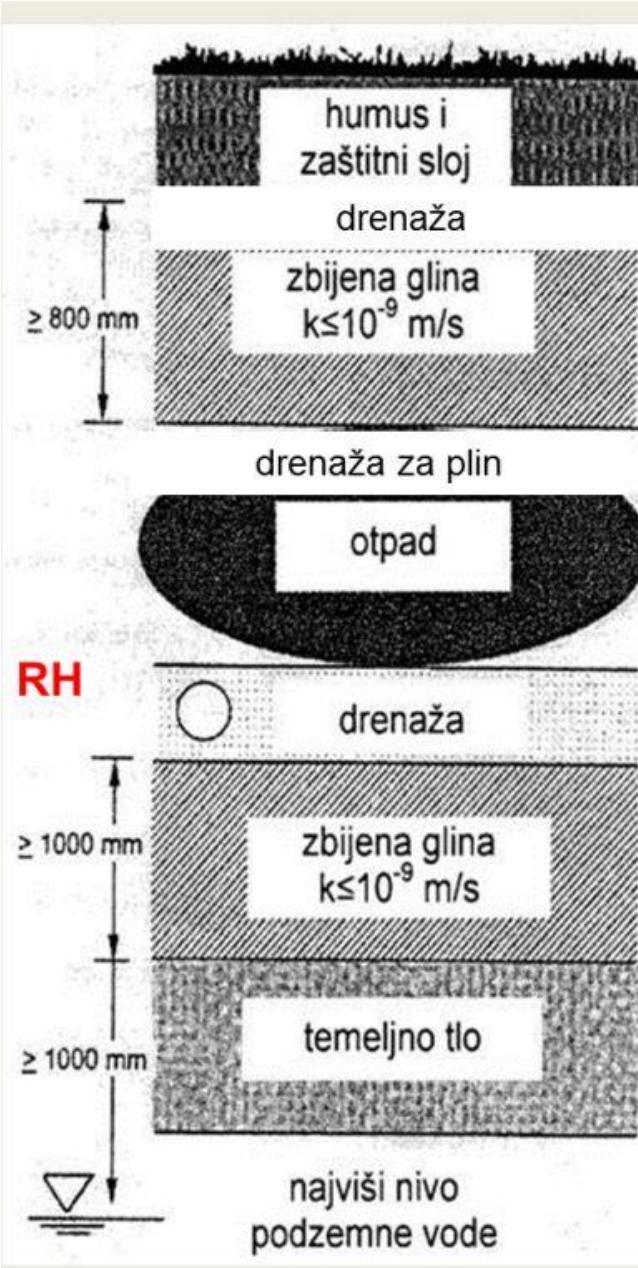
Izvješće o komunalnom otpadu za 2008. – AZO,
srpanj 2010.

- **207** tvrtka koje su 2008. obavljale djelatnost sakupljanja miješanog komunalnog otpada (198 dostavilo podatke)
- **93 %** stanovništva RH obuhvaćeno sakupljanjem kom. otpada u 2008.
- **1 788 311 t** kom. otpada
- **428 kg** per capita komunalnog otpada (1,17 kg dnevno)
- **14 %** odvojeno sakupljeno, **86 %** miješani kom. otpad
- **2,85 %** izravno predano oporabitelju
- **96,8 %** - na odlagališta
- **1,8 %** - kompostiranje

KAKO IZGLEDA ODLAGALIŠTE U RH I U NJEMAČKOJ ?

OSNOVNE FUNKCIONALNE TEHNIČKE CJELINE



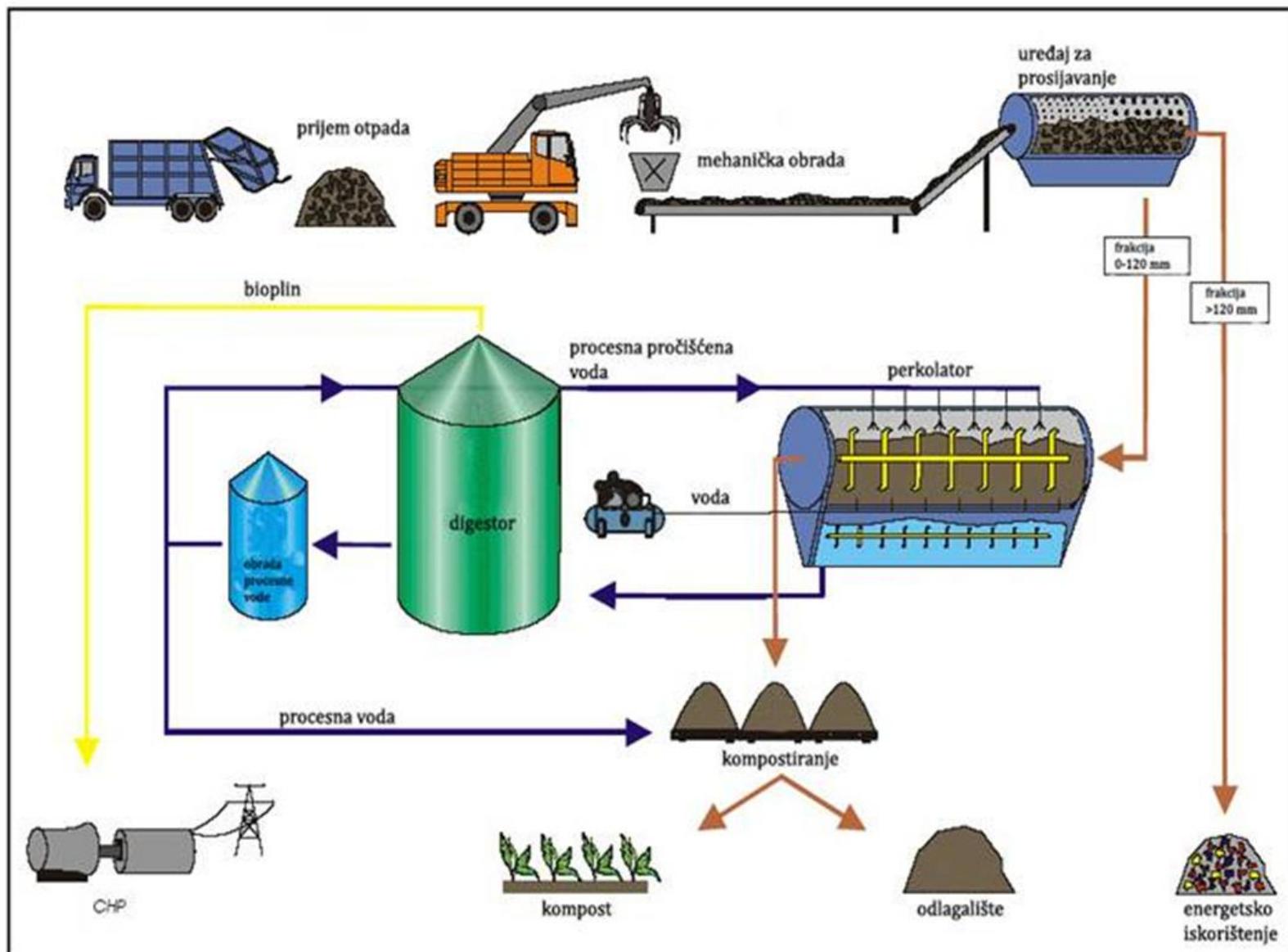


KAKVA JE STRATEGIJA GOSPODARENJEM OTPADOM U RH ?

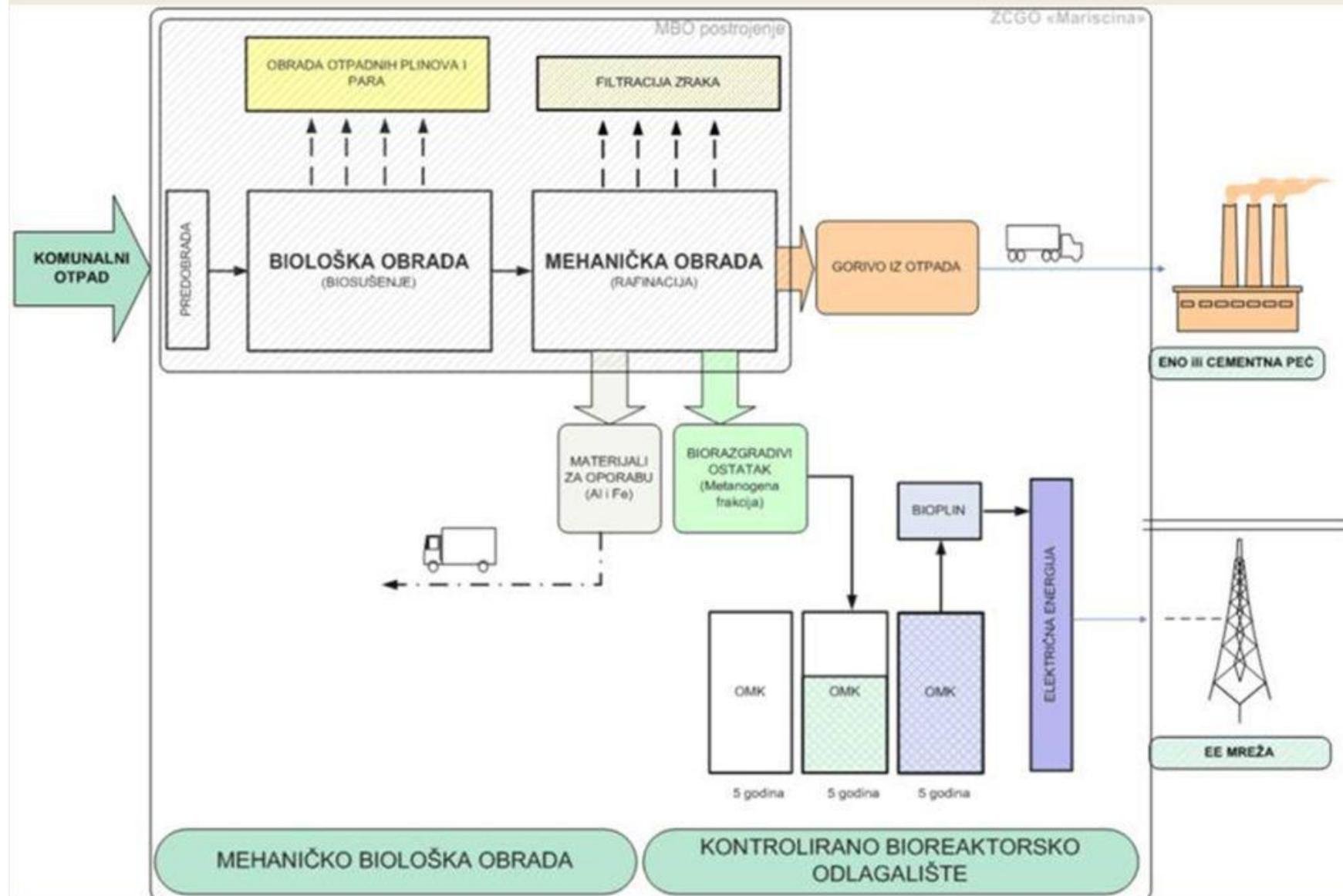
STRATEGIJA I PLAN GOSPODARENJA OTPADOM -Možemo li to provesti ?-

Visina ukupnih potrebnih ulaganja prema Strategiji iznosi 24.389 mil. kn (3.252 mil. eura), od čega za opće mjere i izbjegavanje otpada 525 mil. kn (70 mil. eura), za komunalni otpad 16.965 mil. kn (2.262 mil. eura), a za druge vrste otpada 6.899 mil. kn (920 mil. eura), uvezši u obzir gradnju postrojenja za zbrinjavanje otpada i građevina za mehaničko-biološku i termičku obradu, te druga tehnološka rješenja, osim opcije odlaganja neobrađenog otpada kao konačnog rješenja.

GLAVNI SADRŽAJI CGO



MBO SUSTAV PREDLOŽEN U HRVATSKOJ



MBO SUSTAV PREDLOŽEN U HRVATSKOJ

MBO S BIOREAKTORSKIM ODLAGALIŠTEM

- Mehanička predobrada
- Biosušenje u trajanju 12-15 dana
- Odvajanje metala, RDF-a, te metanogene frakcije
- Metanogena frakcija se odvodi u bioreaktorsku kasetu odlagališta
- Nakon popunjavanja kasete dodaje se voda koja stimulira biološku reakciju i oslobađa se bioplinskim ostacima
- Nastupaju procesi hidrolize i mokre digestije (trajanje 20-25 dana) pri čemu se proizvodi bioplinski gas
- Proizvedeni bioplinski gas se skuplja, filtrira, odsumporava prije upotrebe
- Ostatak se priprema za dodatnu aerobnu degradaciju ili se odlaže (na mjestu gdje se nalazi ili na posebnom odlagalištu).

Značajke: nema reference u Europi, specifični troškovi vjerojatno preko 100 €/t, trajanje postupka (ciklusa) 5 godina, potrebna površina za 100.000 t/g oko 15 hektara, potpuna kontrola emisije neugodnih mirisa.

NEDOSTACI MBO SUSTAVA PREDLOŽENOG U HRVATSKOJ

- 1. Predloženo rješenje nema referencu među izvedenim objektima**
- 2. Predloženo rješenje nije uspoređeno s mogućim alternativama**
- 3. Predloženo rješenje je preskupo**
- 4. Postoji niz mogućih tehničkih problema**
 - 1. Održavanje otpada u suhom stanju tijekom punjenja bioreaktorskog odlagališta**
 - 2. Problem instaliranja mreže cijevi za naknadno dovođenje vode uz istovremeno nužno zbijanje otpada**
 - 3. Problem jednolikog vlaženja kompaktiranog otpada**
 - 4. Slijeganje zbog ubrzanog procesa biološke razgradnje**
 - 5. Problematična kvaliteta biopline zbog ubrzane razgradnje**
 - 6. Neadekvatna mehanička obrada**
 - 7. Proizvedeni RDF nije iskoristiv**

PROBLEMI MBO SA BIOREAKTOROM:

- 1.) Skupa tehnologija i sustav 3,2 mlrd €
- 2.) Skupa obrada >100€/toni
- 3.) Utjecaj na okoliš i velike deponije
- 4.) Minimalna korist RDF i plin
- 5.) Dugotrajna izgradnja
- 6.) KASNIMO !! (kazne od EU)

MOŽDA JE RJEŠENJE NEKONVENCIONALNO...

ALI JE SIGURNO:

- 1.) Jeftino za provođenje cca 500 mil€ umjesto 3,2 mlrd€
- 2.) Ne naplaćuje se dodatno obrada otpada
- 3.) Nema utjecaja na okoliš i deponije su 50% manje
- 4.) Deponira se $\frac{1}{2}$ otpada a $\frac{1}{2}$ se pretvara u visokokvalitetni diesel...
- 5.) Izgradnja traje 20 tjedana a u svakoj županiji niče 1 postrojenje
- 6.) Izbjegavamo kazne EU
- 7.) Zadovoljavamo 1/3 potreba RH za dieselom samo iz komunalnog otpada
- 8.) Otvaramo u roku 1-2 godine 700 radnih mjesta u proizvodnji
- 9.) Ne mijenjamo drastično dosadašnji način skupljanja otpada
- 10.) Komunalni otpad stvara godišnje dodanu vrijednost veću od ukupnog hidropotencijala RH (više od 500 mil€)
- 11.) Ako se komunalnom otpadu pridruži poljoprivredni, šumski i proizvodni otpad, postajemo zemlja izvoznica diesela bez ijedne naftne bušotine
- 12.) Investicija se isplati za cca 5 godina.....

POGLEDAJMO KAKO JA TO ZAMIŠLJAM, A MOGUĆE JE....iako se čini totalno ludo...

01

TECHNOLOGY

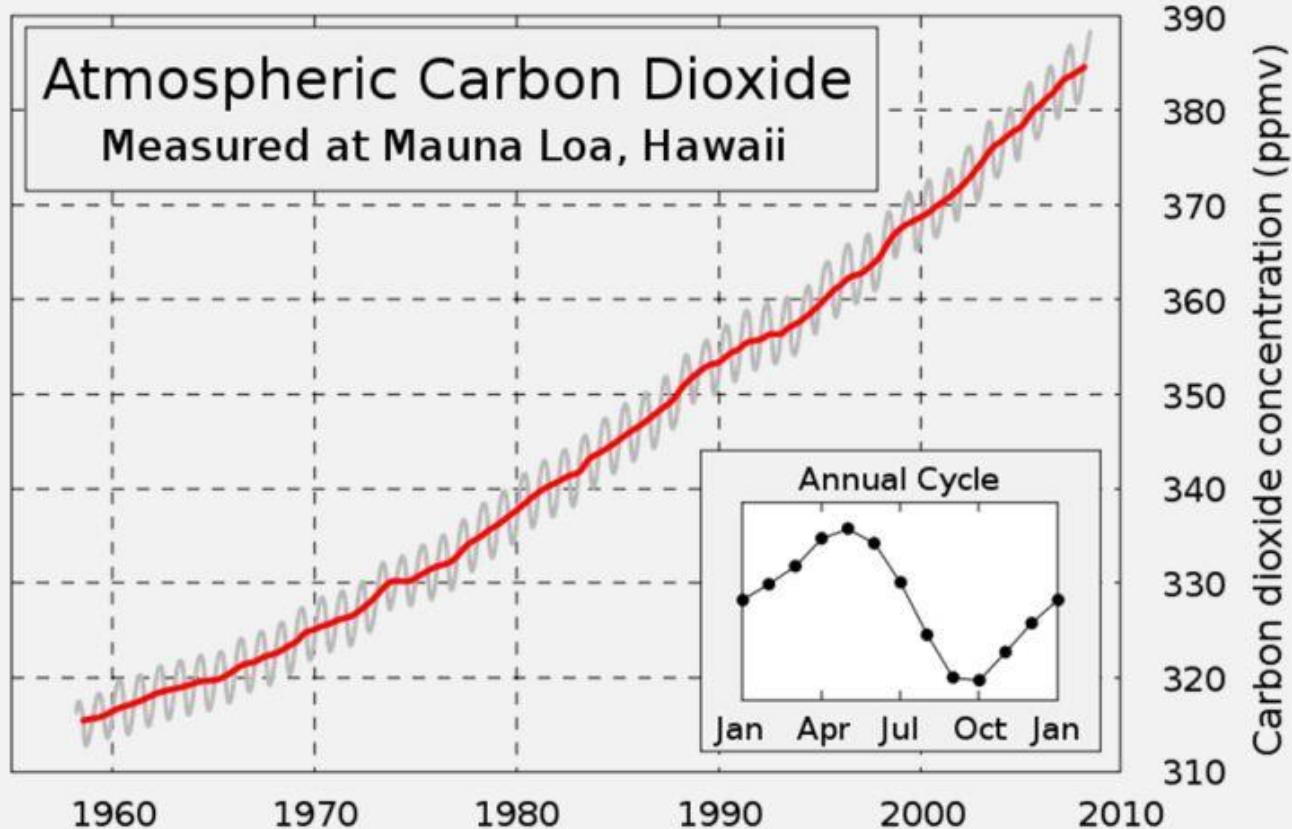
- What is going on
- The nature and the process
- The process
- The potential
- Plant diagram



01

- What is going on with....

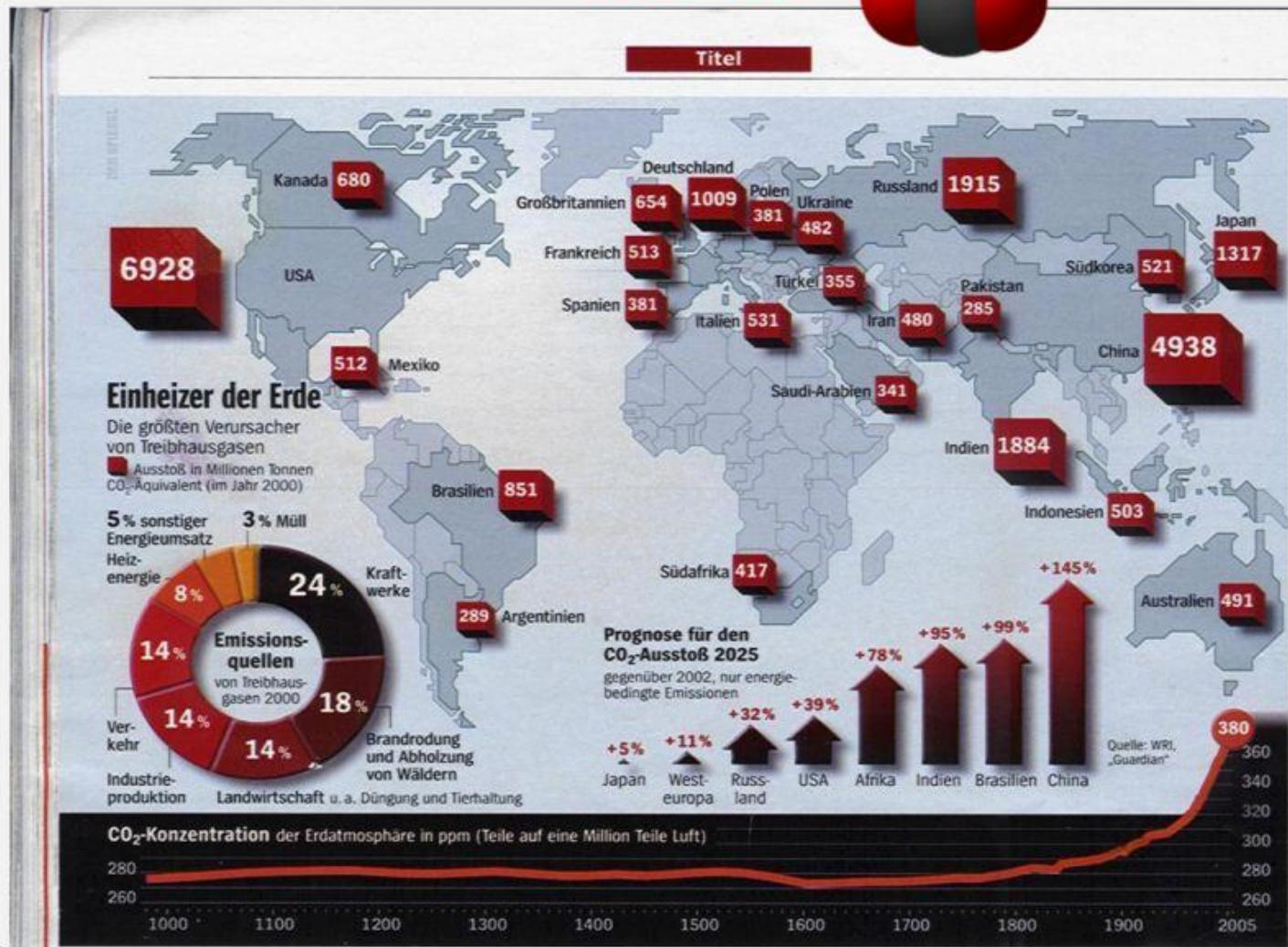
THE CO₂



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▪What is going on with....

THE CO₂

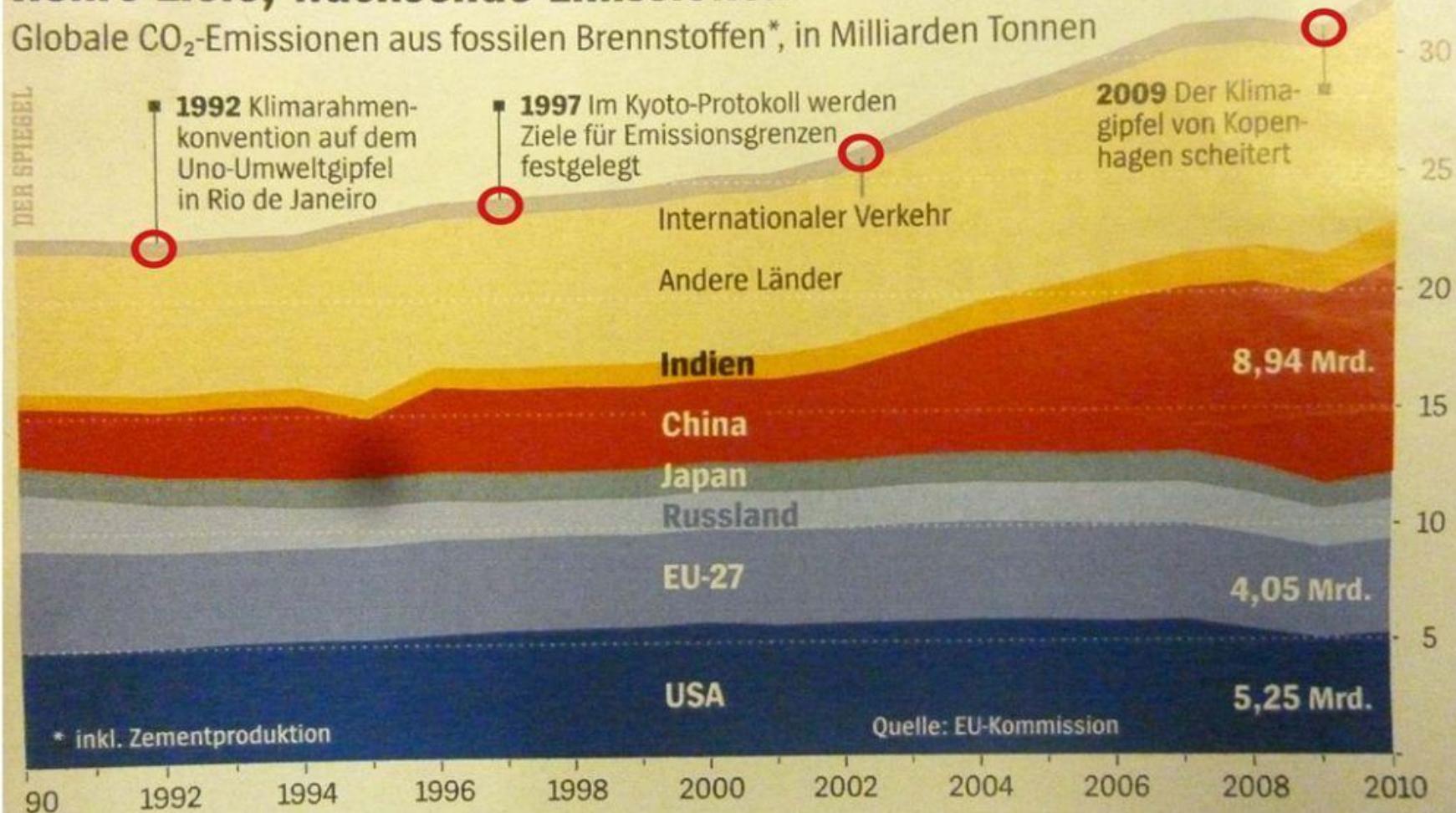


LOFTY OBJECTIVES, GROWING EMISSIONS

Hehre Ziele, wachsende Emissionen

Globale CO₂-Emissionen aus fossilen Brennstoffen*, in Milliarden Tonnen

DER SPIEGEL

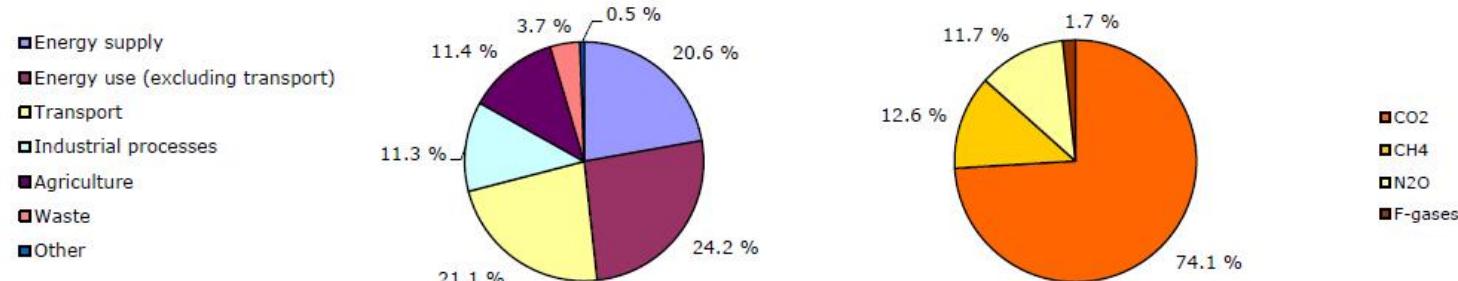


GHG trends and projections in Croatia

European Environment Agency 

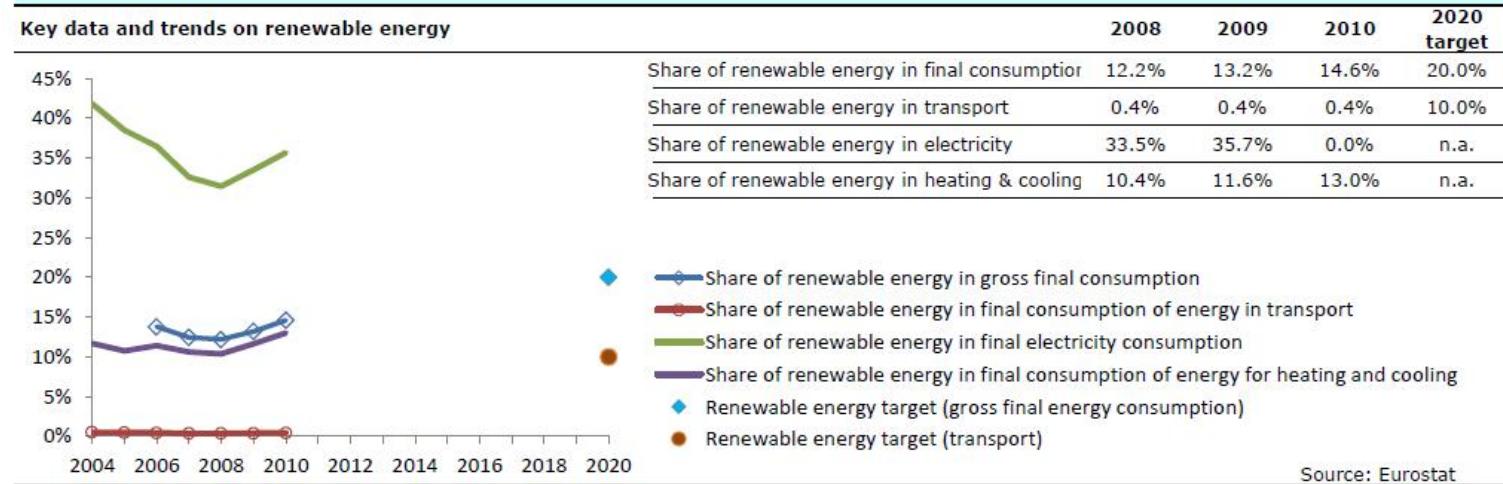
Key GHG data ⁽¹⁾	1990	2008	2009	2010	2011 ⁽²⁾	2012	1990–2011	2010–2011 ⁽²⁾
Average 2008–2012 target under the Kyoto Protocol (Mt CO ₂ -eq.)		29.8	29.8	29.8	29.8	29.8		
Total GHG emissions (Mt CO ₂ -eq.)	31.5	31.0	29.1	28.6	n.a.	n.a.	n.a.	n.a.
GHG from international bunkers ⁽³⁾ (Mt CO ₂ -eq.)	0.5	0.3	0.3	0.3	n.a.	n.a.	n.a.	n.a.
GHG per capita (t CO ₂ -eq. / capita)	6.6	7.0	6.6	6.5	n.a.	n.a.	n.a.	n.a.
GHG per GDP (constant prices) ⁽⁴⁾ (g CO ₂ -eq. / euro)	940	765	762	759	n.a.	n.a.	n.a.	n.a.

Share of GHG emissions (excluding international bunkers) by main source and by gas in 2010 ⁽¹⁾ ⁽⁸⁾



Assessment of short-term GHG trend (2009–2010)

Croatia was among the countries with decreasing emissions between 2009 and 2010 (-1.6%). The total energy consumption in 2010 was 2.6 percent lower than in the previous year. This reduction is the result of decreased consumption of liquid fuels (14.9 percent) and imported electricity (11.8 percent). It is also due to increase in hydro power utilization (by 17.5 percent from the previous year) and larger consumption of fuel wood and other renewables. Due to decreasing of economic activity within 2009 and 2010, cement production was decreased by 23 and 26 percent, respectively. Whereas the ammonia production in 2010 was 17 percent higher in comparison to 2009 and nitric acid production was 29 percent higher as well in 2010 in comparison to 2009. The level of emissions from the latter sub-sectors strongly depend on consumer's demand for particular type of mineral fertilizer at the market.



Cijena CO₂ emisije=18 kn/t ne primjenjuje se na izgaranje goriva od biomase, a prekoračenje 100 kn/toni !!!

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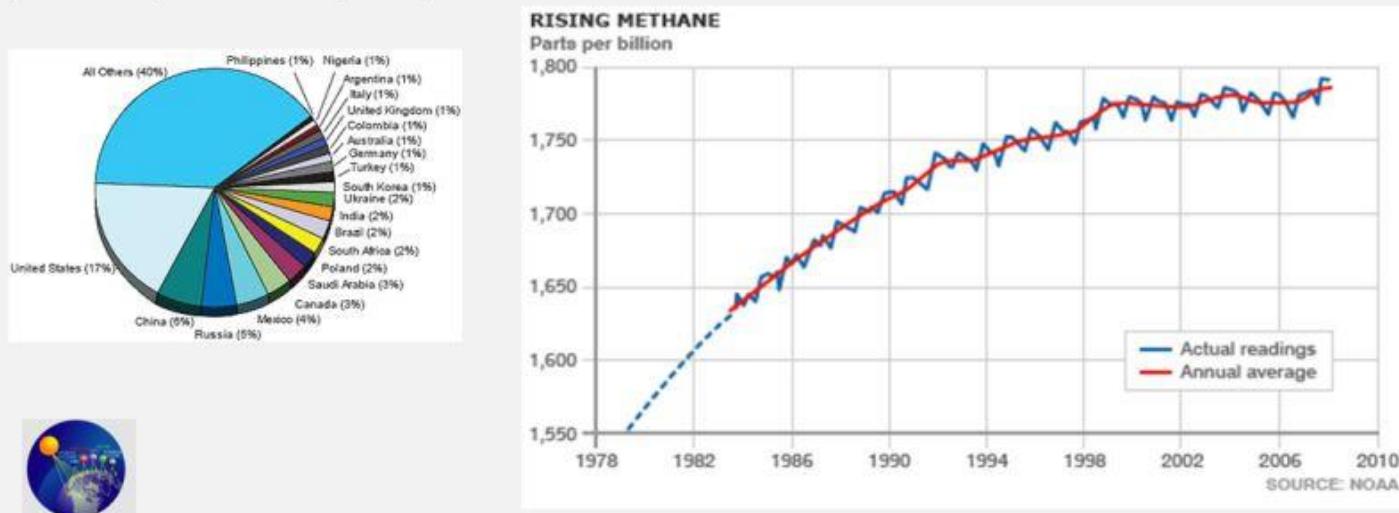
- What is going on with....

METHANE



Methane in the Earth's atmosphere is an important greenhouse gas with a global warming potential of 25 kg CO₂ over a 100-year period.

This means that a methane emission will have 25 times the impact on temperature of a carbon dioxide emission of the same mass over the following 100 years. Methane has a large effect for a brief period (a net lifetime of 8.4 years in the atmosphere), whereas carbon dioxide has a small effect for a long period (over 100 years).

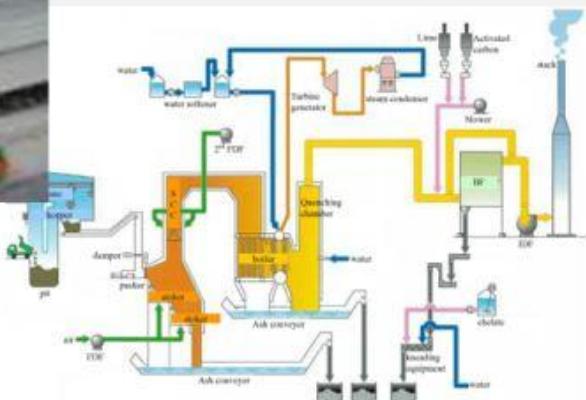


- What is going on with....

DIOXINES

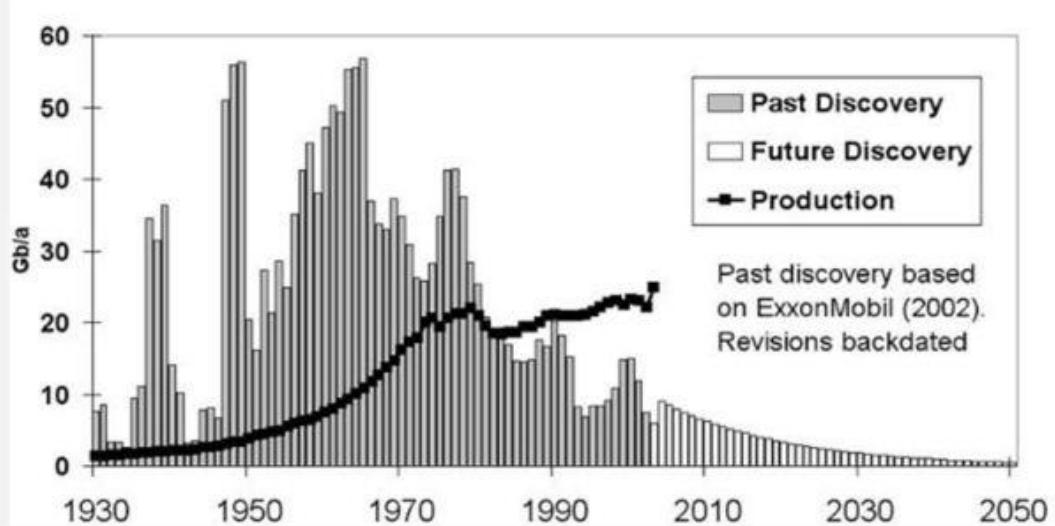


Dioxins occur as by-products in the manufacture of organochlorides, in the incineration of chlorine-containing substances such as PVC (polyvinyl chloride), in the bleaching of paper, and from natural sources such as volcanoes and forest fires



- What is going on with....

CRUDE OIL



Oil discovered 40 years ago is the basis of current oil production.

The search for oil continues but projected oil discoveries will contribute little to projected oil production in 2030

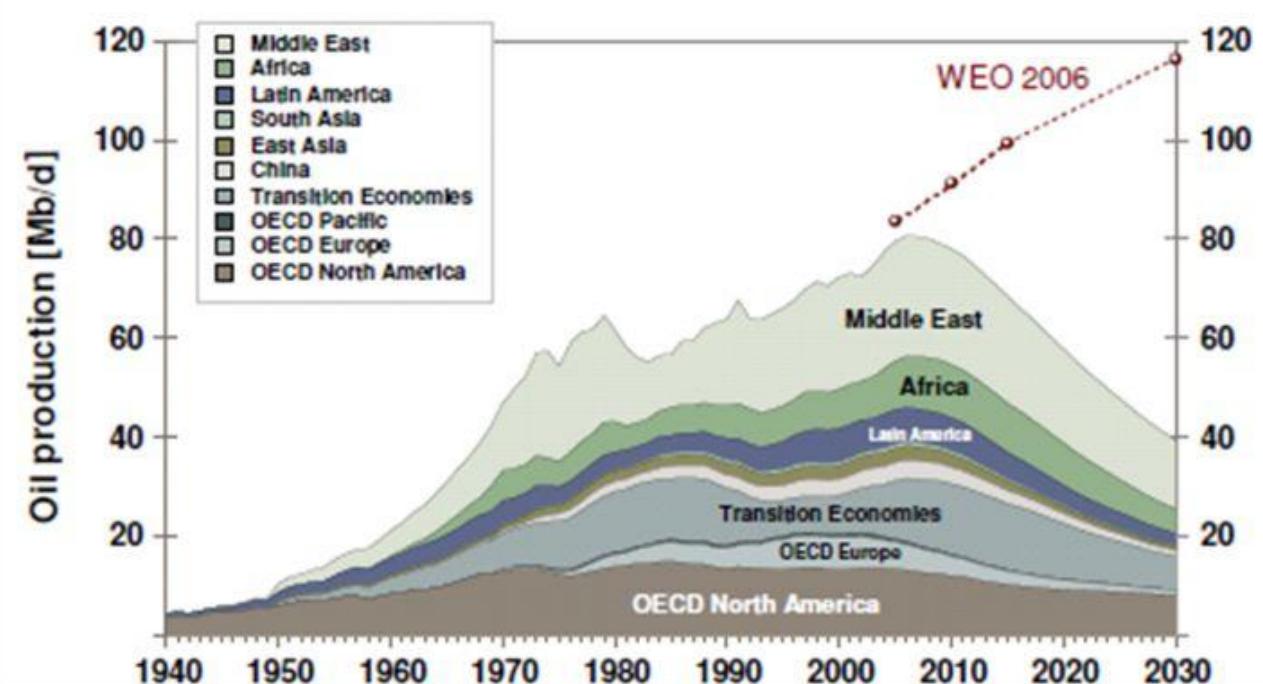
The declining rate of oil discoveries makes it painfully obvious--most of the oil has already been discovered.

The technology for finding oil has improved greatly since the major discoveries, yet little oil has been found in recent years.

The heyday of oil discovery was from 1950 to 1980. It is difficult to avoid the conclusion--most of the oil has been found.

The gap between new discoveries and production will get larger.

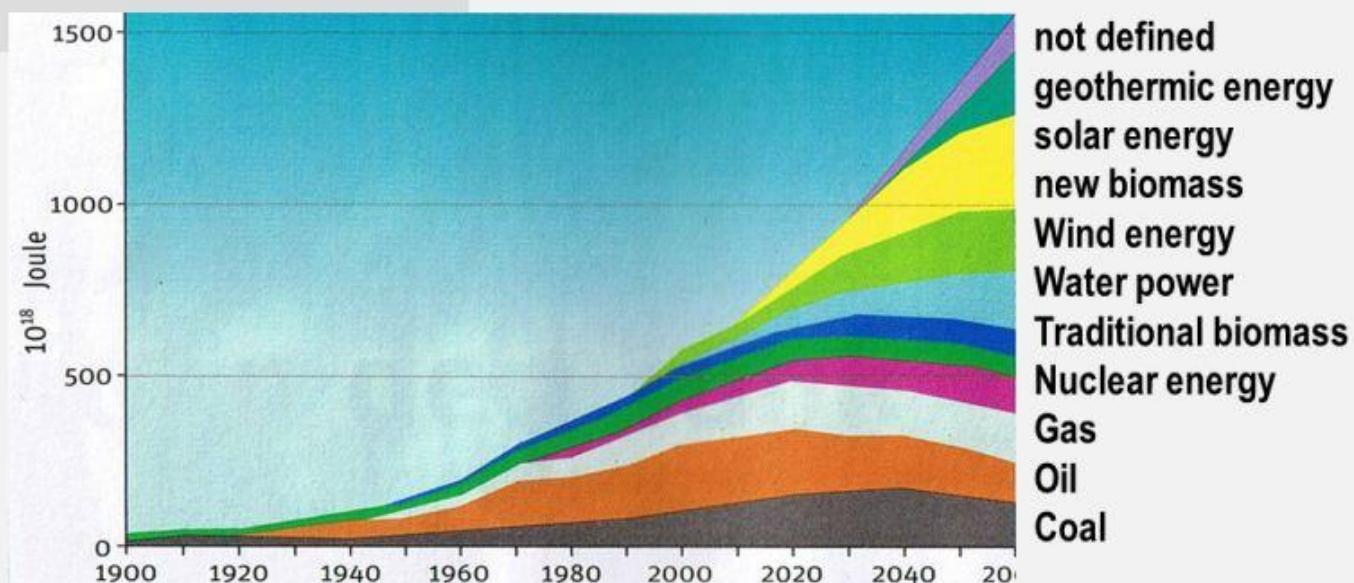
- What is going on with....
ENERGY CONSUMPTION



Based on realistic forecasts the expected demand of oil in 2030 will be covered only with one third of the expected oil production.

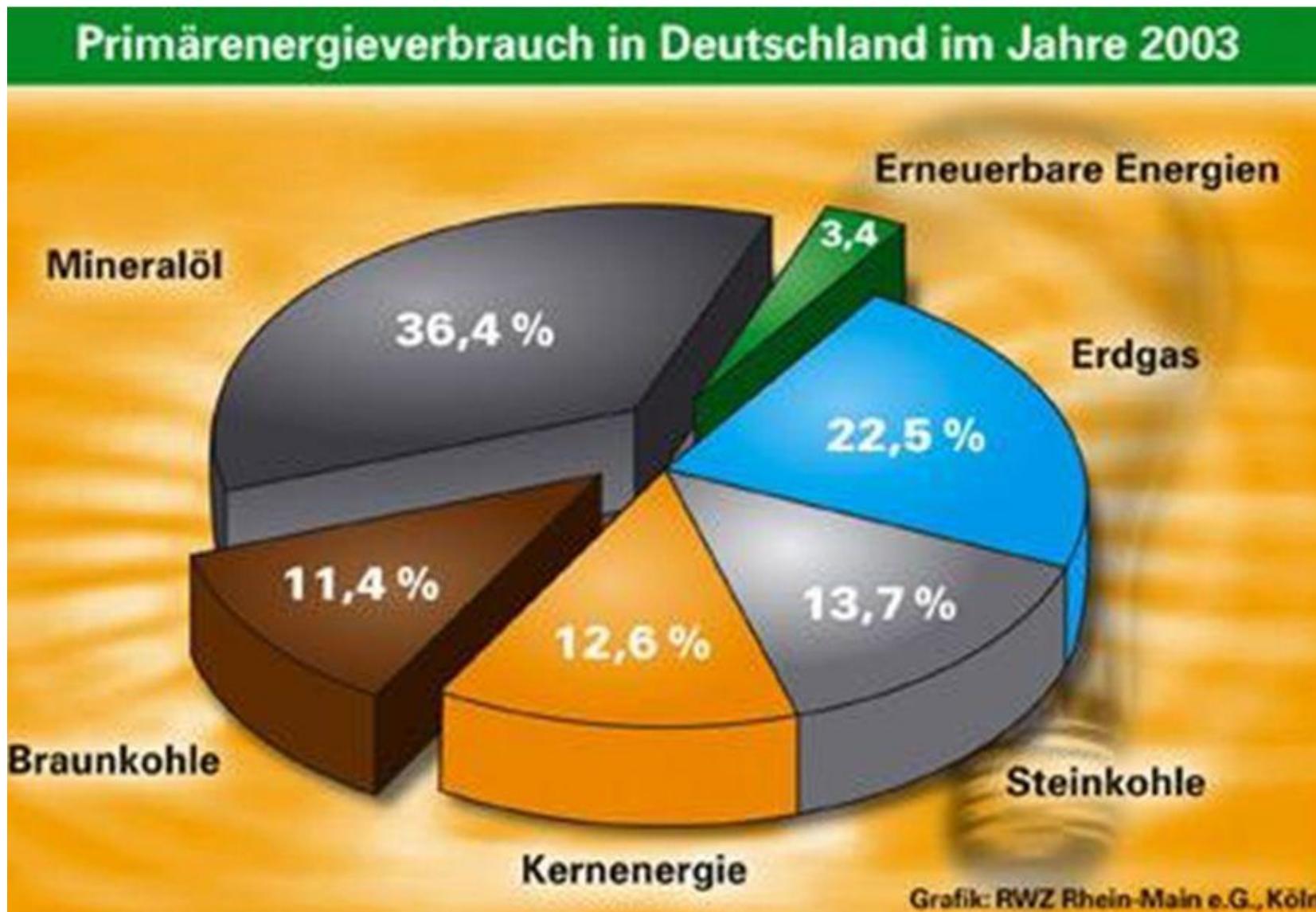
- What is going on with....
ENERGY CONSUMPTION

Dramatic Rising of Energy Consumption



Based on realistic forecasts the conventional energy will cover in 2060 just one third of our energy consumption.

Auch Deutschland ist noch stark abhängig von Fossilen Energieträgern



Subvention of the renewable energy

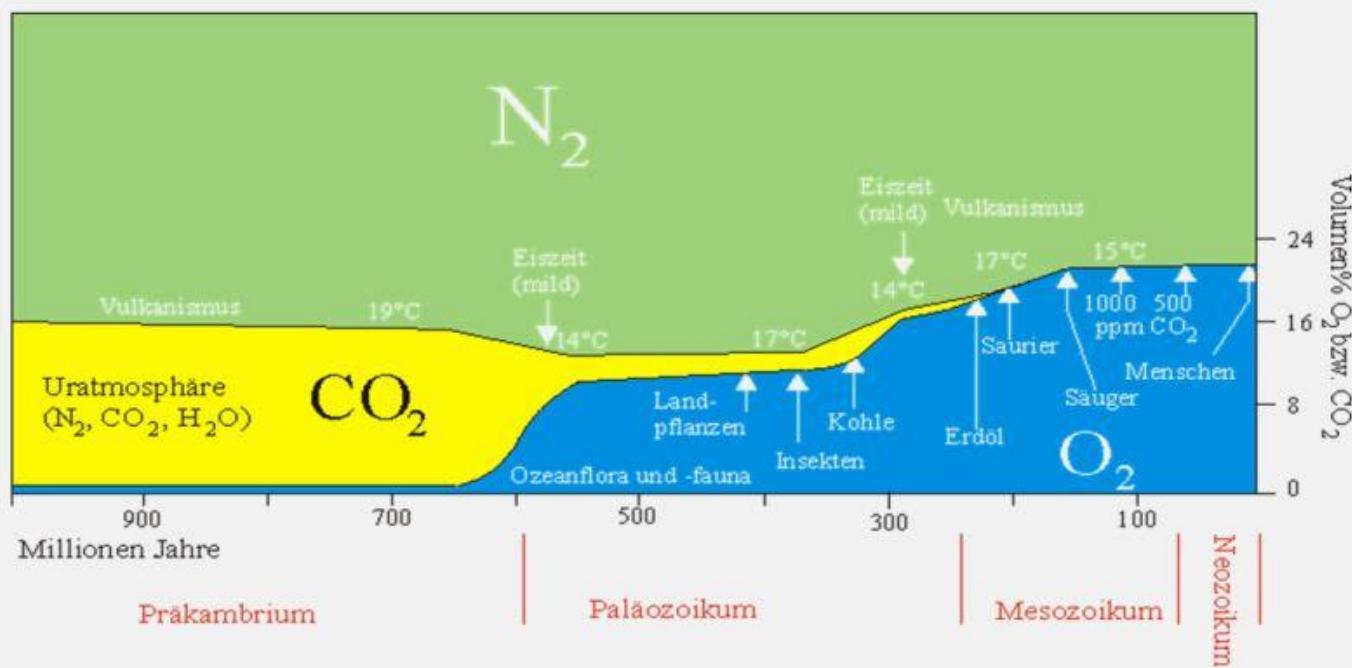
- In Germany is the support of the solar energy 1,86 C/kWh from the customer and nearly the same as support of the government. 52 % of the support for this energy is used for 15 % renewable energy.
- Wind energy get 23 % of the support of the renewable energy with a participation of 40 %. This is regarding to the high change of the energy delivery depending to the wind speed ($N \sim v_{\text{high}}^3$).
- The rest is biomass and water power.

The nature and the process

- Origin of the crude oil
- Process: Copy of the nature

Origin of crude oil

Formation process from planktonic remains to kerosene



Crude oil is derived from organic material; so will be the fuel of the future. It will not be necessary to drill for that fuel anymore; instead it will be derived from the available organic material, which is not used as food. That way, problems with the disposal of organic waste are solved at the same time.

After the high misinvestments in gasification, pyrolysis and the Fischer-Tropsch process it is now clear that such a process can only run at a temperature lower than 300°C.



CPD = Catalytic Pressure-less Depolymerisation

The conversion of organic material into crude oil began around 1 billion years ago with the evolution of the photosynthesis. While photosynthetic life reduced the carbon dioxide content of the atmosphere, it also started to produce oxygen and today the atmosphere of the earth contains 20.9% oxygen.

Furthermore, during the past 320 million years the supercontinent Pangea has split into the current continents, the seas and volcanoes have formed, the earth has expanded to a size 2.5 times bigger and plants have flourished. Some of those plants formed the basis for the coal built during the Carboniferous. Also 0.42kg crude oil has evolved per cubic metre oxygen.

Traditional energy sources such as crude oil and coal are getting scarcer. Besides, the drilling and burning of fossil fuels contaminate the atmosphere, contribute to global warming and most people are left aside when it comes to fuel allocation.

Fuel production from renewable resources does not harm the food production since it is only using its waste. In addition, that form of energy production, where agricultural waste is used for energy generation, provides enough income for almost all the poor people. Only 10% of land used for agriculture is necessary to provide enough resources for that energy production even when considering a rise in population. This energy production technology will be the solution for the future.



PROCESS - Copy of the Nature

It is possible to copy the process of natural crude oil synthesis from organic material. **Nature invented this process** more than 900 Mio. years ago.

We know the conditions:

- 1) minerals as the catalyst
- 2) temperatures of 14-19°C in the ocean and
- 3) 300 Mio. years time in the catalytic layer.

In order to copy this natural process we have to reduce the time. This was possible with the change of 3 conditions:

- 1) 100 % crystallized ion-exchange catalysts instead of minerals
- 2) Temperatures of 300-330°C and oil instead of water
- 3) High mixture speed in the turbine instead of convection and diffusion.

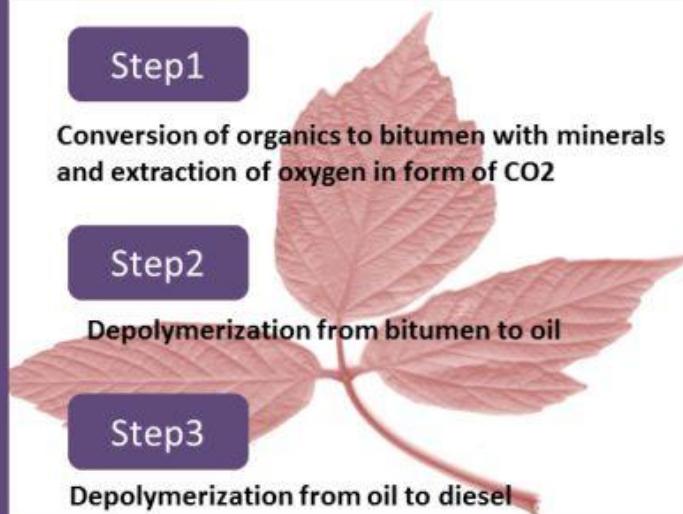
crude C₅₀H₉₆ (H/C-composition = 1,92)

- | Pyrolysis | |
|--|--|
| Koks | Propan |
| Oktan | |
| 17% CH ₄ (METAN) + 19% C (+ 3% C ₃ H ₈ + + 22% C ₆ H ₁₈ + 33% (Diesel) C ₁₇ H ₃₄ + 6 % (Cerosen) C ₁₄ H ₂₈ = 100 % | |
| Liquid result (22 + 33 + 6) = 61 % | |
| own consuption gas and coke | |
| Winner | Loser |
| CH ₄ (H/C-Verhältnis 4 + 108 %) | METAN C (Koks) (H/C-Verhältnis 0 - 100 %) |
| C ₃ H ₈ (H/C-Verhältnis 2,67 + 39 %) | PROPAN |
| C ₆ H ₁₈ (H/C-Verhältnis 2,25 + 17 %) | OKTAN Benzol C ₆ H ₆ (C/H-Verhältnis 1 - 48 %) |
| C ₁₇ H ₃₄ (C/H-Verhältnis 2 + 4 %) | DIESEL |
| -----> KDV | |
| crude C ₅₀ H ₉₆ (H/C-composition = 1,92) + 2 C ₆ H ₁₁ O ₅ = 2 x C ₂₆ H ₅₂ + 5 CO ₂ | |
| 1 t crude + 250 kg cellulose = 105 t heavy diesel + 200 kg CO ₂ | |
| Liquid result with 6 % own cosumption of the gas turbine + equipment = 99 % of the crude (25 % cellulose need | |

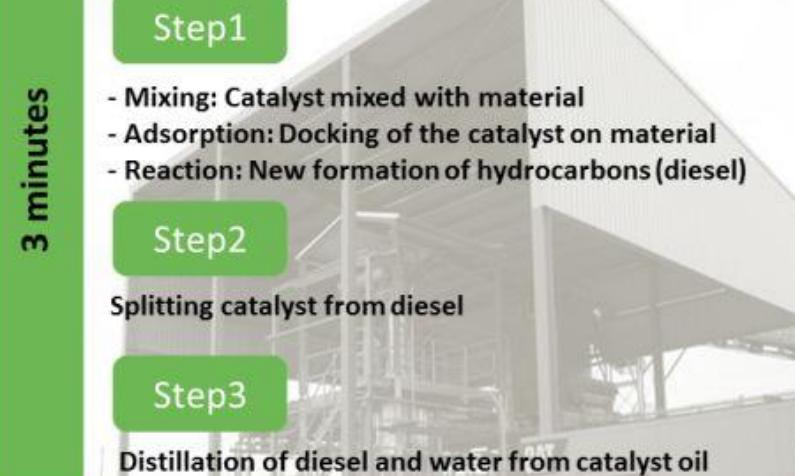
PROCESS - Copy of the Nature

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BY NATURE: 300 mill. years



3 minutes



The process

- Main characteristics of the process
- Inputs of the process
- Outputs of the process
- Emissions of the process
- Benefits and highlights

01

PROCESS Main characteristics

Low pressure

Vacuum as an inherent safety component of the system

Low temperature

A diffusion catalytic process without thermal cracking (pyrolysis) and dehydration

CO₂ Extraction

New formation of oxygen

Free saturated hydrocarbons

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PROCESS
Inputs

BIOMASS

PLASTICS OF ALL KINDS

USED MINERAL OILS

MUNICIPAL SOLID WASTE

Raw materials for our fuel



01

PROCESS Outputs

WATER: Distilled in the sludge plant

DIESEL: Middle distillate from the main distillation column

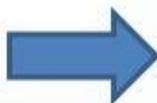
CO₂: Extracted from the biomass in the diffusion-catalytic process

ASH: Final product from the ash plant

Input



Output



KDV: Industrial Development

K	=	Katalytisch
D	=	drucklose
V	=	Verölung



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PROCESS Emissions?

- 1) The plant has no chimney and no emissions from the process.
- 2) All the product produced by the plant in form of gas is condensed diesel steam, light products and CO₂ from the CO₂ extraction of the cellulose. The non-condensable gases and the CO₂ are derived to the generator air filter for recycling, therefore the emission is only in connection with the generator exhaust gases.
- 3) The emission of the generator is not affected by the gases from the plant.



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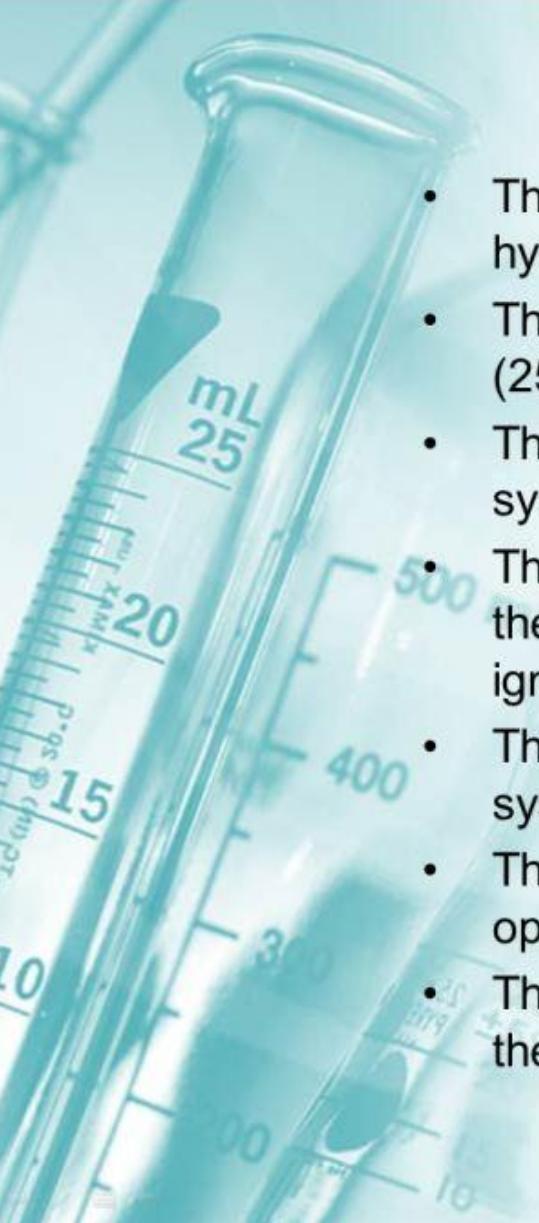
BENEFITS & HIGHLIGHTS

BENEFITS

- The technological reproduction of the natural crude oil synthesis is **accomplished within minutes**
- Synthetic fuel can be produced at **competitive prices**
- The **quality of Diesel fuel is better** than the EU-standards for conventional diesel fuel
- **No environmental pollution.** The technology binds inorganic harmful substances in salt induced by the ionic changing characteristics of the catalyst
- **Environmental protection** becomes a source of energy and jobs

HIGHLIGHTS

- The process can use all materials containing hydrocarbons with reduced content of water and inorganics
- The efficiency is regarding to the low reaction temperature (280 – 320°C), and high conversion rates (about 65 – 85 %)
- The plant does not produce coke and needs no cleaning system
- The plant has no heating systems. The heat is coming from the friction in the turbine avoiding hot surfaces that can ignite materials
- The vacuum controls the safety of the plant and the input system
- The residue is produced in solid form and offers the opportunity for the recycling of the catalyst
- The consumption of the catalyst is very low and the cost of the process is very competitive

- 
- The process can use all materials containing hydrocarbons with reduced content of water and inorganics
 - The efficiency is regarding to the low reaction temperature (250 – 285°C), and high conversion rates (about 65 – 85 %)
 - The plant does not produce coke and needs no cleaning system.
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The potential

Playing with some numbers

PROCESS THE POTENTIAL

Biomass examples:

sewer sludge
forest waste
agricultural waste
energy through photosynthesis

"biofuel-" plants as source of feedstock

planting deserts and cities with new type of plants as "Jatropha" having roots up to 10 m
harvest the plants without destruction and without implications on the food chain
create new jobs in planting, harvesting and conversion in diesel
create social structures

Jatropha



-1000 has.

-8,000 tons of diesel per year



Sugar cane waste



Brasil



-1000 has.

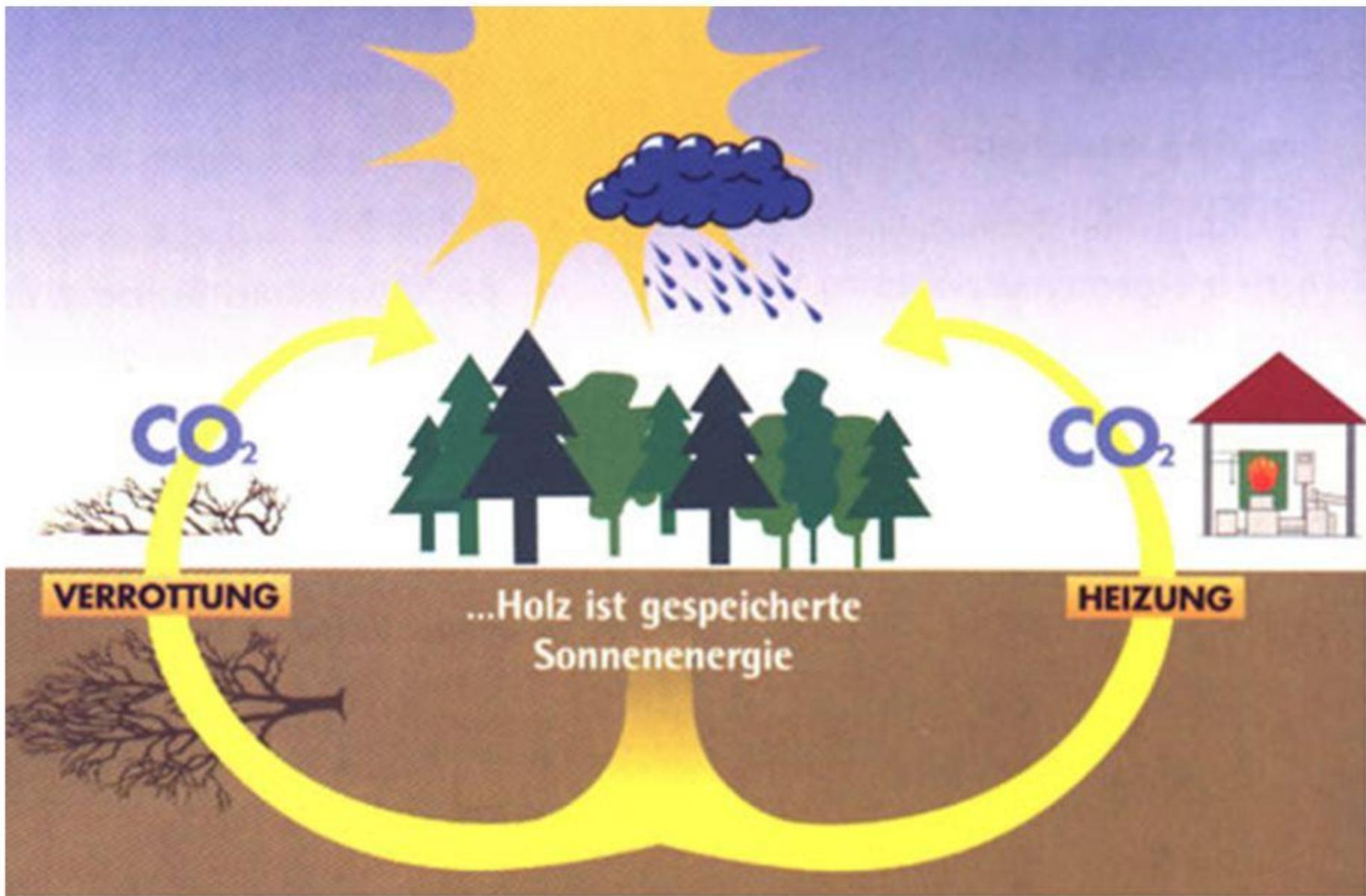
-9,000 tons of diesel per year

Palm oil waste

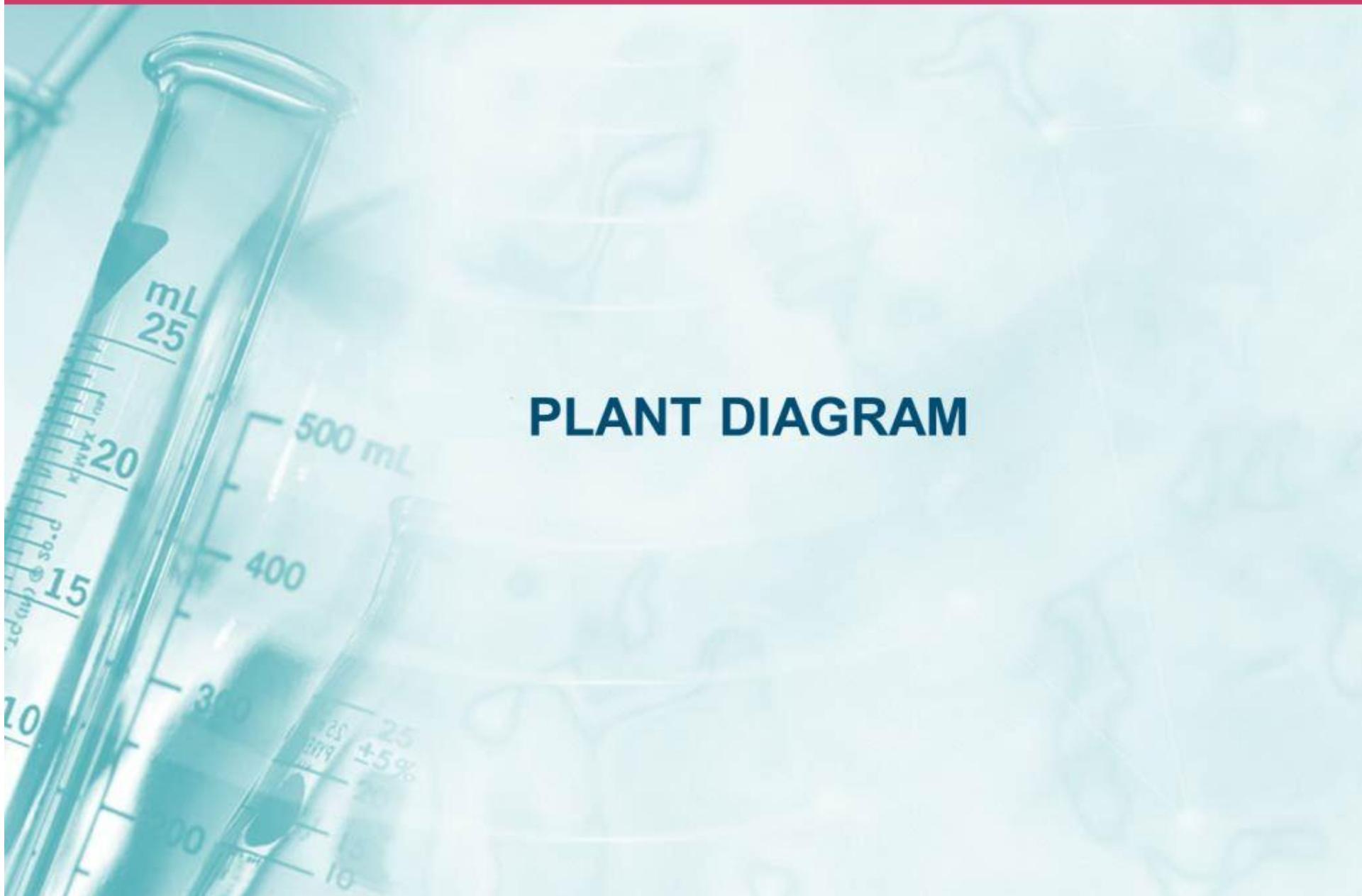


-1000 has.

-7,000 tons of diesel per year

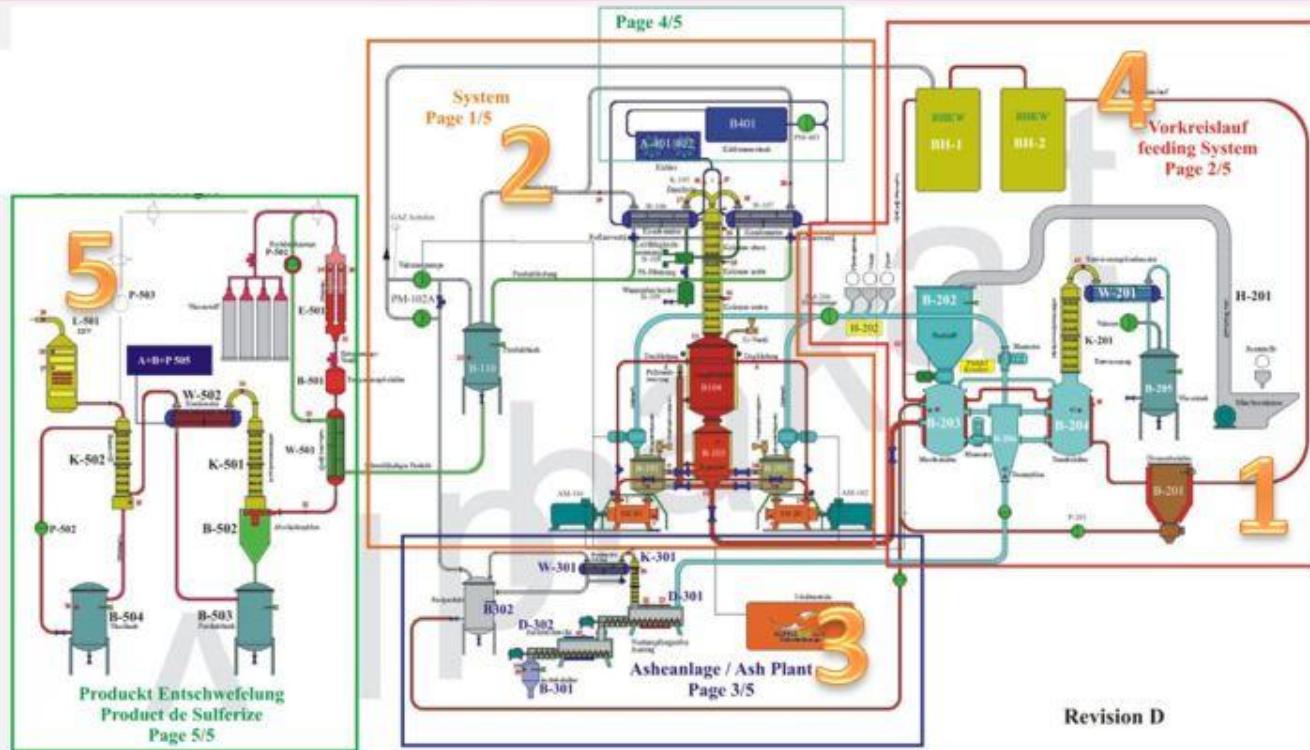


PLANT DIAGRAM



PROCESS DIAGRAM OF THE PLANT

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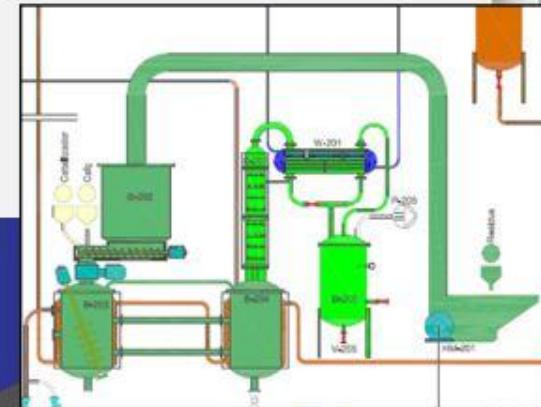
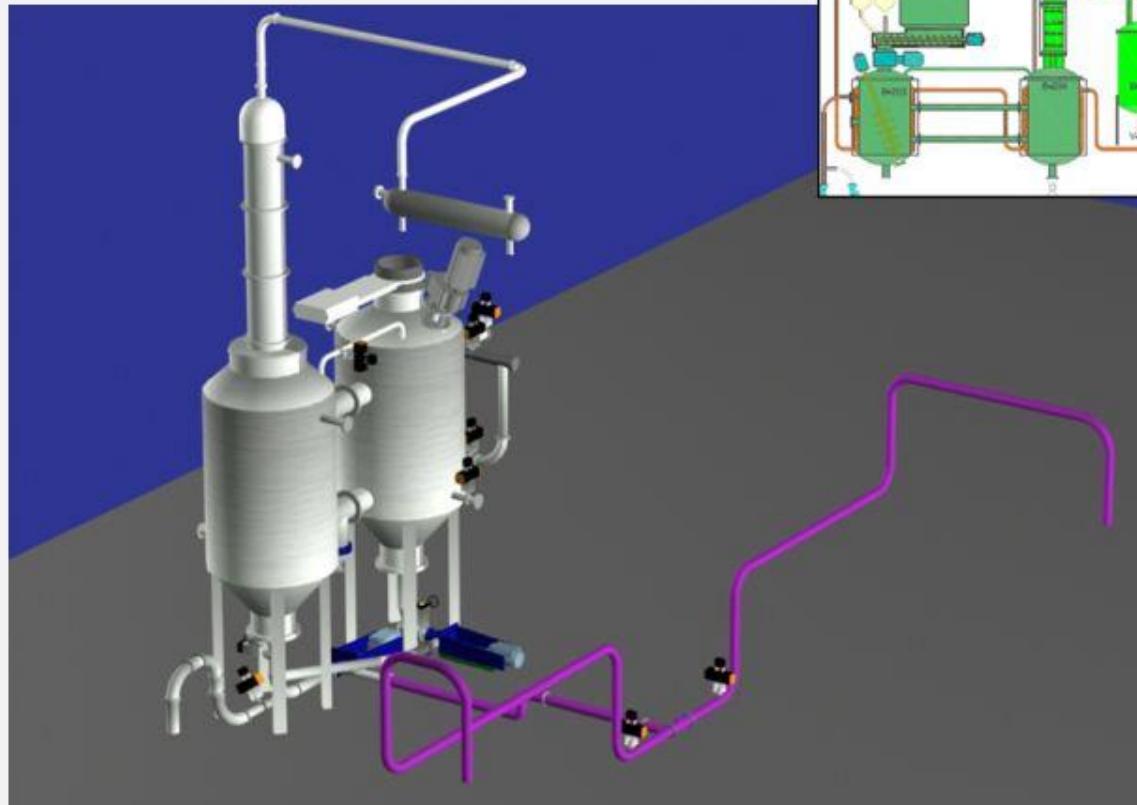


1 SLUDGE PLANT

01

PROCESS DIAGRAM OF THE PLANT

1 SLUDGE PLANT

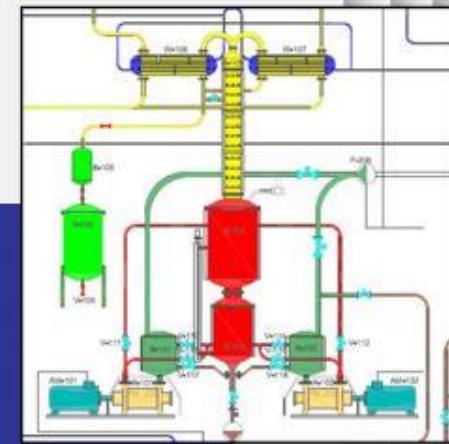
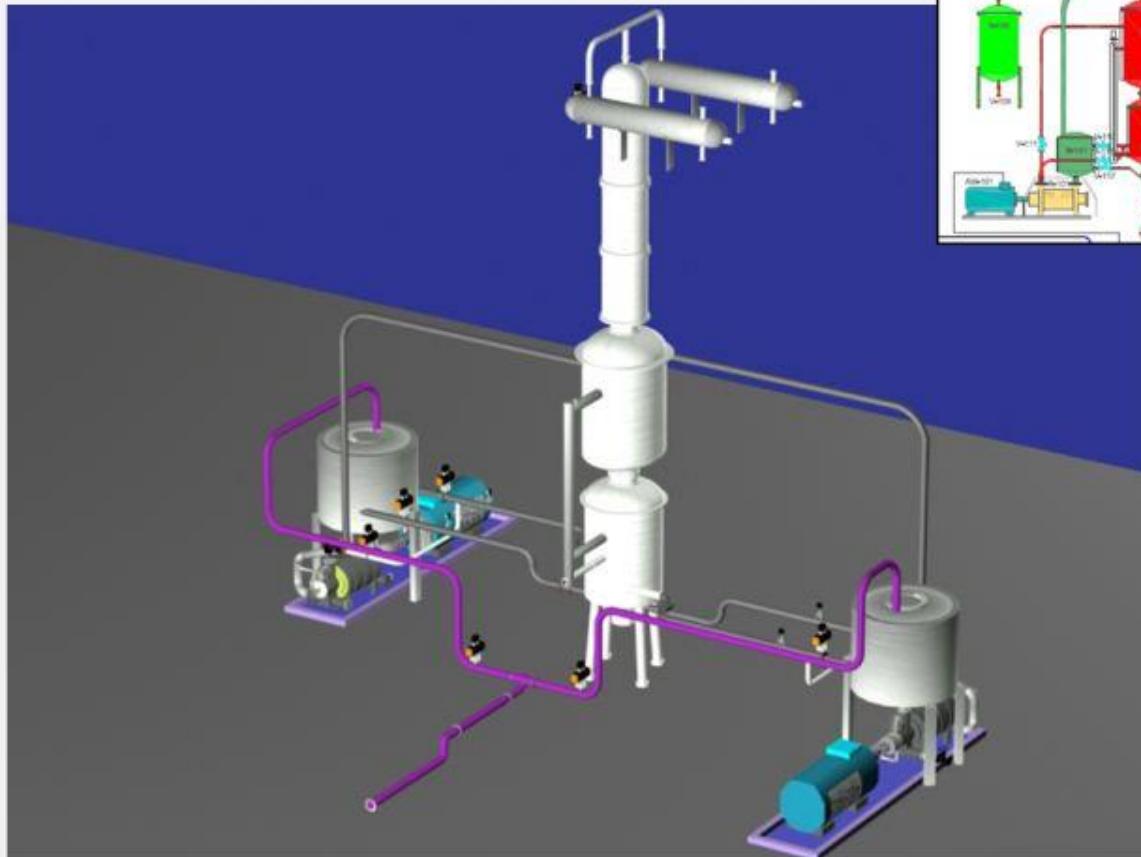


01

PROCESS
DIAGRAM OF THE PLANT

2

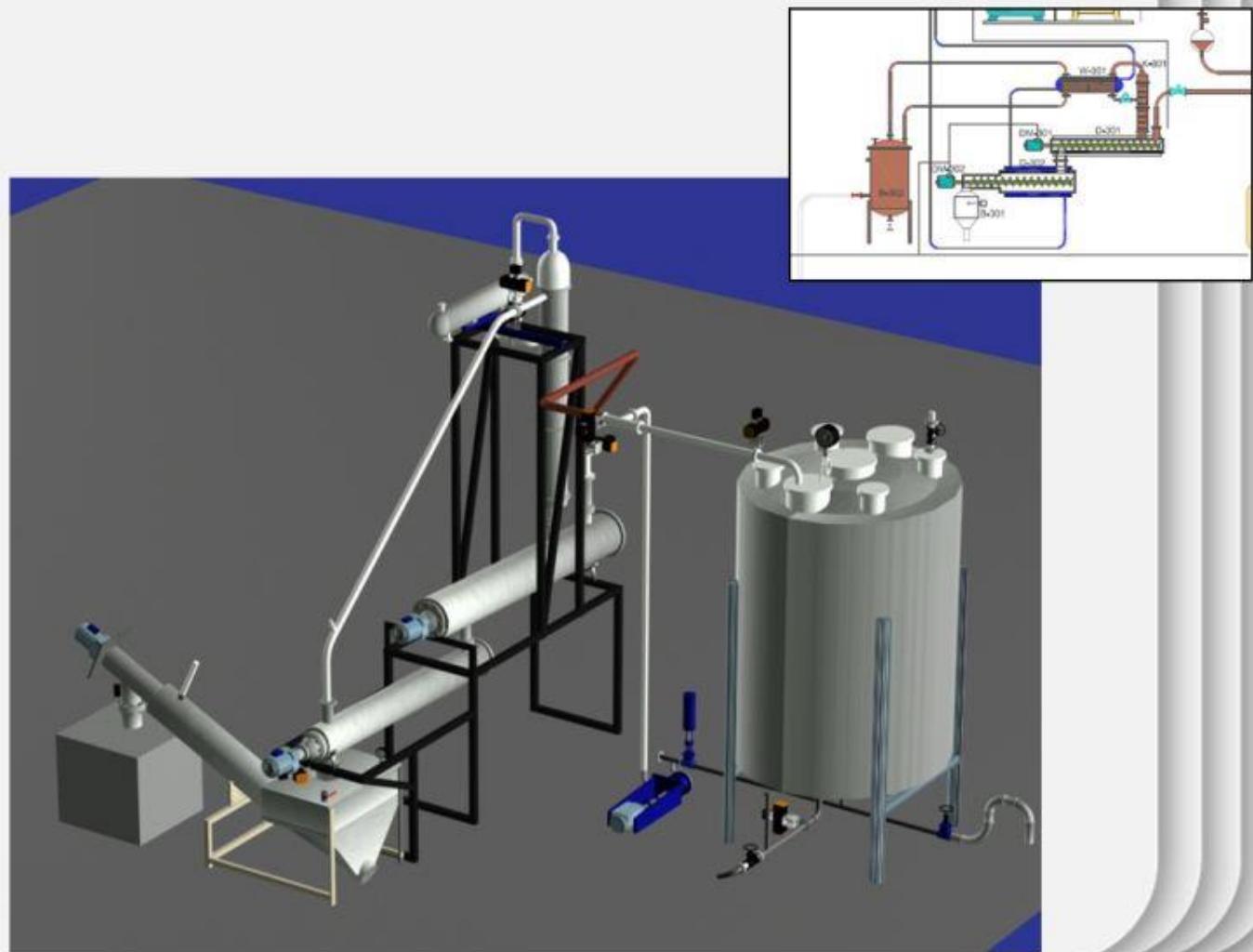
PLANT



01

PROCESS DIAGRAM OF THE PLANT

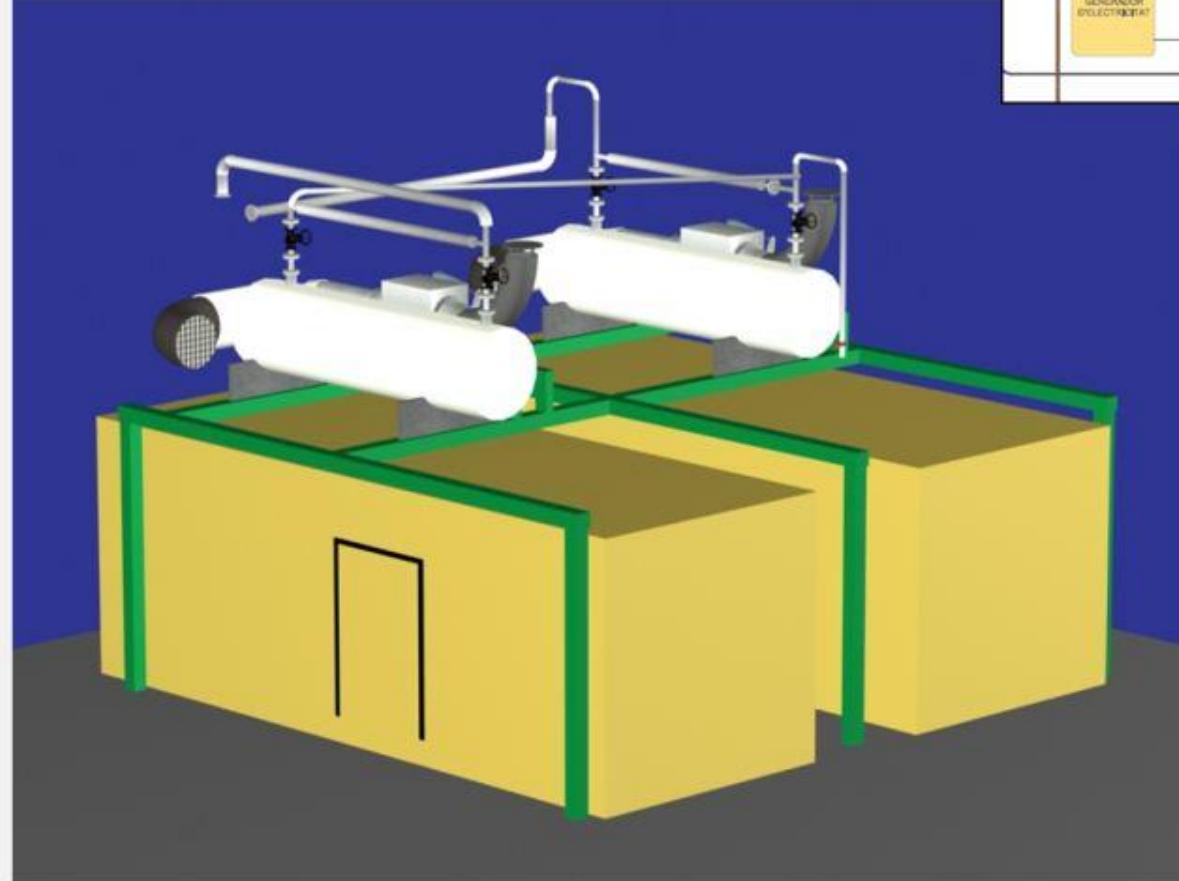
3
ASH
PLANT



01

PROCESS DIAGRAM OF THE PLANT

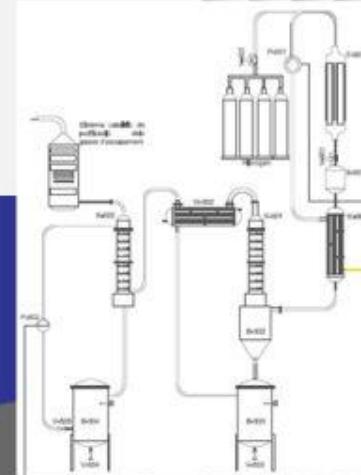
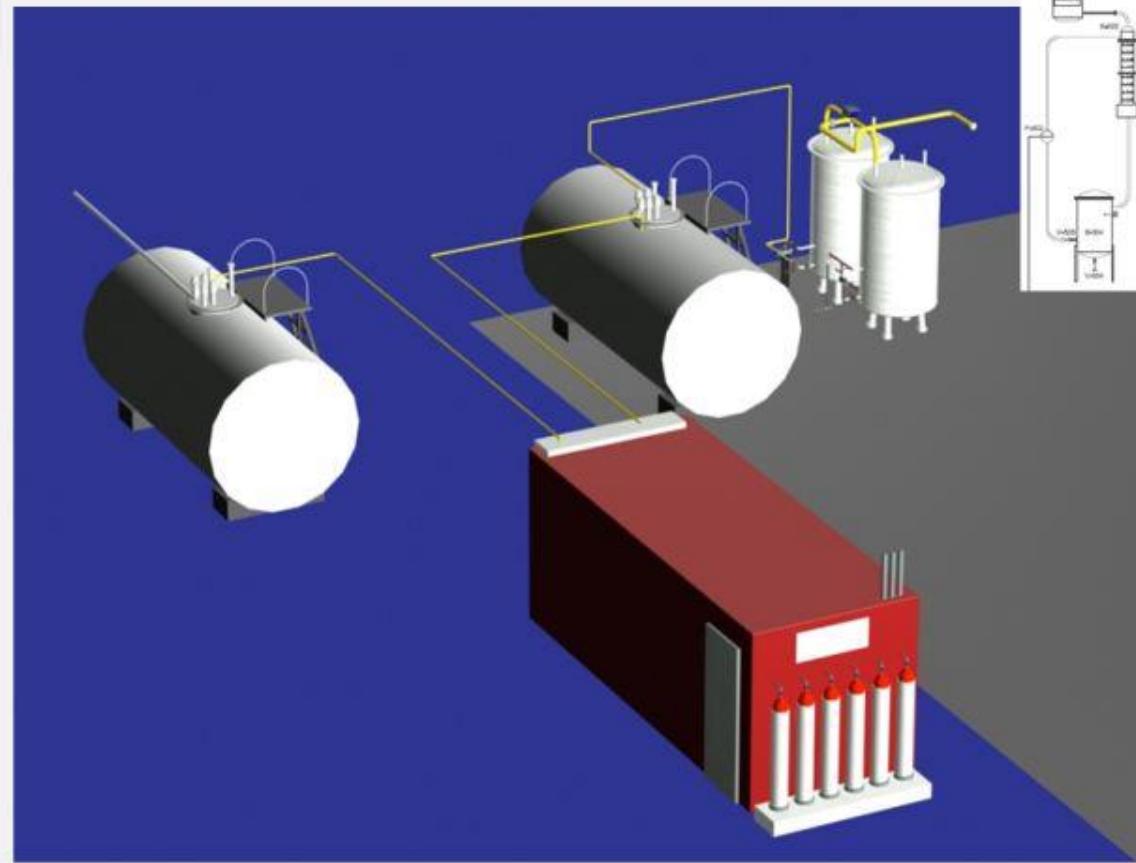
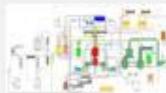
4 GENSET
PLANT



01

PROCESS DIAGRAM OF THE PLANT

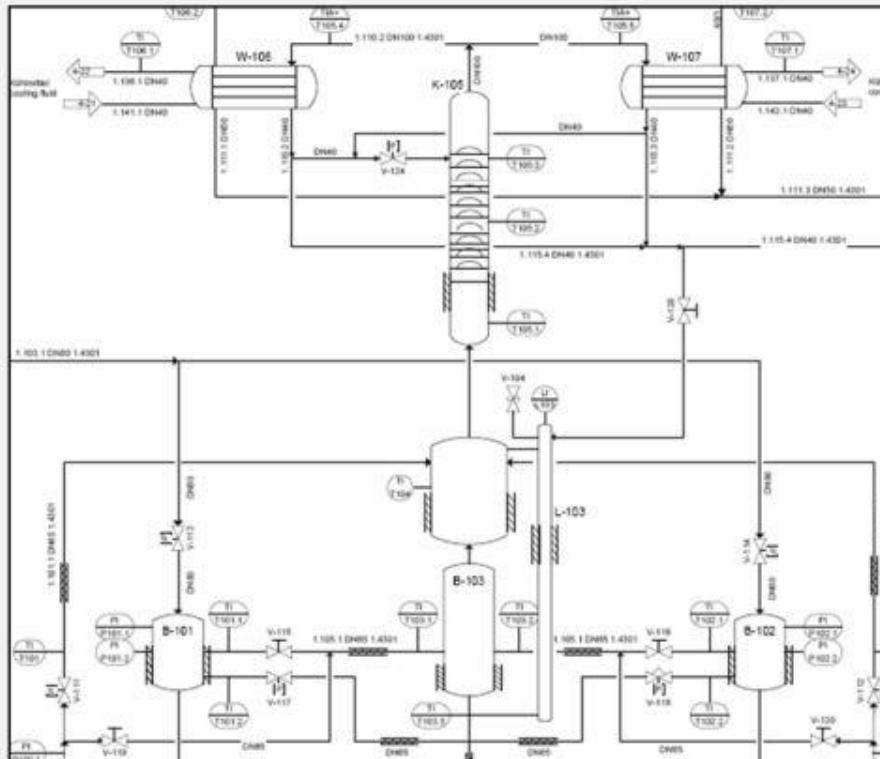
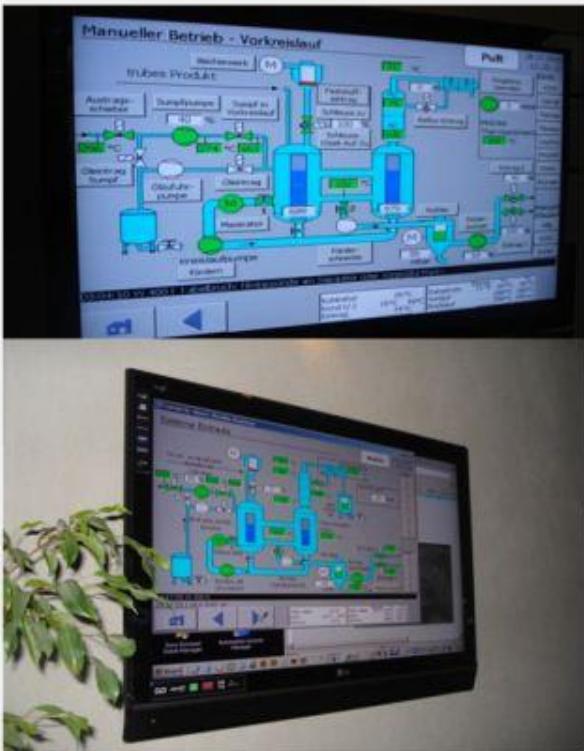
5 DESULPHURATION PLANT

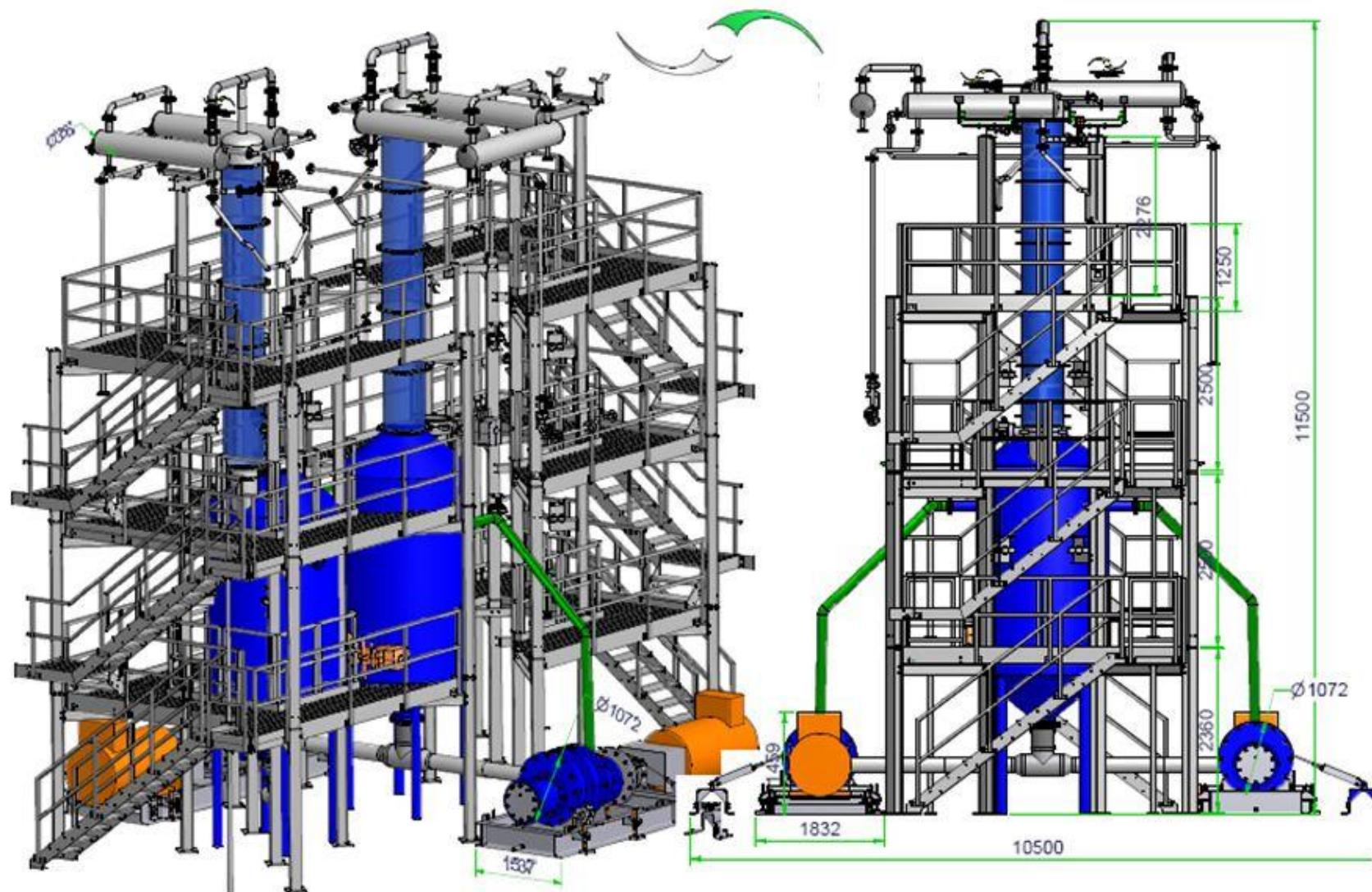


PROCESS DIAGRAM OF THE PLANT

01

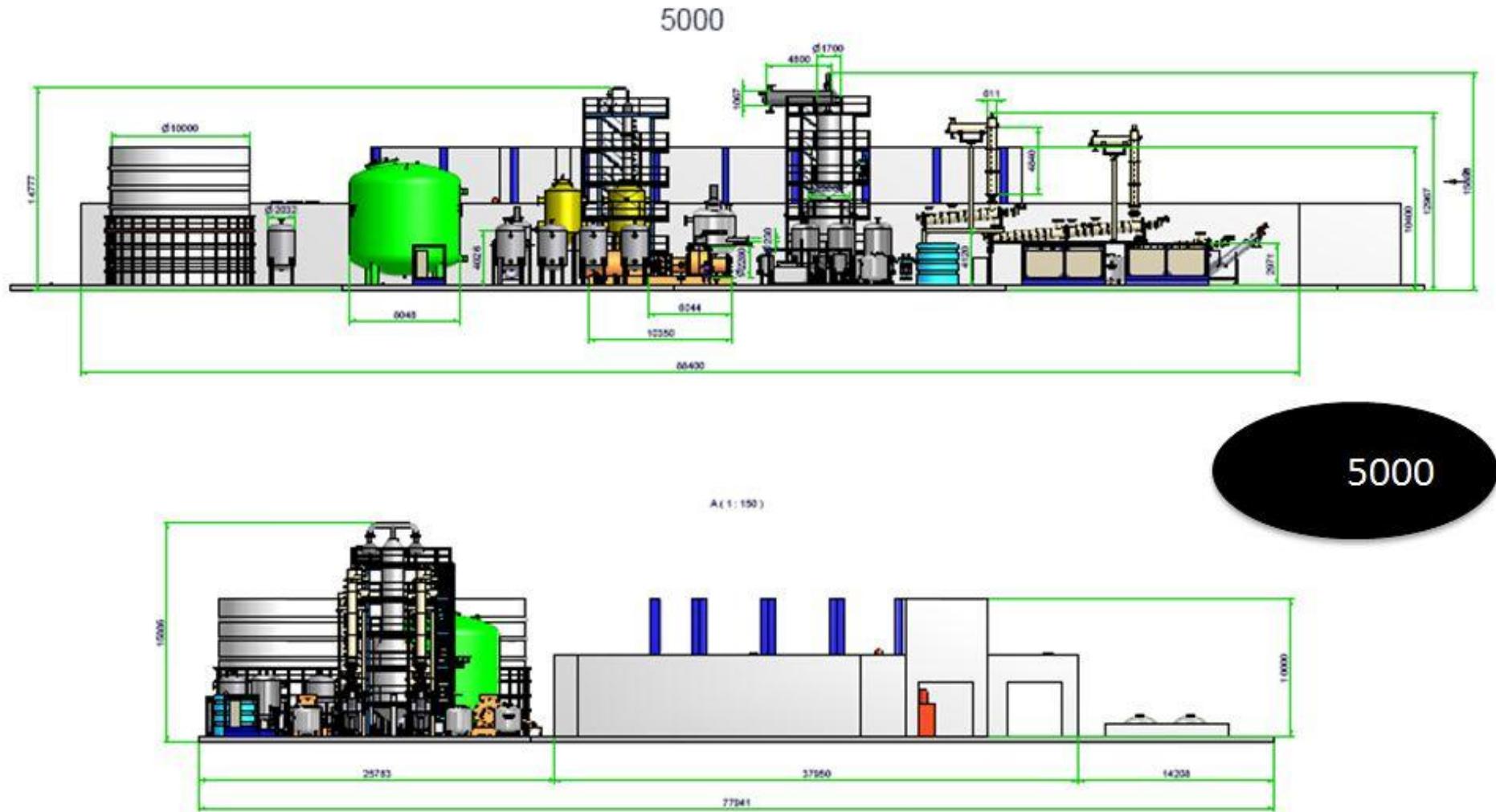
CONTROL THE CONTROL SYSTEM







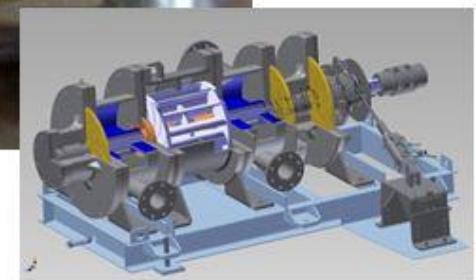
1000 COMPACT

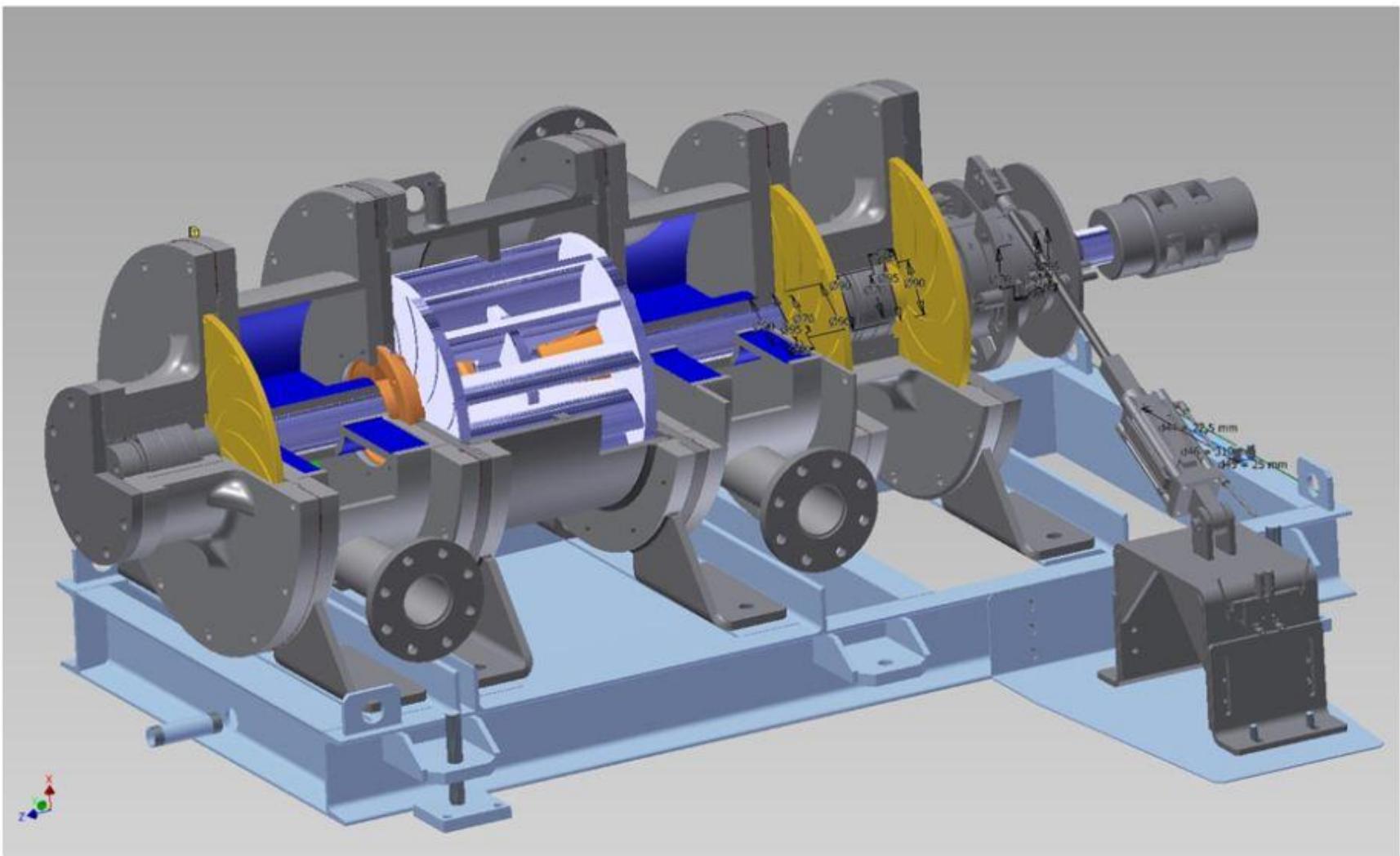


Production of Synthetic Diesel



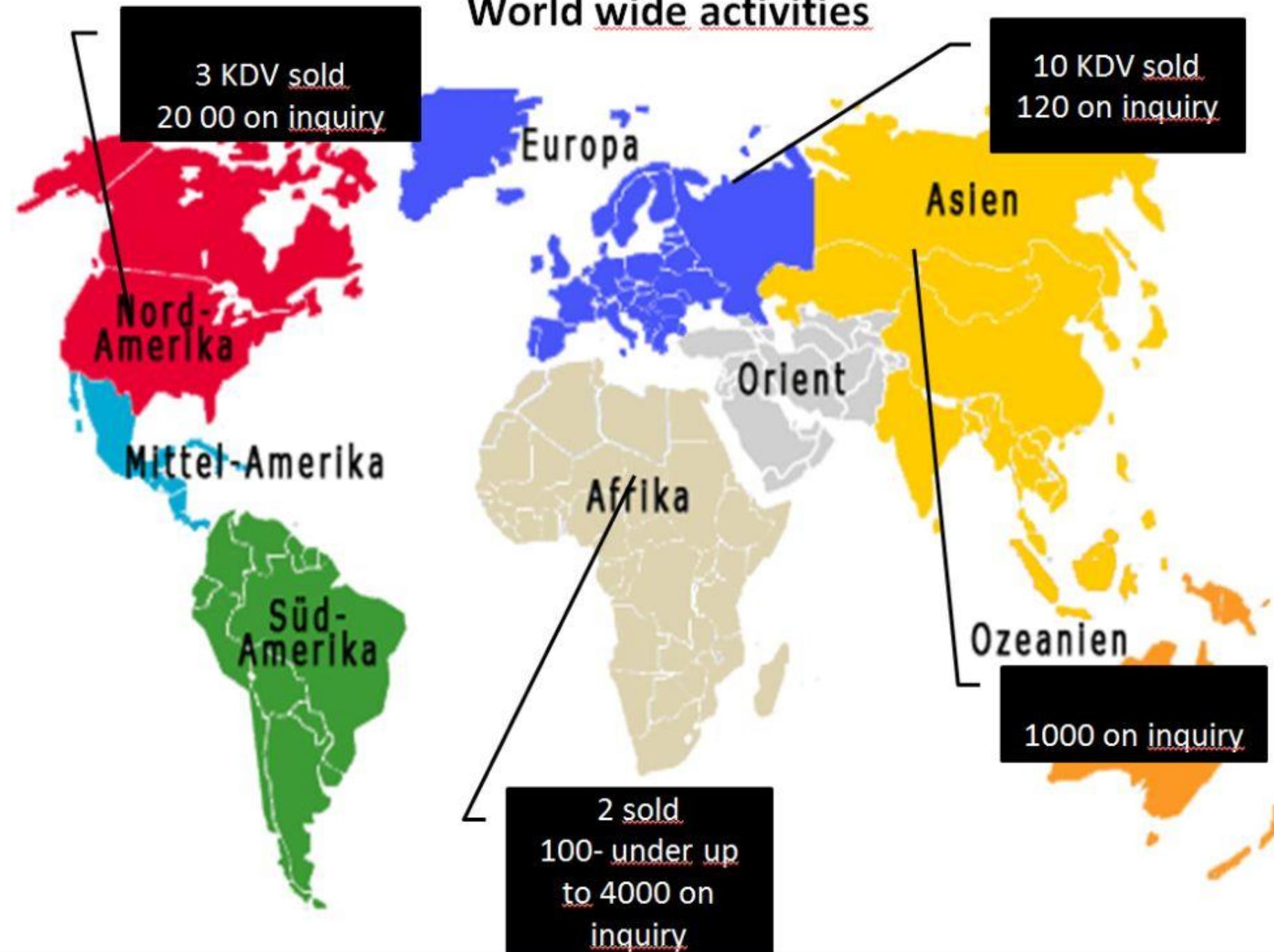
Plant erection





Function of reactor

World wide activities



REFERENCE FACILITIES IN GERMANY, CANADA, SPAIN AND MEXICO

.500 IN GERMANY

In January 2009 the first .500 plant in Hoyerswerda, Germany began with the diesel production. Classified domestic waste (Garbage) is used as input material.



500 IN CANADA

It was April 14, 2007 when the first .Plant in Barrie, Canada began with the diesel production. The system converts electronic waste into Diesel. Since August 2007, this facility is running with maximum capacity. On June 3rd, 2008 there was an open day for visitors.



.500 IN SPAIN

At January 24, 2007 the first facility – a .200 started with the diesel production in Spain (Bodilla, near Madrid). The input materials are mineral and biological residues.

It's also used for testing different input materials as qualification for the planning of a .700, which will start operation in early 2009.



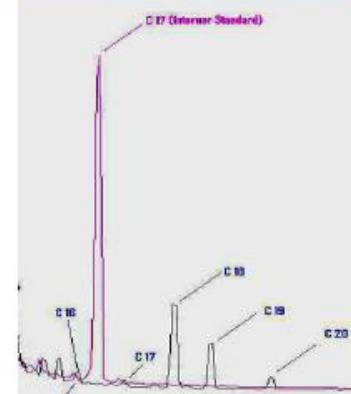
.500 IN MEXICO

In October 2004 the first industrial .Plant was opened in Mexico. In the following Dr. developed the turbine further. At the end of 2006 the system was refitted with 8 (eight) turbines (high speed chamber mixer) of the newest generation, so the capacity was increased from 200 to 500 liter per hour Diesel-Production. The Plant in Monterrey, Mexico converts waste oil into .Diesel.

THE QUALITY OF DIESEL

Plants produces mineral diesel fuel with highest quality ant the following characteristics:

- Best chemical consistence
- Cetane number of 58 – 60 and best chemical characteristics
- Compliance with all relevant requirements of EU-Norms
- No authorization from the manufacture of motors and cars is needed



TECHNOLOGY WITH THE BEST ENERGY-EFFICIENCY

The following comparison of different conventional methods for producing bio fuels from different biomasses show the inefficiency of these conventional methods compared with the fuel production of the Technology.

Fuel	Raw Material	Liter per Hectare	Diesel Equivalence (l/ha)	Energy Efficiency
Diesel	Miscanthus	9000	8960	637%
Bio-Methane	Silo Maize	3460 ¹	4850	344%
BTL - Diesel	Miscanthus	4400	5040	292%
Bio-Ethanol	Corn	3540	2080	148%
Biodiesel RME	Rape	1550	1410	100%
Rape - Oil	Rape	1460	1410	100%

The efficiency of the Technology is 6.4 times higher than the one of RME (Rape-Methyl-Ester) and more than twice as much as the BTL-Technology (Biomass to Liquid) from which it is also possible to produce synthetic diesel fuel. Besides the Technology, the BTL-Technology has also the ability to use all biological residues as input material. It has also been considered the work and costs of rape and maize (corn) which are higher than from energy plants like Miscanthus. Furthermore the rape cultivation areas stand in direct competition to food and feed cultivation areas. However energy plants can also be cultivated on bad soils.

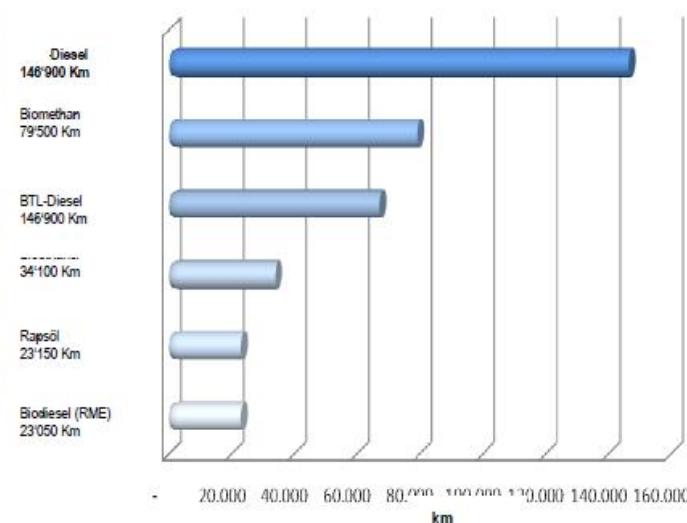
COMPARISON OF RANGES BETWEEN

TECHNOLOGY AND OTHER CONVENTIONAL TECHNOLOGIES

The adjoining figure shows the energy efficiency of the above mentioned technologies by showing the ranges for the different fuels (based on the diesel equivalent) which can be produced from the relative biomass per hectare cultivation area.

For the evaluation of the range there is taken a basis of 6.1 liter diesel for 100 km. Furthermore the different yield of hectares as well as the different energy efficiency of the several technologies will be considered.

Diesel has with a clear distance a range of 146'900 km compared with biodiesel (RME) which has a range of 23'050 km.





STEAM BOILER

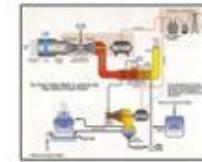
With 2.8 tons of brown coal and 3.6 tons of wood or paper burned in steam boilers can generate **2.6 MWh** electricity.



2,6 MWh

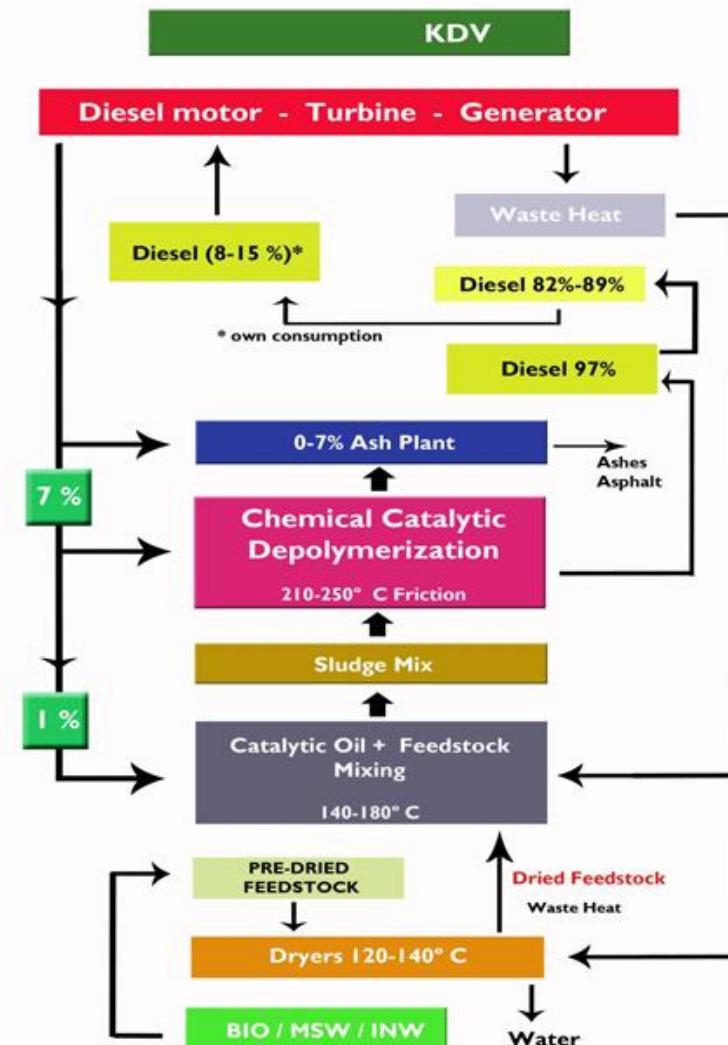
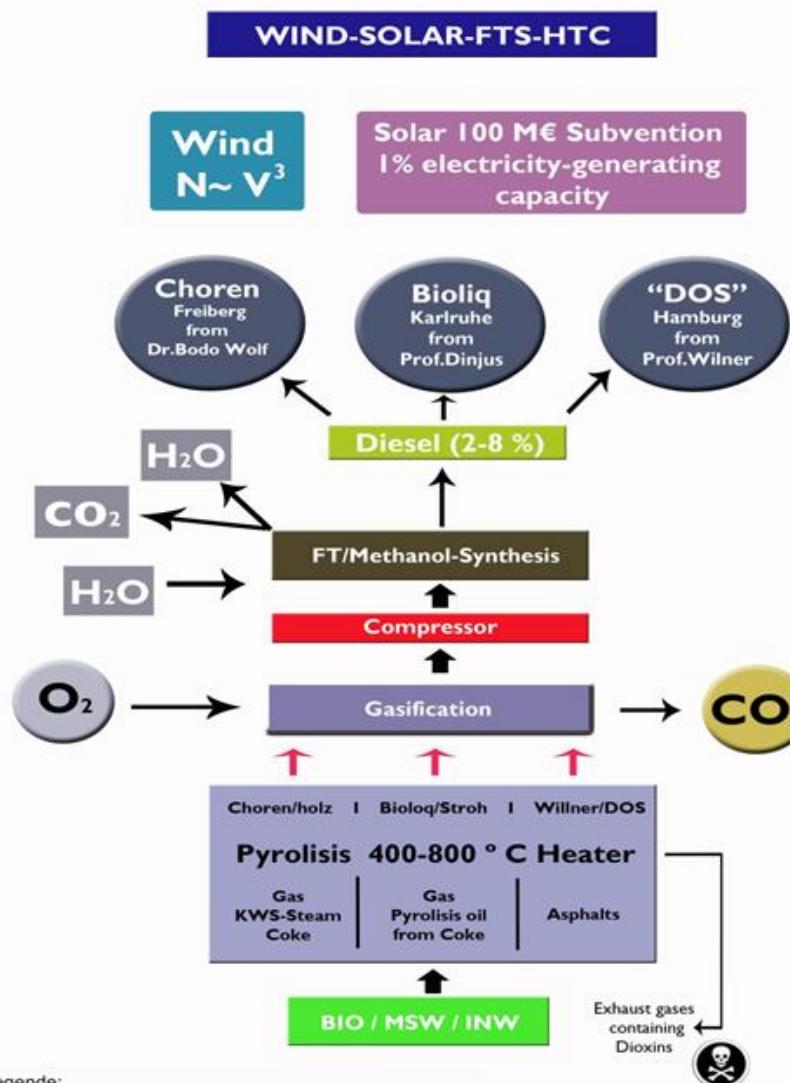
KDV + COMBINED CYCLE PLANT

With 2.8 tons of brown coal + 3.6 tons of cellulose will yield 2.0 tons of diesel, in addition to ash, water and CO₂. With 2 tons of diesel burned in a combined cycle plant can generate (depending on size) **10-12 MWh** electricity.



10,4 MWh

Graphic: Energy Efficiency Comparison between some very well known German Technologies



Legende:

N ~ V³ = Leistung proportional der Windgeschwindigkeit³

DOS = Direktumwandlung Organischer Substanzen

KWS = KohlenWasserStoffe

FTS = Fischer-Tropsch-Synthese
MTO = Methanol-to-Oil

HTC = Hydro-Thermale-Karbonisierung
KDV = Katalytische Drucklose Verölung

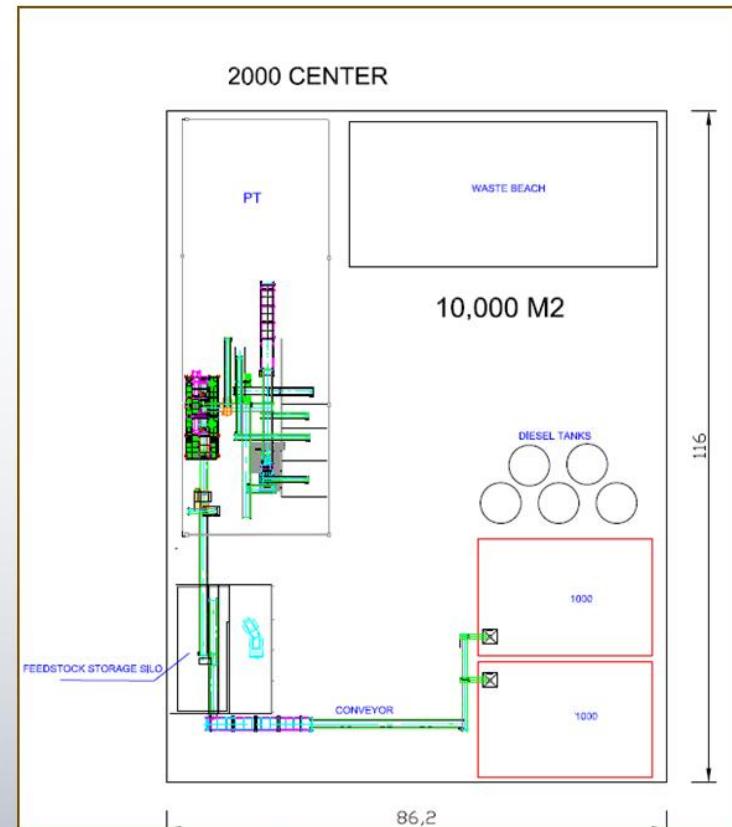
KDV = Katalytische Drucklose Verölung



Buyer's site
requirements

A LAND REQUIREMENTS

- Case: 2000 center





Die erste 150
Anlage in Addis Ababa

VARIJANTNO RJEŠENJE – EXPERIMENTALNA FAZA - GYOR Mađarska



POJAŠNJENJE TEHNOLOGIJE I NJEZINOG POTENCIJALA ZA RH:

- Rješenje za RH se sastoji u primjeni najnovije Njemačke tehnologije katalitičke depolimerizacije koja kada se primjeni samo na komunalni otpad u RH znači proizvodnju cca 330 litara dizela od tone mješanog komunalnog otpada po proizvodnoj cijeni **cca 2 kn/litri**.

Ova tehnologija isplativa je sve dok je cijena barela nafte na svjetskom tržištu viša od **50 \$/barelu** (sada je oko 110 \$/barelu)

Stare zalihe otpada na deponijama moguće je također upotrebljavati za sirovinu pri proizvodnji diesela, sa smanjenim efektom i ovisno o stupnju biološkog raspada i količini vode.

To znači da u RH primjenom te tehnologije možemo **proizvesti 1/3 diesela** koji je potreban RH pri čemu nestaje do 50% količine otpada (otpad biološkog porijekla) , a deponije traju dvostruko duže i to bez utjecaja na okoliš (nema dimnjaka).

Ako komunalnom otpadu pridružimo industrijski, šumski i poljoprivredni otpad kojeg ima cca 6 puta više od komunalnog, tada možemo u RH proizvesti **diesela 2x više od potrebnog !!!**

To znači da RH može osnovati novu profitabilnu „INU“ a da ne mora uvoziti sirovinu niti bušiti bušotine za proizvodnju nafte i direktno zaposliti cca 700 ljudi, a indirektno puno više !

Tehnologija se zasniva na **ubrzavanju prirodnog procesa nastajanja nafte** u katalitičkom sloju stijenske mase kroz 300 milijuna godina pri temperaturi 14-19 stupnjeva C i pri visokom tlaku na proces od tri minute pri 300-330 stupnjeva C gdje dolazi do intenzivnog prožimanja (trljanja) organskog dijela otpada sa katalitičkim uljem u kojem se nalazi prirodni katalizator (mineral) pri čemu nastaju ugljikovodici čije dugačke formule se kontrolirano cijepaju (krekiranje) kako bi dobili frakcije ugljikovodika, odnosno sintetički diesel.

Tehnologija je 6,3x učinkovitija od tehnologije biodiesel RME (Rape-Methyl-Ester) – proizvodnje biodisela iz uljane repice i bar dvaput efikasnija od tehnologije BTL (Biomass to Liquid)

KAKO ZAMIŠLJAM PRIMJENU NAVEDENE TEHNOLOGIJE U RH: (KUHARICA)

- 1.) RH treba **osnovati poduzeće** koje će se baviti obradom otpada i preuzeti odgovornost na svim deponijama otpada (sada su odgovorne županije i gradovi koji nemaju dovoljno stručnih ljudi). Angažman države garantirao bi transparentnost i sigurnost manipulacije i korištenja otpada te kontrolirani utjecaj na okoliš
- 2.) Na mjestima deponija otpada potrebno je **izgraditi tvornice diesela** (mogu biti i na rubovima gradskih središta) kroz koja prolazi sav otpad, sortira, razvrstava, prodaje i obrađuje tehnologijom katalitičke depolimerizacije na način da se iz njega stvara nova vrijednost – DIESEL
- 3.) Novostvorena vrijednost u vidu (**brendiranog**) **diesela** („diesel koji otvara radna mjesta“) distribuira se do krajnjeg korisnika kroz državne ili privatne benzinske postaje tipa „jedan pištolj“
- 4.) Kod skupljanja otpada **nije potrebno strogo razvrstavati** otpad već težiti da se u kućanstvu odvaja suha (pvc, tkanine, papir, pelene, guma, biljke, drvo...) i mokra (kompost= ostaci od jela) frakcija biološkog porijekla otpada, te frakcija mineralnog otpada (metali, keramika, šuta, zemlja... što može biti riješeno kvartovski) uz dosadašnje odvojeno skupljanje baterija i sl...

5.) **U svakoj županiji i gradu Zagrebu instalirati jedno postrojenje za razvrstavanje i preradu otpada u sintetički diesel vrhunske kvalitete.** Za dvije godine moguće je instalirati 21 postrojenje odgovarajućeg kapaciteta i direktno zaposliti cca 700 ljudi sa investicijom cca 500 milijuna € bez znatnog mijenjanja dosadašnjeg načina skupljanja otpada.

6.) Za neškodljivo uklanjanje opasnog otpada kao što su baterije, kemikalije, elektronika... (osim nuklearnog) potrebno **je izgraditi jedno postrojenje sa tehnologijom uplinjavanja plazmom.** Tehnologija plazme omogućuje zbog visoke temperature cca 5000 °C uništavanje svih problematičnih kemijskih spojeva kao što su dioksini, furani i sl. Pri čemu se kao nusprodukt dobivaju korisne tvari kao što su HCL, metali, okamenjena inertna masa za nasipavanje, sumpor, toplinska energija i sl. Postrojenje za potrebe cijele RH (a moguće je vršenje usluga i susjednim zemljama jer one pa ni cijela EU nemaju tu tehnologiju) košta cca 37 mil€ a kapaciteta je 100.000 tona na godinu (140 mil€ za kapacitet 280.000 tona sa termoelektranom 70 MW) pri čemu ako radi punim kapacitetom može proizvesti električnu energiju cca 100.000 MWh zelene energije pri čemu se u proces mora vratiti 40% proizvedene električne energije.

Moguća varijanta je i kupnja mobilnog pogona montiranog na kamionu koji nema energijski efekt, ali je jeftinije rješenje i opasni otpad je uništen na neškodljiv način.

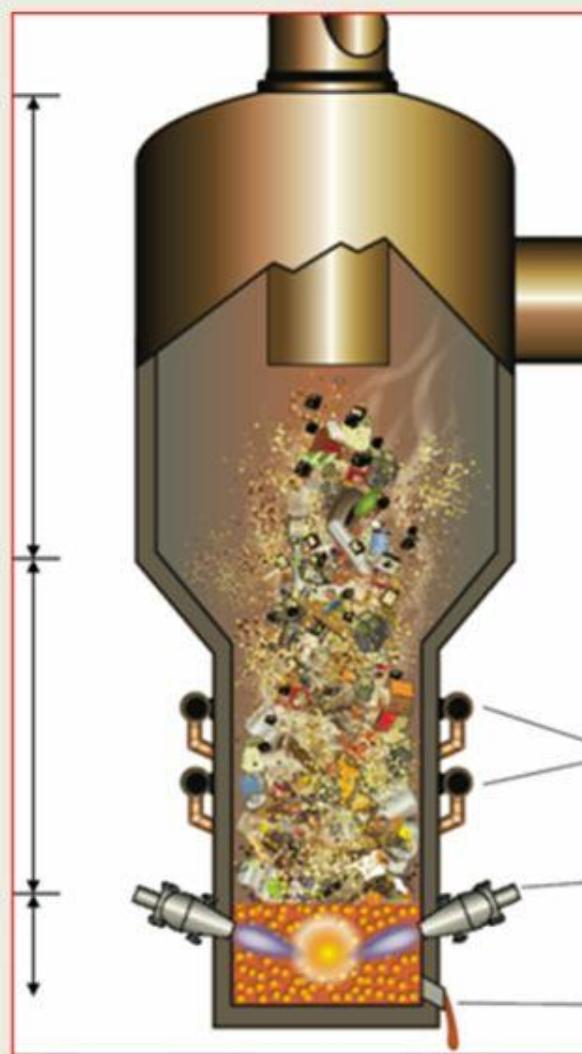
7. **Nuklearni otpad** i dalje se mora skladištiti, ali njega ima vrlo malo
I TO JE TO !!!

KONVERTER - SHEMATSKI PRIKAZ

Zona nadvoda

Zona
rasplinjavanja

Zona taljenja



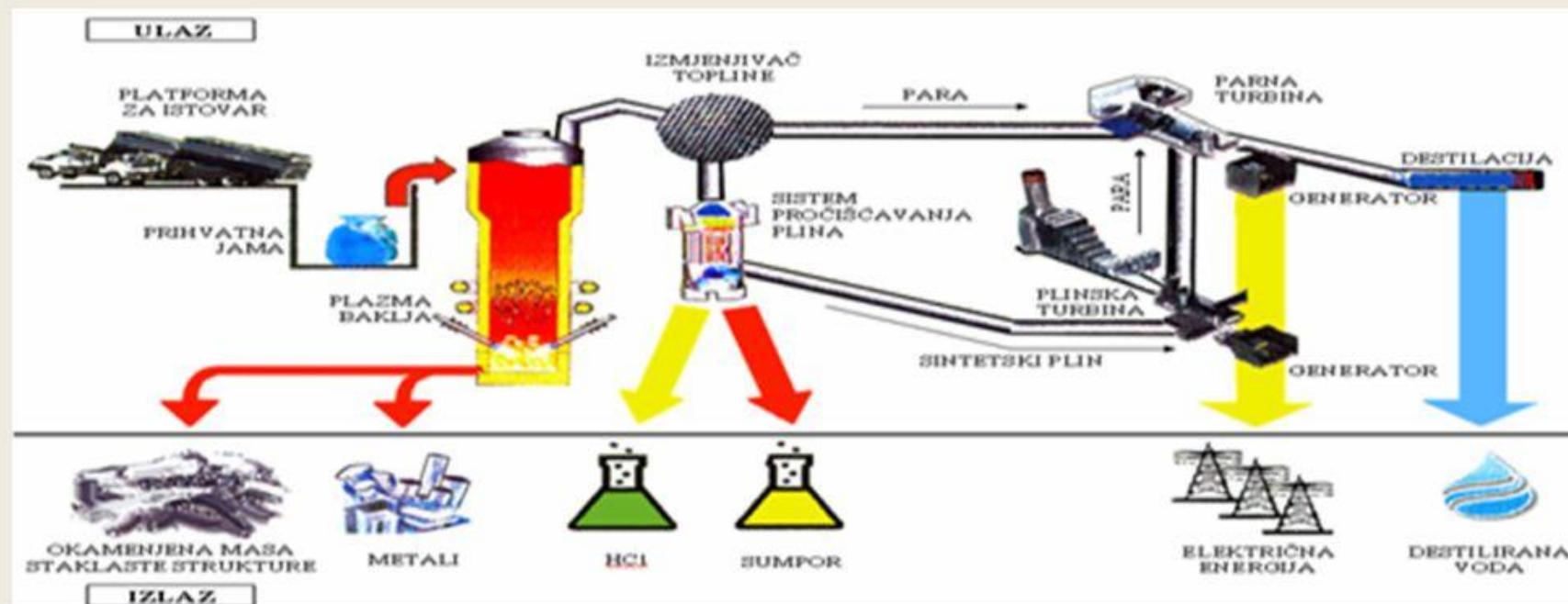
Otvor za izlaz sintetskog
plina

Ubacivanje zraka

Plasma baklja

Otvor za izlaz metala i troske

SHEMA TEHNOLOŠKOG TOKA



1. Tretman tehnologijom plazme
2. Prijem komunalnog otpada
3. Anorganski dio i metali
4. Organski dio i sintetski plin koji se upućuje u
 - plinsku turbinu kogeneracijskog karaktera ili
 - u plinski diesel motor ili
 - u parnu turbinu

EKONOMSKE ZNAČAJKE

Za kapacitet postrojenja 100.000,0 t/god. (ili oko 15,0 t/sat), uključivo proizvodnju elektro energije, cijena postrojenja je
37.000.000,0 EUR-a
(bez komunalno opremljenog građevinskog zemljišta)

Prihod je:

- 100.000,0 MWh proizvedene „zelene energije“ x 90,0EUR-a/MWh = 9,0 mio EUR/god.
 - 60,0 EUR-a/t komunalnog otpada x 100.000,0 t/god. = 6,0 mio EUR/god.
-
- 15,0 mio EUR/god.

To je prihod koji stimulativan za donašanje investicione odluke.

Zgura, ali i pepeo, kao ostatak od gasifikacije može se koristiti kao nasip, ali se može i utiskivati u duboke bušotine.

EKOLOŠKI EFEKTI

Ovo je izuzetna tehnologija koja nas rješava sada aktualnih problema u procesu gospodarenja otpadom.

BROJKE:

PROIZVODNJA KOMUNALNOG OTPADA

Hrvatska godišnje proizvede 4.418.000 stanovnika x 1,1 kg otpada/stanovniku/dan x 365 = 1.773.000 tona komunalnog otpada (sa trendom rasta jer je u EU prosjek 1,45 kg/stanovniku/dan)

PROIZVODNJA DIESELA

Najnaprednjom tehnologijom se iz komunalnog otpada može napraviti x 330 = 585.090.000 litara sintetskog diesela po cijeni proizvodnje cca 1,80 kn/lit (cijena proizvodnje = 1.053 mlrd kn = 140 mil €)

INVESTICIJA

Investicija za cijelu RH iznosi 530 mil.€ i može se realizirati na svakom postojećem odlagalištu otpada jer zauzima cca 1-4 ha

Povrat investicije za cca 4-6 godina

KOLIČINA DOSTUPNE SIROVINE

Pri svemu treba imati na pameti da je komunalni otpad svega cca 1/10 ukupnog otpada koji nastaje u RH, a sirovina u ovoj tehnologiji može biti i poljoprivredni i šumarsko-drvni otpad koji je 6x obimniji od komunalnog, kao i „nerješivi” mulj sa pročistača otpadnih voda...

TEORETSKI MOGUĆI EFEKTI PREDLOŽENE TEHNOLOGIJE

Ukratko, kada bi (TEORETSKI) iskoristili sav poljoprivredni i šumarsko-drvni otpad RH koji ima kapacitet godišnje proizvodnje $7.100.000 \text{ tona} \times 500 \text{ lit/toni} = 3.550.000.000 \text{ litara}$ (eura dodane vrijednosti) što je dodatnih 7,7% povećanja BDP-a, ispada da uz pomoć komunalnog, poljoprivrednog i šumarsko-drvnog otpada možemo povećati BDP RH za magičnih $1,3+7,7 = 9\% !!!$

POSTOJEĆA STRETEGIJA RH:

Postojeća strategija gospodarenja otpadom **predviđa ulaganja od 3.25 mlrd €** za neučinkovitu MBO tehnologiju (mehaničko-biološka obrada otpada) od čega na izbjegavanje otpada 70 mil €, za komunalni otpad 2,26 mlrd€ a za druge vrste otpada 920 mil€

Istom strategijom je predviđena energana na otpad u iznosu čak 290 mil€, odnosno **spalionica** koja ima izuzetno loš učinak na okoliš i ljude (dioksini, furani i sl...) a energane na otpad u iznosu 439 mil€ . Za skupljanje otpada predviđeno je čak 434 mil€...

EFEKTI KATALITIČKE DEPOLIMERIZACIJE

Predložena tehnologija sigurno bi značajno **smanjila predviđene troškove** za više od 50 % uz dodatne efekte uštede na potrebnim **deponijama koje bi mogle biti 50% manje** i bez otpada koji negativno utječe na podzemne vode (deponiranje samo inertnog otpada mineralnog porijekla)

Brutto domaći proizvod RH = 10.394€/st x 4.418.000 = 45.920.692.000 €

Dodana vrijednost od prodanog diesela izrađenog samo iz komunalnog otpada iznosi : $585.090.000 \times (9,5-1,8) = \text{cca } 585.090.000 \times 1 \text{ €} = 585.090.000 \text{ € ili } \textcolor{red}{1,3\% \text{ BDP-a RH !!}}$

USPOREDBA SA HIDROPOTENCIJALOM RH:

- Ukupni hidropotencijal RH procjenjen je na stvaranje **dodatne vrijednosti u iznosu 500 milijuna €** godišnje što je MANJE od potencijala stvaranja dodane vrijednosti koji može stvoriti komunalni otpad !!!
- **Komunalni otpad može stvoriti za 17% više dodane vrijednosti od ukupnog hidropotencijala RH** (Švicarska ima EU max od 91,34% iskorištenja) i to bez ikakvog utjecaja na okoliš i smanjenja površine Nature.

INVESTICIJA

- Prosječna visina investicije za pojedinu županiju iznosi **18 milijuna €** (proizvodnja 2000 litara diesela na sat) od čega se do 50% može dobiti bespovratnih sredstava od EU (za sve zemlje kandidate za EU koje imaju BDP manji od 75% od prosjeka u EU) a za ostatak dignuti kredit od EBRD uz kamatu 4,5% na rok 5 godina.

GARANCIJA

- Državna Njemačka agencija **HERMES daje garanciju** isplativosti investicije u roku 7 godina na 80% vrijednosti investicije. (riješen problem dobivanja kredita)
- Dakle, za ovu investiciju potrebno je samo **20%** sredstava !!!

MULJ SA PROČISTAČA OTPADNIH VODA

- Ovom tehnologijom **riješio bi se i problem odlaganja mulja** sa pročistača otpadnih voda koji sadrži teške metale i virusе (esherihija koli) što se najčešće kod nas rješava najgorom metodom odlaganja na poljoprivrednim površinama tako da nam teški metali i virusi vraćaju u lanac prehrane što predstavlja javno zdravstveni problem.

PROBLEMI UVOĐENJA OVE TEHNOLOGIJE U RH

- 1.) Zakon o otpadu** ne prepoznaje mogućnost izrade goriva iz otpada i forsira spaljivanje bez ograničenja dioxina ! Neselektivno i djelomično prepisane EU direktive !!!
- 2.) Zakon o biogorivima NN 65/2009, 145/10** (samo za potrebe prijevoza i nema poticaja za sva biogoriva)
 - „*biogorivo*“ je tekuće ili plinovito gorivo za pogon motornih vozila i brodova za potrebe prijevoza, proizvedeno iz biomase (uključuje otpad)
 - VRSTE BIOGORIVA : *biodimetileter* (biomasa), *biodizel* (od biljnog ili životinjskog ulja), *bioetanol* (biomasa) *biometanol* (biomasa), *bioplín*, *biovodik*, *bio-ETBE*, *Bio-MTBE*, *čisto biljno ulje*, **sintetička biogoriva su sintetički ugljikovodici ili mješavine ugljikovodika koji su proizvedeni od biomase.**
 - PROPISANI POTICAJI za proizvodnju biodizela iz uljane repice, bioetanola iz kukuruza, bioetanola iz šećerne repe, biodizela iz otpadnog jestivog ulja, biodizela iz lignoceluloznih sirovina, bioetanola iz lignoceluloznih sirovina, bioplína, biometanola (**ne i sintetičkih biogoriva**)
 - ODLUKA ZA POTICAJ : biodizel u visini 3,46 kn/l i bioetanol u visini 1,75 kn/l.

- 3.) Uredba o kakvoći biogoriva NN 141/2005, 33/2011** (novi pojmovi – neusklađenost)

Smatraju se biogorivima :

- bioetanol, biodizel, bioplín, biometanol, biodimetileter, bio-ETBE (etyl-terc-butil-eter), bio-MTBE (metil-terc-butil-eter), bio-TAEE (tercijarni-amil-etyl-eter), biobutanol, Fisher- tropschov dizel (sintetička biogoriva), biovodik, čisto biljno ulje, biljno ulje

**USUDIMO LI SE POSTATI USPJEŠNIJI OD OSTATKA EUROPE
U GOSPODARENJU OTPADOM ?**

HVALA NA PAŽNJI

PITANJA ?