

chem2Dmat 

AUGUST 31 - SEPTEMBER 03, 2021 • BOLOGNA, ITALY

EUROPEAN CONFERENCE ON CHEMISTRY OF TWO-DIMENSIONAL MATERIALS



GRAPHENE-XT

2D material for lubrication,
a commercial application.

Simone Ligi

GXT FL graphene



GRAPHENE-XT

- Graphene in water.
- Low amount of exfoliating agent.
- No oxidation process, nor volatile chemicals.
- Green chemistry applied to all processes.
- Low production cost.

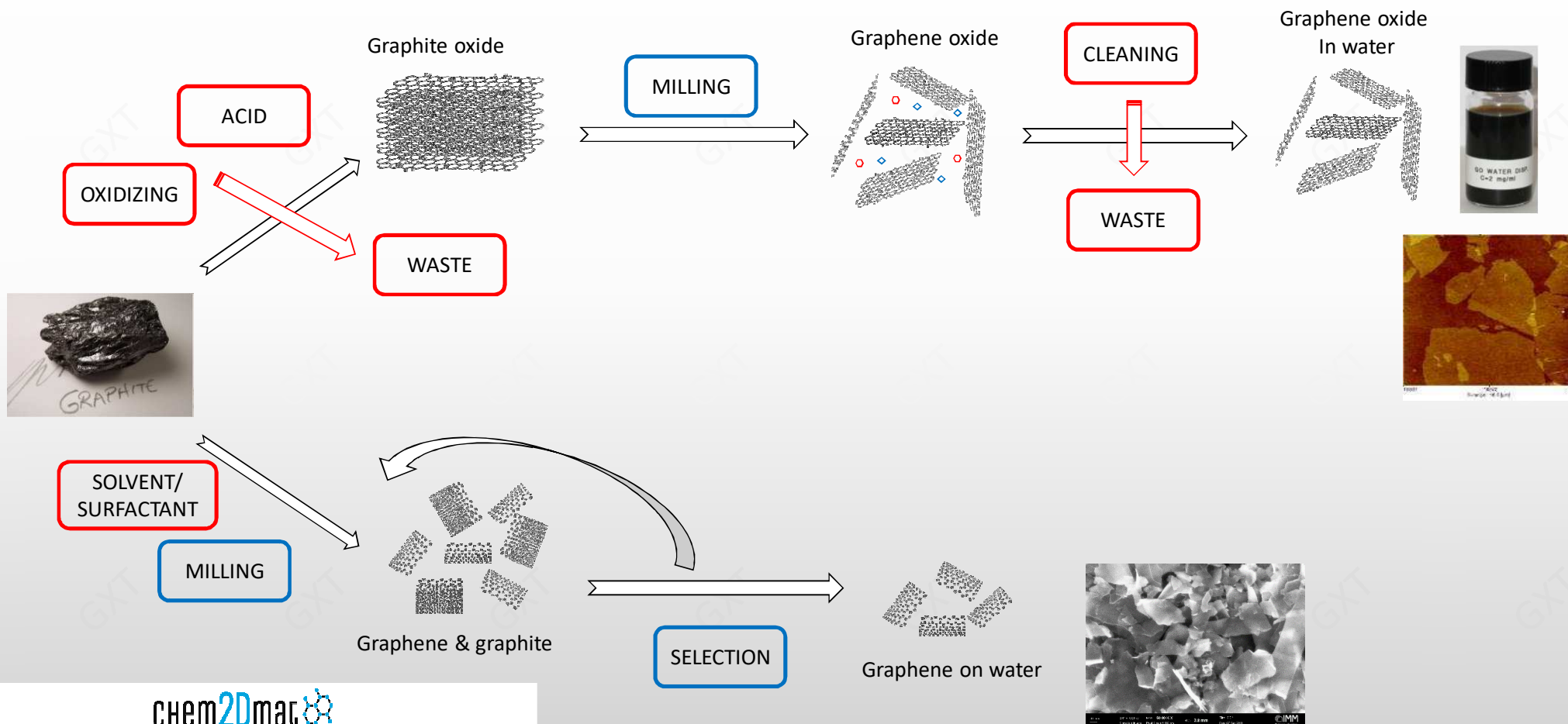
There is beauty in simplicity



Prevent scale up problems



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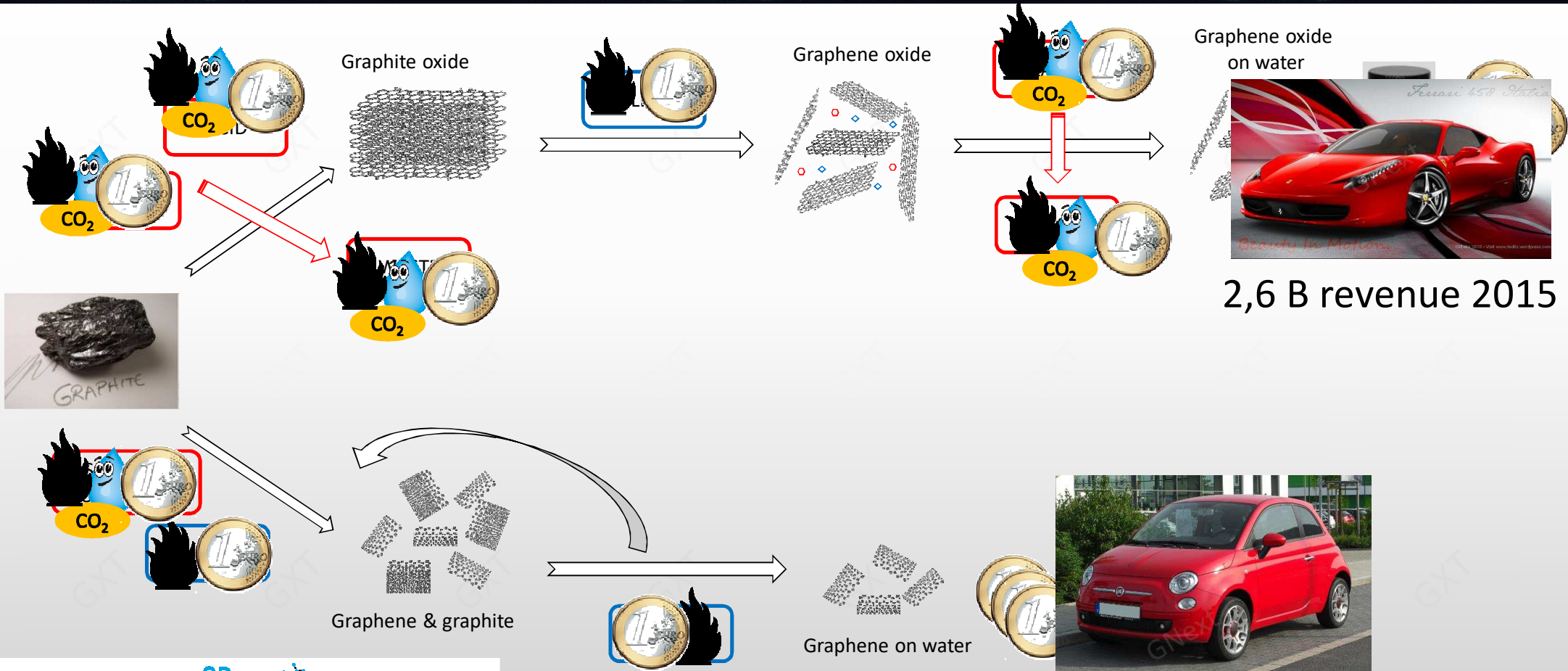
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How was our plan?



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110,6 B revenue 2015

S. Ligi

Who will succeed?



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We will not achieve an eco-friendly lifestyle by the work of ecologists, but rather by the work of the economists.

.....and they are already working:

Financial Stability Board (FSB)

Climate Action in Financial Institutions Initiative

Network for Greening the Financial System (NGFS)

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Environmental advantages.



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.....a market of 2 Bm²/y

Traditional ESD bag



Graphene ESD bag



LCA analysis from 54% up to 99% carbon footprint reduction

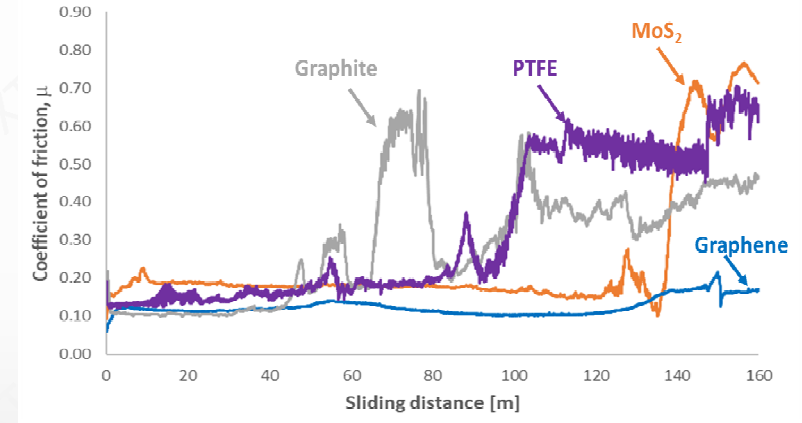
800.000 ton/y of CO₂ production can be easily reduced to 8.000 ton/y

Tribo XT coating



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- Tribo XT is a solid lubricant coating with very low friction coefficient.
- Graphene acts as a protective layer between two sliding parts, the layers of graphene have very little friction between them and can slide against each other.
- Is possible to reach very low friction coefficient with 0,01 micron of coating.
- Tribo XT can be applied to many substrate: metals, glass, polymer, etc



Lubricant	Starting friction, μ	Friction after 100 mt, μ	Friction after 160 mt, μ
Graphene	0,12	0,12	0,16
PTFE	0,13	0,2	0,6
Grafite 95	0,2	0,25	0,4
Grafite 33	0,11	0,3	0,4
Conductive paint	0,2	0,3	0,4
MoS ₂ (PVD)	0,2	0,2	0,7

Additives used in the oil industry

- Viscosity Modifiers
- Anti Foam
- Anti-wear/Extreme Pressures
- Detergents
- Dispersants
- Anticorrosive
- Antioxidants
- Friction modifiers.

INSTEAD OF
THOSE CAN WE
USE
GRAPHENE

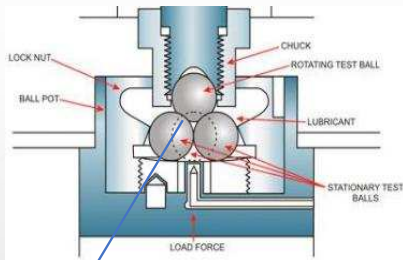


GRAPHENE for OIL

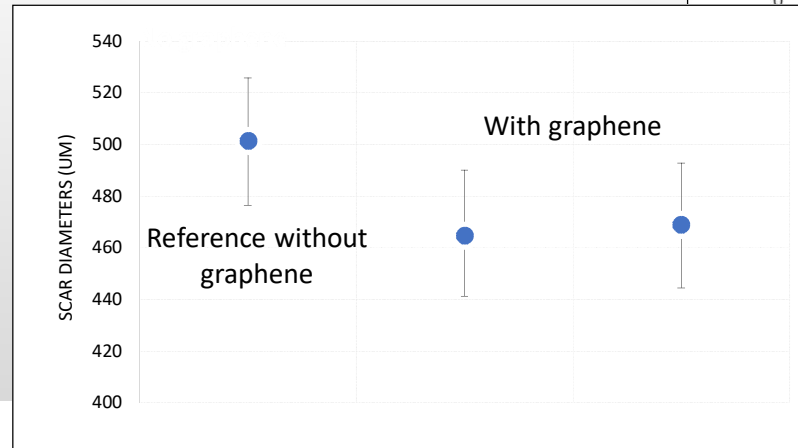
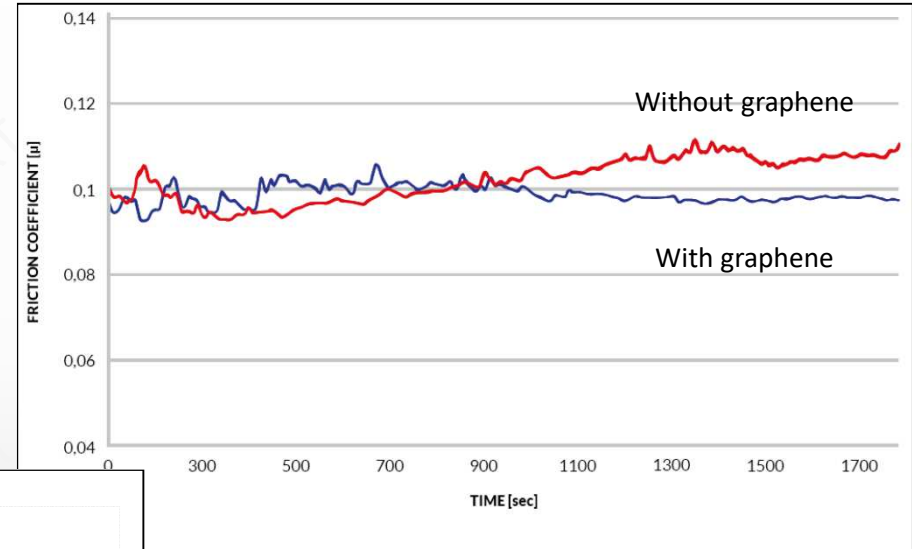
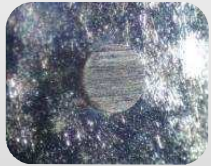


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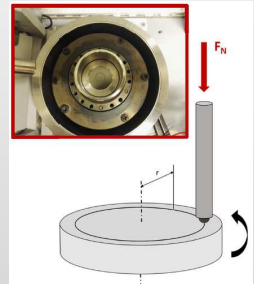
Development of a graphene additive for synthetic oil to improve lubrication performance.



4 ball test



Pin on disk



What more...



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- No sedimentation
- No clogging
- No bad interaction
- No....



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Beta on motorcycle



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- Yeah it's working.
- Engine seems going well.
- Less noise.



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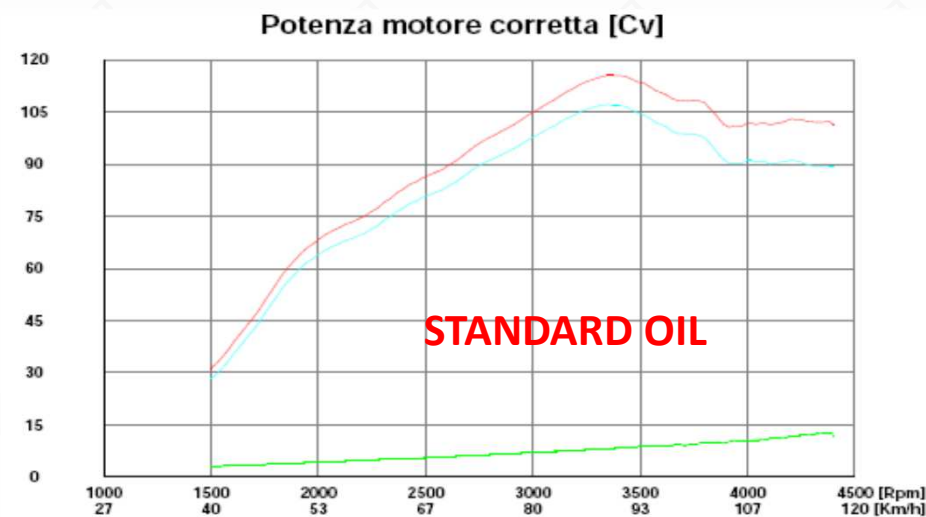
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Engine Power Curves: VW Golf 1.6 TDI

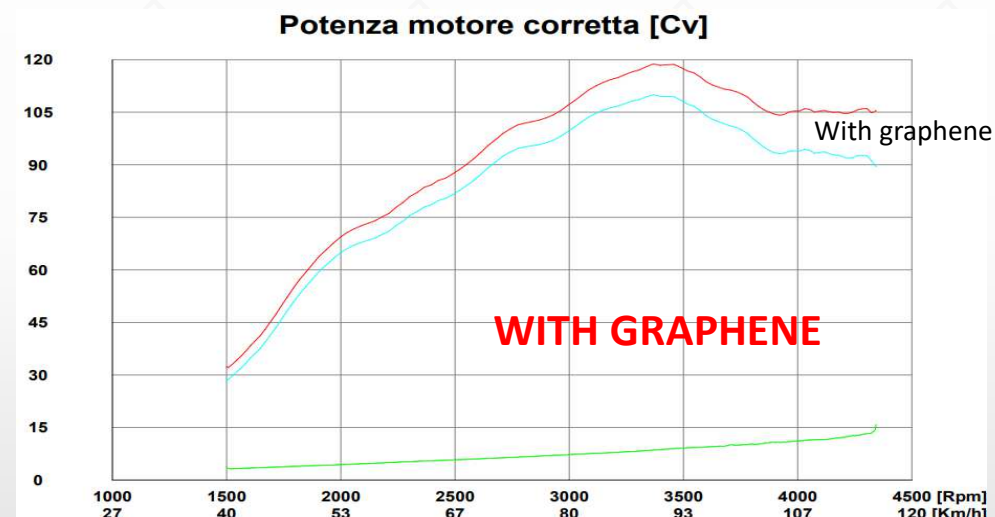


Codice prova: Vw Golf 1.6 std10 Data: 01/01/2000 09:13

Range di prova [Rpm]: 1500-4399

Temperatura ambiente	[°C]: 35
Pressione atmosferica	[mBar]: 1007.6
Umidità relativa	[%]: 35.76
Fattore di correzione 95/1/CE	: 1.023

Potenza Max.	[Cv]: 115.58
	[Rpm]: 3402
Coppia Max.	[Kg·m]: 25.16
	[Rpm]: 3159



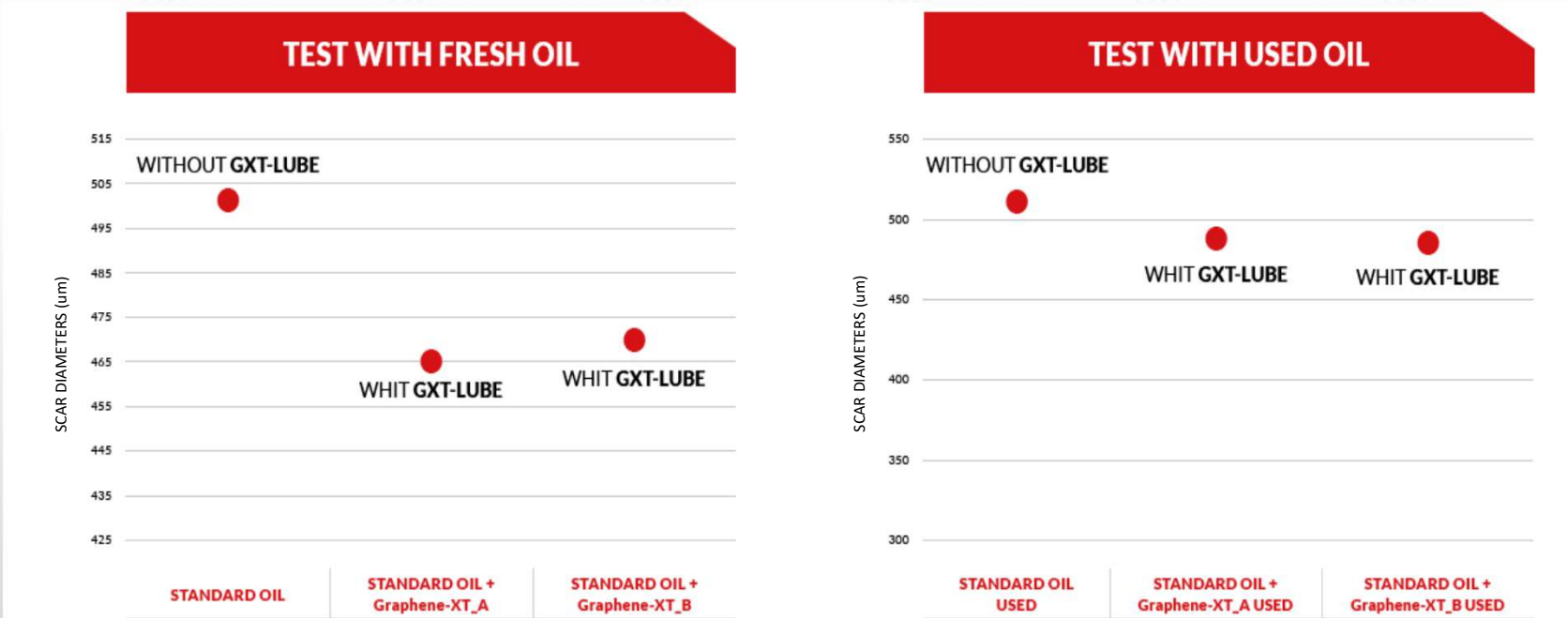
Codice prova: Vw Golf 1.6 std7 Data: 01/01/2000 07:20

Range di prova [Rpm]: 1500-4343

Temperatura ambiente	[°C]: 34.8
Pressione atmosferica	[mBar]: 1007.3
Umidità relativa	[%]: 33.67
Fattore di correzione 95/1/CE	: 1.021

Potenza Max.	[Cv]: 118.79
	[Rpm]: 3368
Coppia Max.	[Kg·m]: 26.2
	[Rpm]: 2741

Friction performance of highly stressed oil 4 ball test results



What about oil stability



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Viscosity variation of stressed oil

	Viscosity variation
Standard oil	
Short aging	6,0 %
Medium aging	8,6 %
Graphene oil	
Graphene oil short aging	0.7 %
Graphene oil medium aging	1,5 %



Ready for market



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- Reduce friction.
- Reduce blow by.
- Increase compression.
- Reduce consumption, thus pollution.
- Reduce noise.
- Increase oil stability.



SOON ON E-COMMERCE AND ON SPECIALIZED GARAGE

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THANK YOU