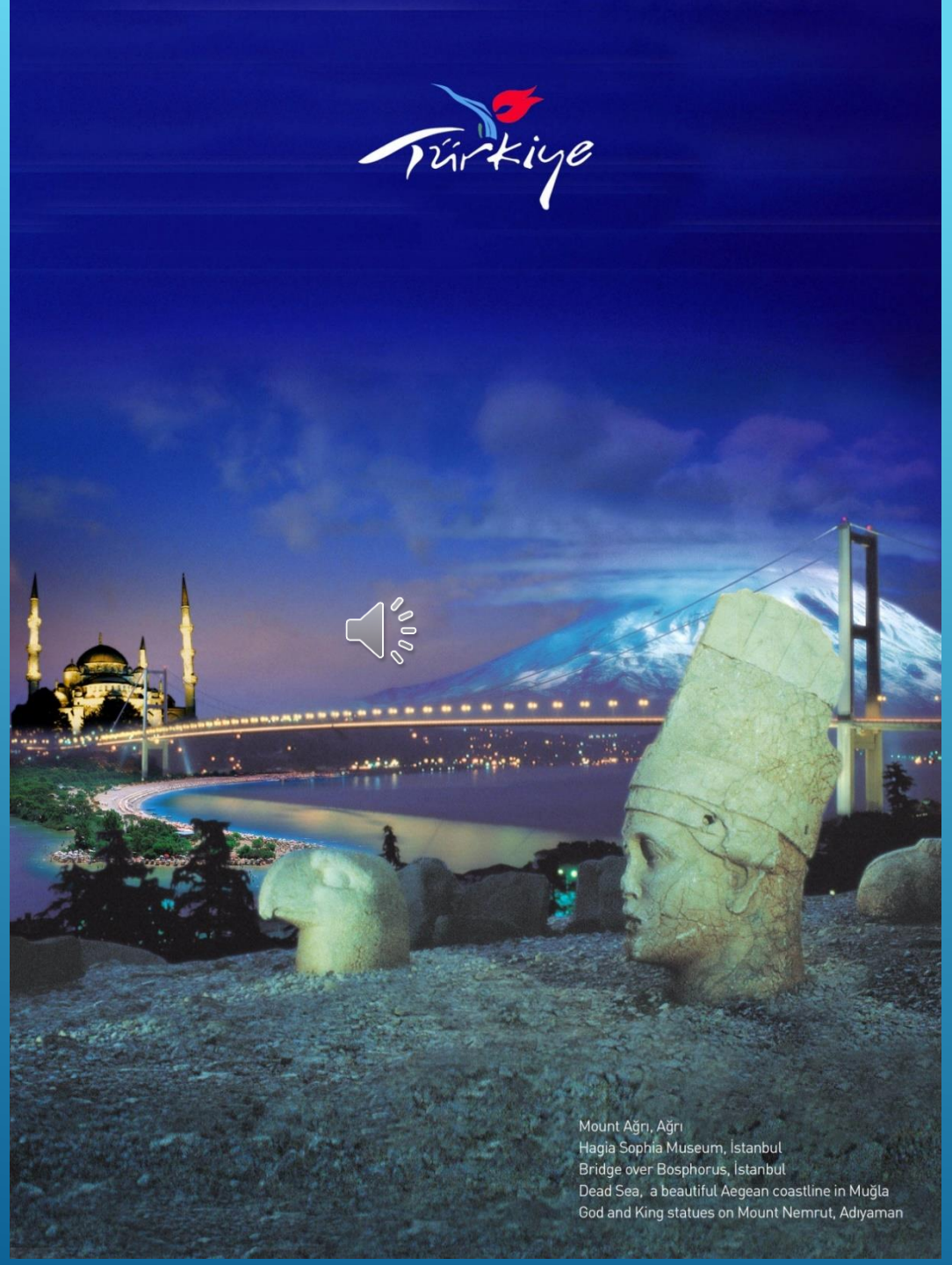
Environmental and Commercial concerns about Fossile Fuels and solutions

ATLANTA

November 2022



by Celal Beysel
Bursa / Turkey
cbeysel@floteks.com.tr

www.floteks.com.tr
www.floplast.com.tr
www.flopark.com.tr

Good Morning….

1) A 1 minute film about Floteks Research
2) Hydrogen to replace fossile fuels
3) Why do rotomolders need to act?
4) Rotomolded liners for composite pressure tanks
5)Estimated future of Hydrogen tanks

ENERGYPROBLEMS

OF THE FUTURE

Regions with Fossile Fuel resources are not reliable;
Peace is very delicate at those regions.
Lack of democracy : huge threat to fossile fuel stocs…

Fossile Fuel is not unlimited

Fossile Energy is polluting the World…

Huge problem to solve:
How to obtain the Energy we need,
to have a sustainable environment and a
sustainable production to maintain our lifestyle?

The governments are trying to balance citizens lifestyle vs. environmental burden …

Why do rotomolders need to act?

Some day,

the rotomolders will also be questioned

about the high Energy loss of our production method…

Dr. Mark Kearns

ONLY 8-15 % OF THE ENERGY USED IN CONVENTIONAL ROTOMOLDING OVENS ARE USED FOR MELTING THE RAW MATERIAL…

- https://blog.rotomolding.org/2021/12/13/will-future-rotomolders-be-gas-free/ Dr. Nick Henwood

What is the best solution to overcome the present and future Energy crisis?

Today, the question

‘’what is the environmental effect of any Energy used, from craddle to grave’’

is mostly neglected.

- Sun, Wind and hydraulic Energy are not efective enough to produce the electricity needed, on the spot.

- Nuclear Energy is questionable.

- To the contrary of common prejudice.

Batteries storing the Electrical Energy are also polluting, among many other problems…

A SOLUTION WITH GOOD PROSPECTIVES: HYDROGEN

Hydrogen Strategies of developed nations:

VERY SERIOUS BUDGETS:

Country	Allocated budget for hydrogen projects	Indicative timeline
Italy	€10.5bn*	2021-2030
Germany	€9bn	2021-2030
Spain	€9bn**	2021-2030
France	€7.2bn	2021-2030
The United States	€6.7bn	2021-2030
The Netherlands	€1.1bn	2020-2030
Japan	€340m	2021-2030
Australia	€340m	2021-2022

Sources: ING Research, Alman Ulusal Hidrojen Stratejisi, France-Hydrogene

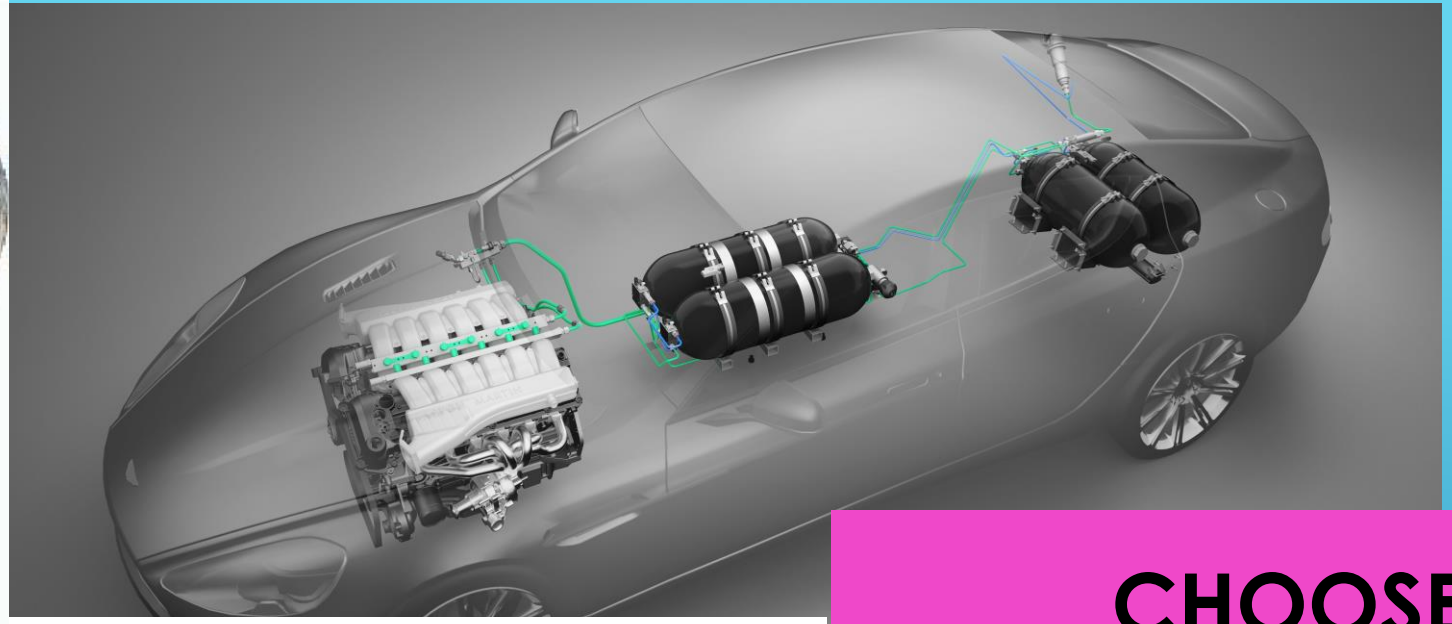
- H2 can be produced using sun and wind Energy as ‘green Hydrogen’, in Energy farms.

- H2 can either be sent via pipelines or in pressure vessels to the spots they will be used.

- So, the most reliant Energy seems to be hidden in H2 energy, which is unlimitedly available.

- Energy value of 1 kg of H2 gas is around 34 kWh/kg
- Energy value of Diesel is much lower per kg : 14 kWh/kg
- However, life is not as easy as it seems:

Energy value per volume of Hydrogen at ambient pressure and Temperature is very low.



CHOOSE:

350 -700 bar

at 23 degrees C

or

10-15 bar

at - 220 degrees C

Thermoplastic Liner

Plastic liner manufacturing methods

- Blow molding
- Welding of injection molded dome to the extruded pipe
- Rotational molding

Challenges:

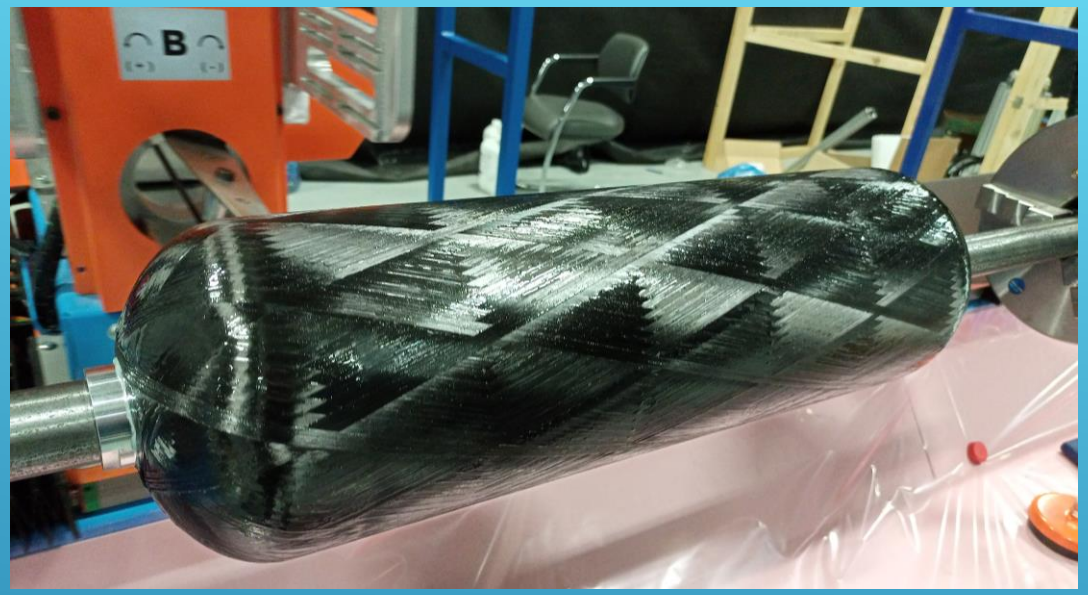
- minimium layer thickness
- maximum inner volume,
- with high pressure.
- Gas sealing at metal boss – plastic liner connection
- Permeability
- Production speed
- Quality assurance

Air Leakage testing of rotomolded liner

Fiber winding

Winding methods:

- **Thermoset winding:**
  - ❖ **Wet fiber winding with resin bath**
  - ❖ **Dry prepreg winding**

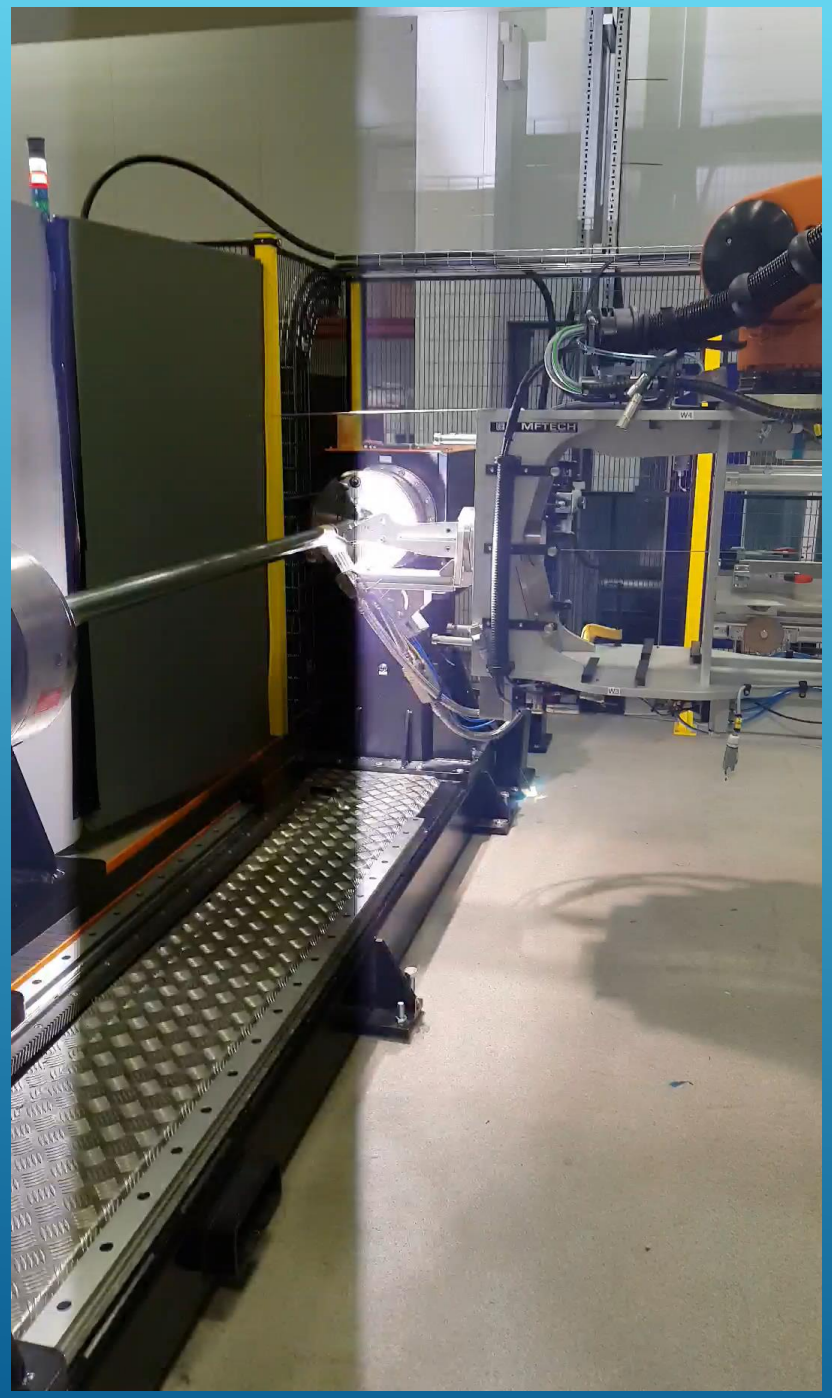


Thermoset wet winding

Curing Oven

AN INNOVATION: THERMOPLASTIC DRY WINDING (WELDING)

- Improvements in Laser technology made it possible to lay unidirectional thermoplastic tapes (UDTT) onto thermoplastic matrix.
- Another Improvement is IR welding onto thermoplastic matrix, using UDTT.
- Both technologies make oven curing obsolete.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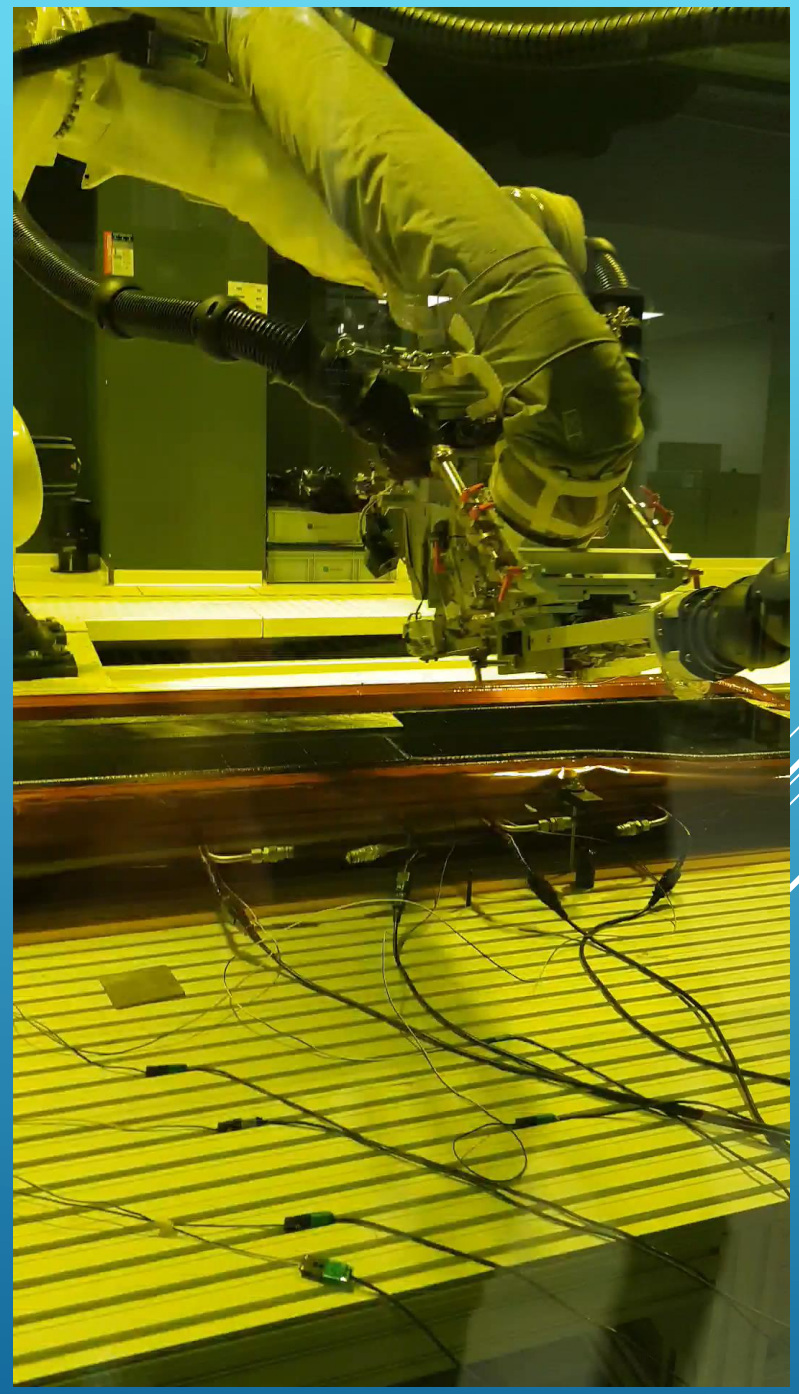
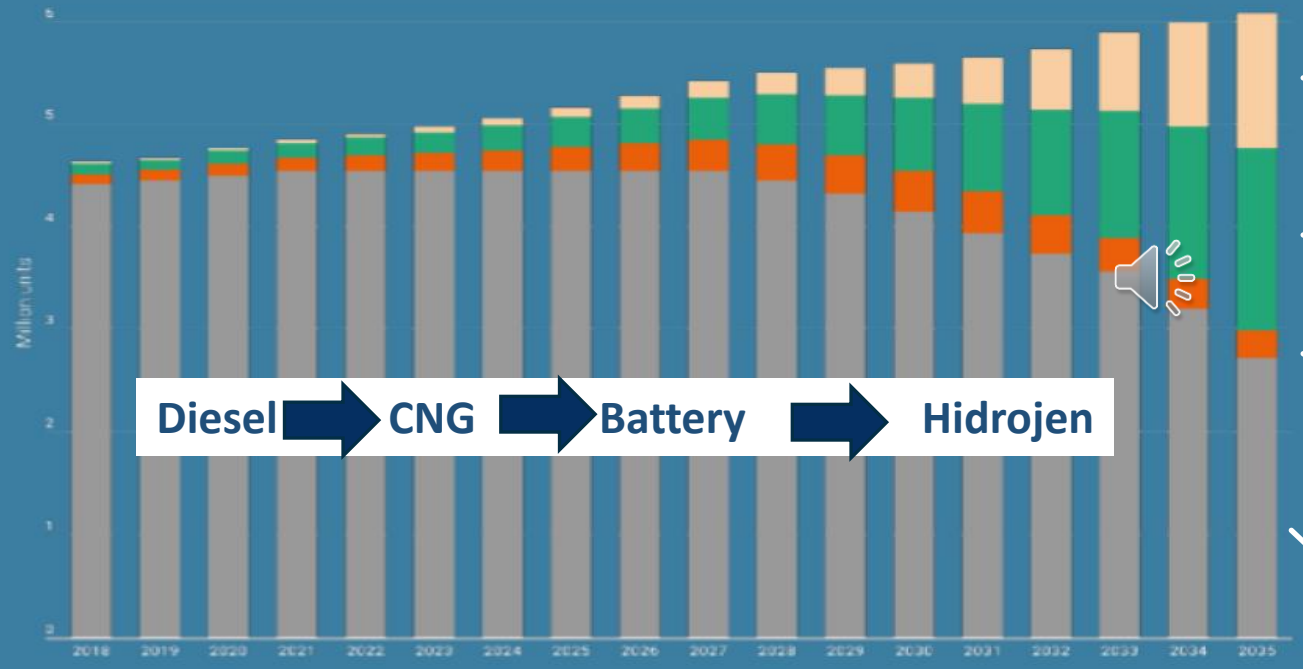


There are many rotomolders supplying the automotive industry with diesel tanks

What is the future of diesel?

Global Medium-&-Heavy Commercial Vehicle Production Forecast by Powertrain 2018-2035



	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Petrol	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Diesel	4.40	4.44	4.49	4.53	4.53	4.53	4.53	4.53	4.53	4.53	4.44	4.31	4.14	3.93	3.73	3.55	3.19	2.71
NGV	0.100	0.100	0.115	0.132	0.152	0.175	0.201	0.231	0.266	0.306	0.352	0.369	0.388	0.407	0.367	0.330	0.297	0.267
HEV	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PHEV	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EV	0.100	0.10	0.12	0.14	0.17	0.20	0.24	0.29	0.34	0.41	0.49	0.59	0.71	0.85	1.03	1.23	1.48	1.77
FCEV	0.020	0.020	0.026	0.034	0.044	0.057	0.074	0.097	0.125	0.163	0.212	0.276	0.358	0.466	0.606	0.787	1.024	1.331

In near Future. Nr. of Commercial Heavy Vehicles using Diesel and Adblue tanks will decrease drastically…

Fuel Cell / Hydrogen
Developing very rapidly
Market for ROTOMOLDED Type IV Tanks

Battery

CNG vehicles
same market in 2035
Market for ROTOMOLDED Type IV Tanks

Nr. of vehicles using Diesel will decrease

Market for ROTOMOLDED Conventional tanks

Source: TAYSAD,
UITP (International Association of Public Transport)

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