



# **ENRESS**

## **THERMOCHEMICAL RECYCLING**

**Efficient and ecological utilization of plastics  
and other waste materials**

The company **ENRESS** was founded in 2013 and its team works closely with leading European universities, such as the **Institute of Chemical Technology in Prague** or **UNIVERSITY of J. Purkyně in Ústí nad Labem**, and professional authorities such as **ORLEN UniCRE**, **ORLEN Unipetrol RPA**, **DUSLO**, **BASF** and others.



The Enress team includes experts with deep scientific and practical knowledge in the environmental field.

ENRESS is a member of the WASTEN Cluster, which brings innovative Czech manufacturers of advanced technologies together. Partners of the Wasten Cluster focus on processing of municipal and industrial waste and scientific research.

Enress is partner of the environmental project “Ocean Cleanup”.

## ENRESS laboratory in the Czech Republic



The European countries produce yearly about 30,000,000 tons of plastics.

- 43%, ie 12.9 million tones of plastic waste **is incinerated**
- 25%, ie 7.5 million tones of plastic waste **ends up in landfills**
- only 32%, ie 9.6 million tones of used plastics are **mechanically recycled**  
(sorting, crushing, washing, drying, regranulation and recycling production)

The Enress thermochemical recycling technology process and utilize plastic and other waste, which for mechanical recycling is not usable.

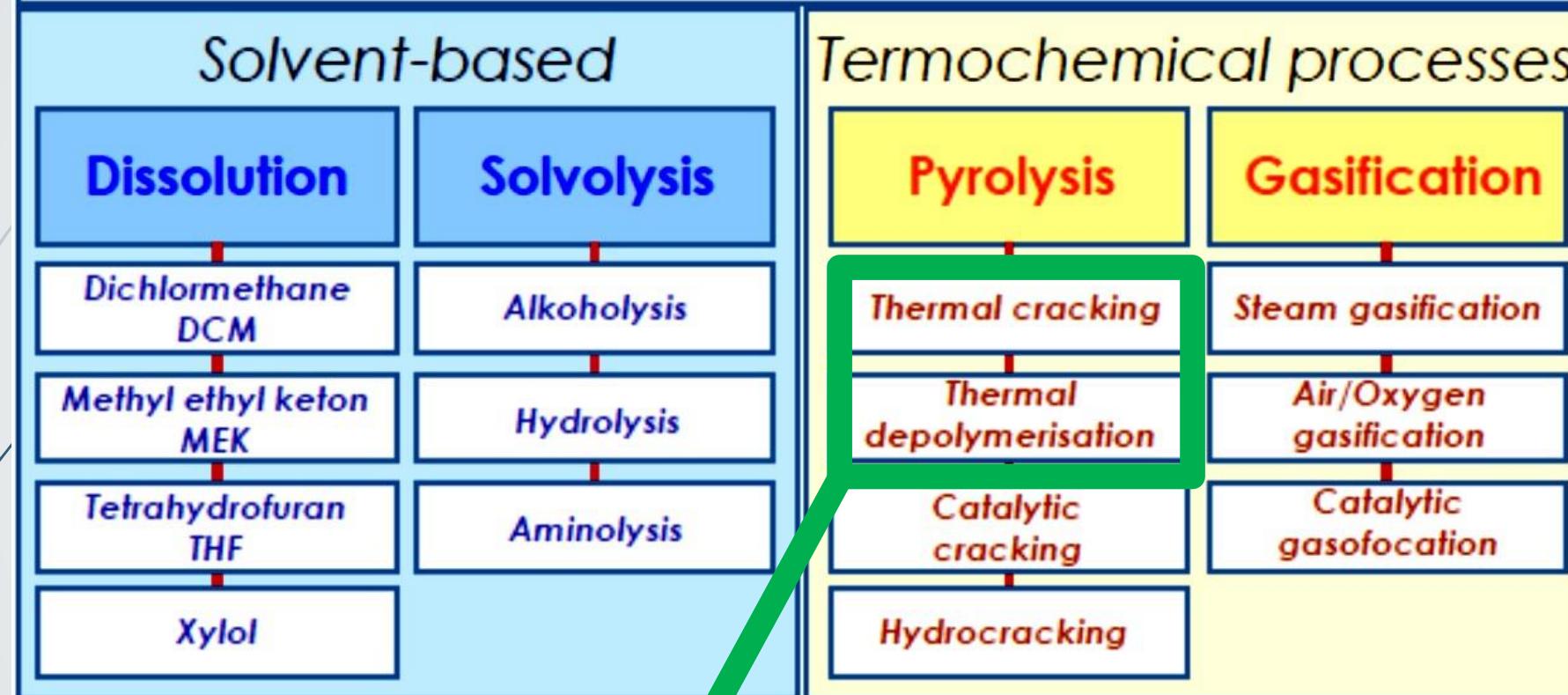


The ENRESS TDU2000® is an efficient and **emission-free technology**

- desolves plastics as well other organic materials such as **rubber, tires, waste oils, healthcare waste, etc.**



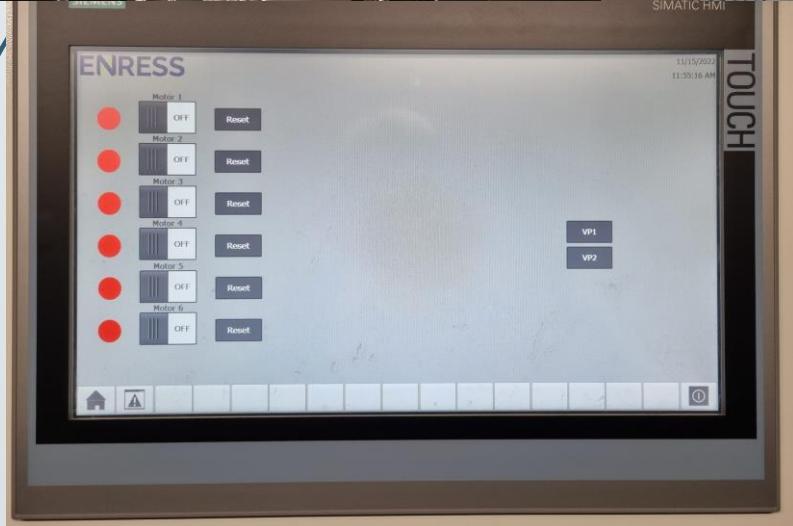
# Chemical recycling



ENRESS TDU2000® technology:

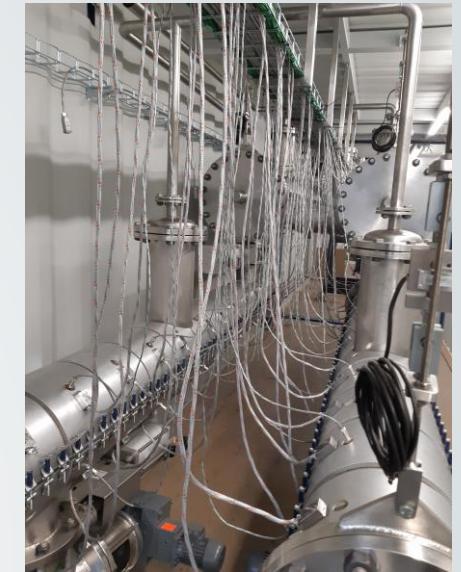
- ✓ **thermal decomposition**
- ✓ **thermal depolymerization**

## ENRESS Technology = emission-free and safe



## ENRESS basic devices:

- Enress\_MT\_750 desolves up to **17 tons of plastic waste per day**
- Enress MT\_1000 processes **24 tons of tires per day** and:
  - waste oils
  - healthcare waste
  - car glass
  - composite and laminated plastic materials
  - sludges from sewage treatment plants
  - and other .....



## ENRESS TDU2000®

- Principle of anaerobic thermal decomposition + electrical induction heating

The decomposition process involves three components:

1. Liquid recyclate (process oil)
2. Gas
3. Carbon Inert Residue



## 1. The use of the liquid recyclate (process oil):

- raw material for the production of new plastics  
**(significantly reduce production of CO<sub>2</sub> emissions)**
- additive to diesel fuel
- replacement of fossil resources in refineries
- production of electricity
- heat/cold - energy production



## 2. The use of the ENRESS PROCESS GAS



- Enress process gas = clean and safe fuel for energy production
- Cleaning and conditioning:
  - Exemption from all organic compounds of halogen elements unwanted additives.
- When using the Enress process gas – no more emissions than by incinerating the natural gas.
- The process gas contains a low oxygen content = high quality and tightness of the TDU2000 system.
- The cleaning and treatment system for the process gas is an integral part of the ENRESS systems.
- Use: energy and gas companies, transport infrastructure.

## Oxygen content - Analyses

ITEM	Analyses results				
	W24/2022	W25/2022	W26/2022	W27/2022	W28/2022
	Volume %				
O <sub>2</sub> *	0,54	0,30	0,36	0,53	0,54
CO <sub>2</sub>	5,83	5,15	4,68	4,26	3,73
H <sub>2</sub>	9,68	15,72	19,25	23,09	24,62
CO	2,38	2,65	2,63	2,58	2,35
CH <sub>4</sub>	13,71	19,45	21,86	24,44	25,85
N <sub>2</sub>	2,51	1,92	1,88	1,67	0,38
etan	5,3238	7,2924	8,0669	8,7830	9,3838
etylene	2,8630	3,5813	3,8211	4,1326	4,4353
acetylen	0,0008	0,0007	0,0006	0,0005	0,0005
propan	4,1111	5,0233	5,2732	5,5652	5,8860
propen	2,9096	3,5426	3,7425	3,9903	4,3128
butans	3,4899	3,5795	3,5078	3,3024	3,1816
buta-1,3-dien	1,2776	0,5198	0,3907	0,2510	0,1517
propyn	1,1523	0,8537	0,6377	0,4665	0,4481
but-1-en-3-yn	0,9132	0,7540	0,8573	0,5748	0,5528
others (C4-C6)	43,7386	29,8621	23,3195	16,0760	14,2794
Caloric volume MJ/m <sup>3</sup>	79,02	67,11	61,25	55,43	54,20
Heat/cold balance MJ/m <sup>3</sup>	72,83	61,71	56,24	50,81	49,63

### 3. COAL SUBSTANCES

- Effective sorption agent
- Ground water squirrels and carriers of NPK components
- Solid substitute fuel



	%	+/-	
Ba	0.052	+/-	0.003
Sb	0.001	+/-	0.001
Sn	0.004	+/-	0.001
Cd	0	:	N/A
Pd	0	:	N/A
Ag	0	:	N/A
C	55.378	+/-	0.087
Mo	0.001	+/-	0.001
Nb	0.010	+/-	0.001
Zr	0.033	+/-	0.001
Sr	0.045	+/-	0.001
Rb	0.003	+/-	0.001
Bi	0.002	+/-	0.001
As	0.006	+/-	0.001
Se	0	:	N/A
Au	0	:	N/A
Pb	0.004	+/-	0.001
W	0.005	+/-	0.002
Zn	0.023	+/-	0.001
Cu	0.019	+/-	0.001
Ni	0	:	N/A
Co	0	:	N/A
Fe	3.993	+/-	0.014
Mn	0.046	+/-	0.003
Cr	0.039	+/-	0.001
V	0.063	+/-	0.003
Ti	2.075	+/-	0.009
Ca	10.050	+/-	0.046
K	0.414	+/-	0.008
Al	10.427	+/-	0.157
P	0.091	+/-	0.010
Si	12.295	+/-	0.056
Cl	1.437	+/-	0.005
S	1.384	+/-	0.014
Mg	2.097	+/-	0.197



**ENRESS**

**TDU2000® - Material output balance**

## ENRESS MT\_750 - Process products output balance

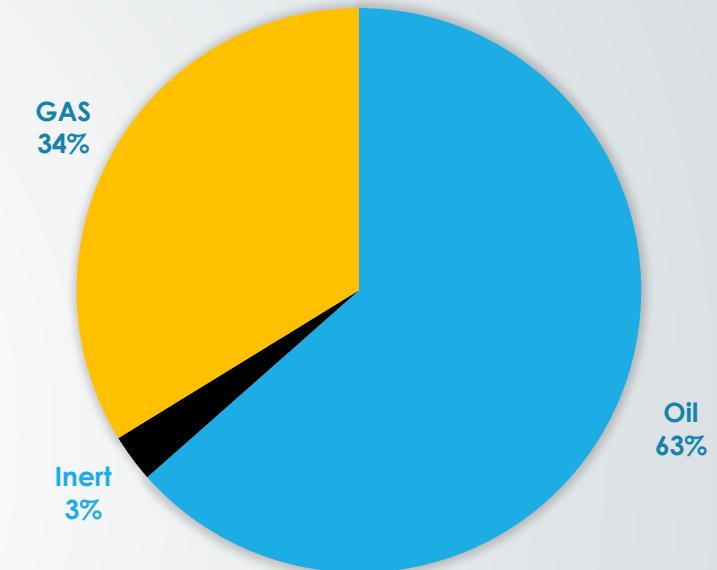
**Waste material: plastics**

**Output balance of the products gained:**

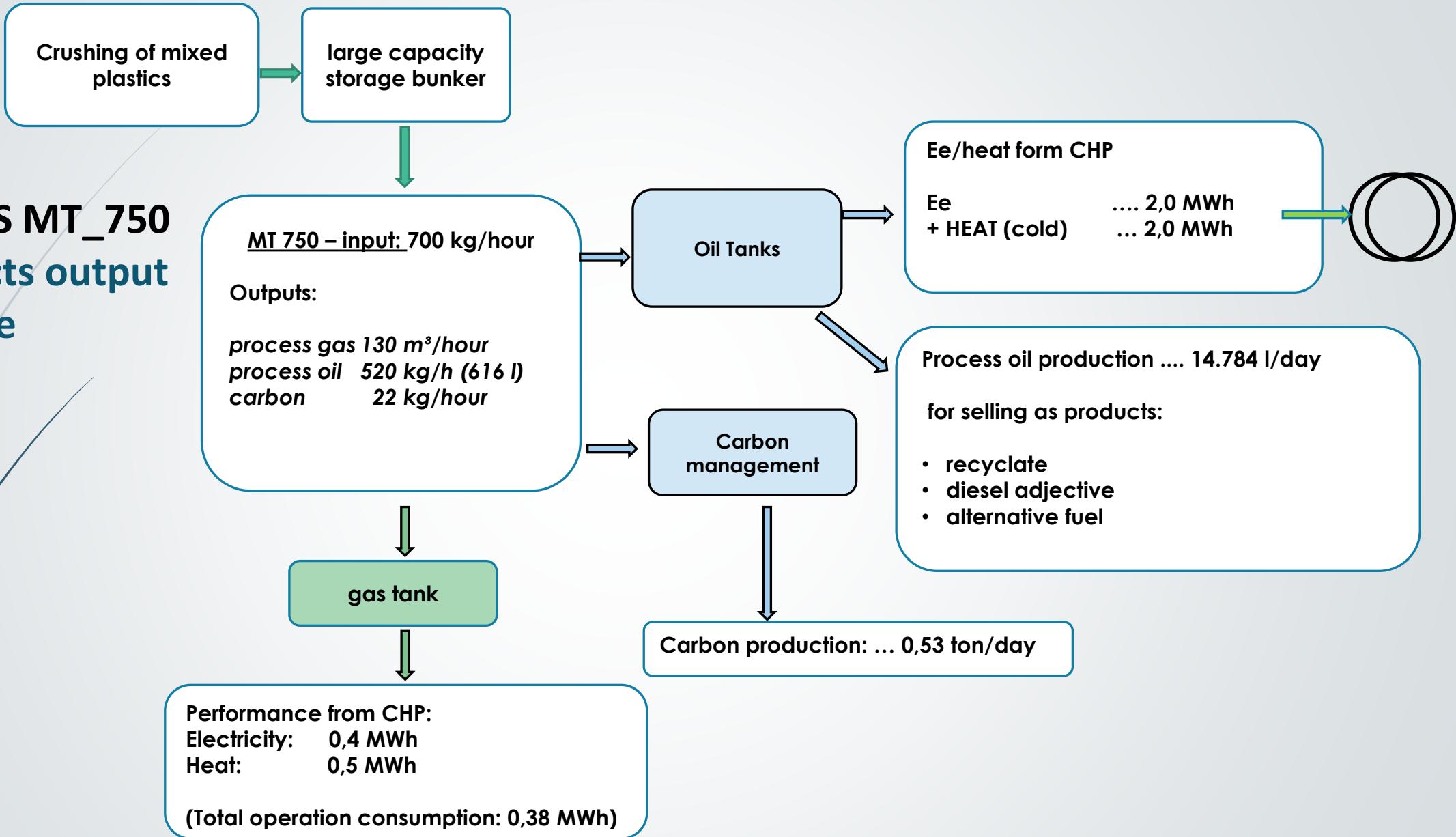
1. Process oil (recyclate) ... range from 63 to 90 wt. %
2. Process gas ..... range from 8 do 34 wt.%
3. Carbon residue ..... from 3 wt.%

Process products: when 700 kg plastics per hour

1. Process oil (recyclate) ... min. 520 kg/hour. (ca 616 l/ hour)
2. Gas ..... max. 122 kg/hour. (ca 130 m<sup>3</sup>/ hour)
3. Carbon residue ..... ca. 22 kg/ hour



# ENRESS MT\_750 Products output balance

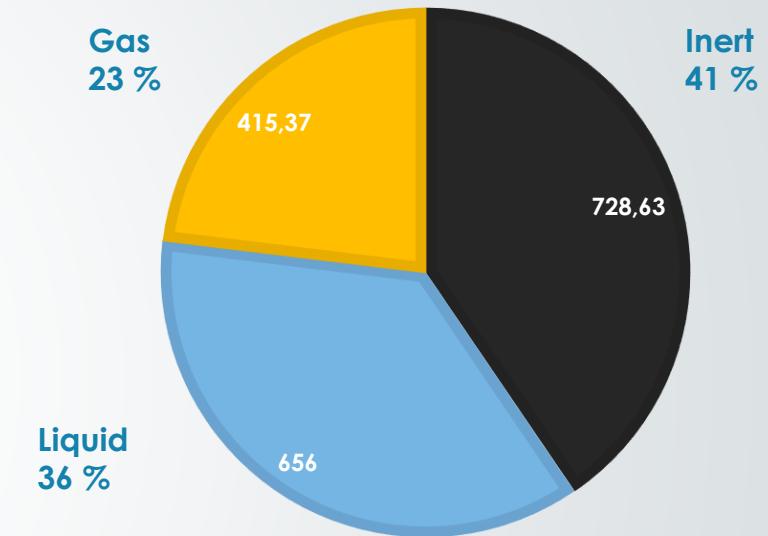


## ENRESS MT\_1000 - Process products output balance

**Waste: tires**

Output balance of the products gained:

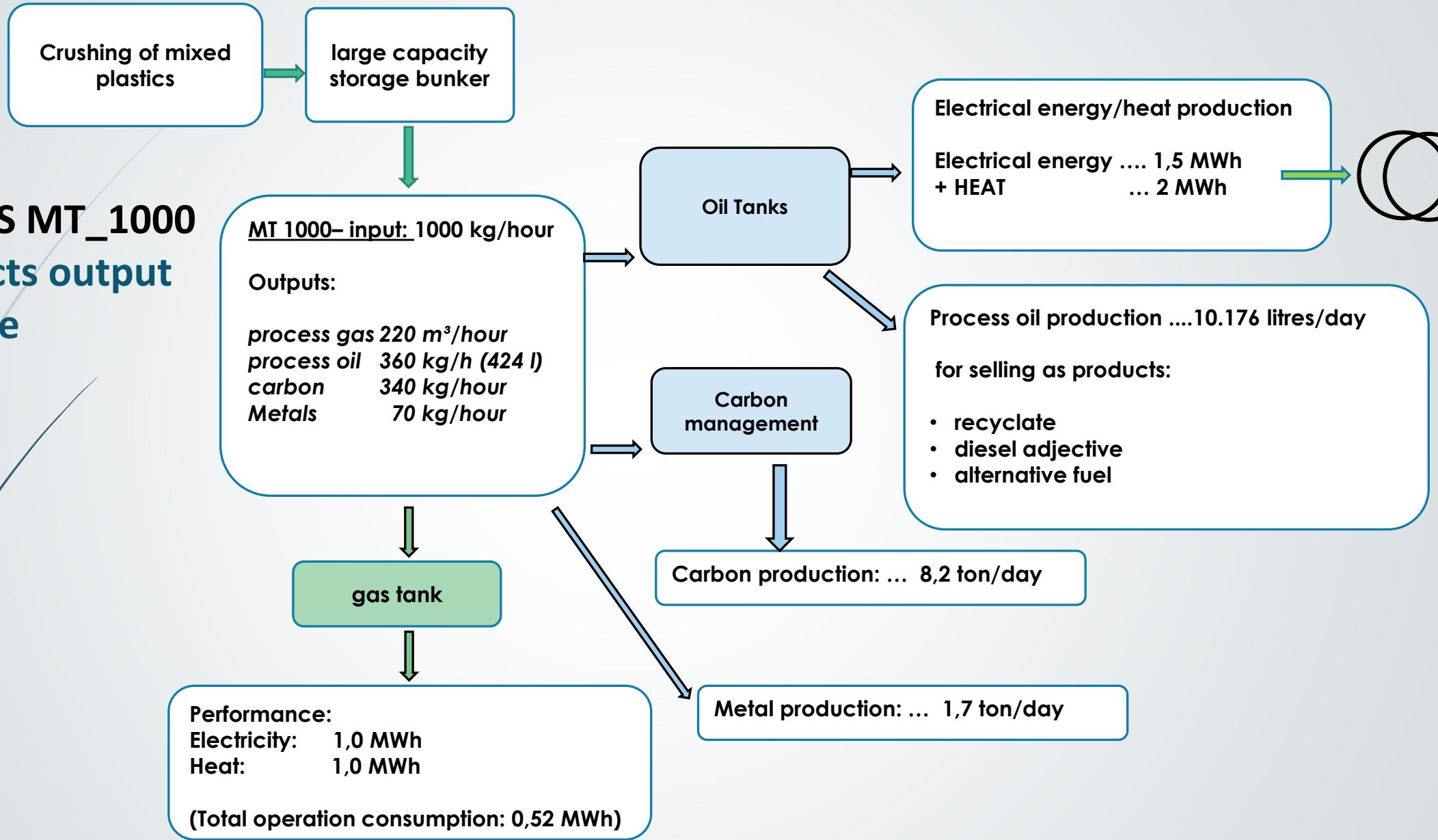
1. Liquid recyclate ..... up to 36 wt. %
2. Gas ..... up to 23 wt.%
3. Carbon residue ..... cca. 41 wt.%



The output production when dissolving 1000 kg tires per hour

1. Liquid recyclate ..... 360 kg / hour. (ca 424 l/hour)
2. Gas ..... 220 kg / hour. (ca 205 m<sup>3</sup>/hour)
3. Carbon residue ..... cca. 340 kg / hour. + 70 kg/hour metal

# ENRESS MT\_1000 Products output balance

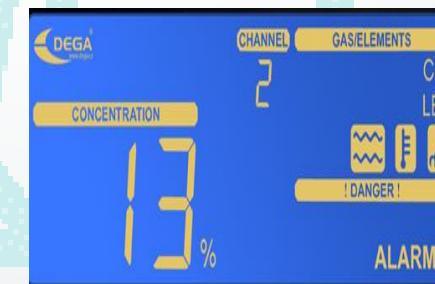


## TDU2000® technology safety...

- ✓ The ENRESS sophisticated security systems
  - eliminate erroneous operator commands
  - correct or eliminate the causes of operational anomalies
  - safety shut down the device, when comes to emergency indication

### The integrated systems:

- ✓ sensor and detection system
- ✓ camera systems
- ✓ remote data transmission
- ✓ automatic fire protection system
- ✓ safety backup battery source





## ENRESS Produktion and service centre in CZ – city: Nové Mesto nad Váhom

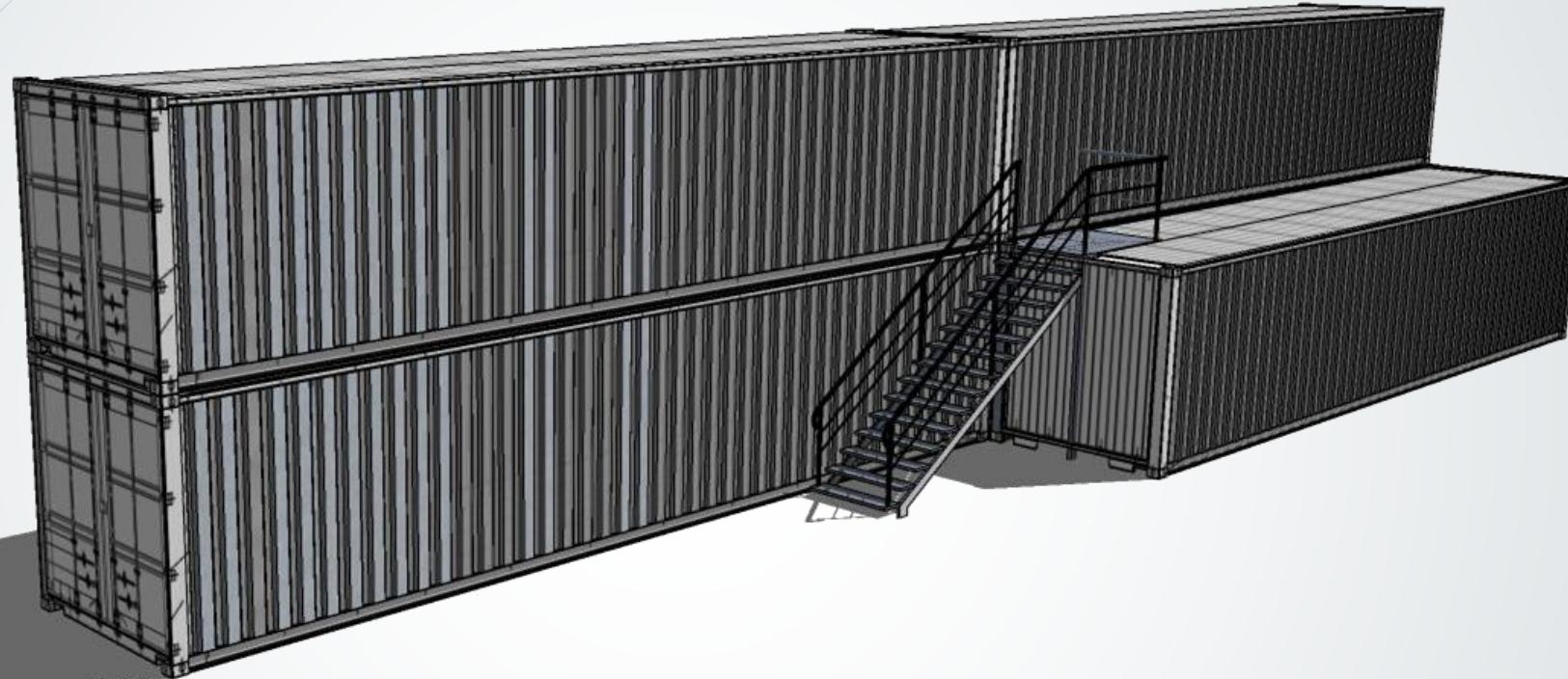


## Instalation of the ENRESS MT\_750



... in the city Velké Pavlovice ...





We supply the ENRESS devices in a modular container solution measuring L x W x H - 24.4 x 4.9 x 5.4 meters and a total weight of approx. 24 tons.





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