VERT Research Projects and worldwide market support for air quality

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V. Hensel, VERT Association

Research to enable Best Available Technologies

- Continuous research and development for solutions to reduce harmful substances to lowest possible level
- Continuous improvement of measurement devices to detect lower emission levels
- Continuous improvement on certification procedures to enforce and qualify innovative solutions
- The request for **B**est **A**vailable **T**echnologies enforces innovation and markets to the benefit of the society

Goals and intension for Industrialization | Mobilization

- Economical growth
- Technological development
- Value creation
- Prosperity of the society
- Higher living standards
- Higher mobilization

Side Effects of Industrialization | Mobilization

- Pollutants released to the environment
- An increase in automobiles
- Congested cities
- Increasing per capita energy consumption
- Increased health effects
- Poisoning of water
- Increasing GHG and Global Warming

Canada

VERT carried out the DEEP project (Diesel Engine Emission Project) since 2003 with Canadian mining companies to reduce emissions for occupational health reasons, which is now in force.

USA

Teaming up with regional and local clean air authorities several retrofit projects were implemented in the United States, e. g., retrofit of construction machines. VERT filters were approved by the National Institute for Occupational Safety and Health (NIOSH) and the City of New York.

Switzerland

Switzerland has retrofitted not only all construction machines (50,000+ filters), but as well buses, locomotives and ships with a particle filter ten years before other countries started.

United Kingdom

VERT member companies retrofitted more than 4,000 buses of the public transport system in London, Birmingham, and Manchester. The performance of the SCRT systems are controlled via telematic systems.

Germany

In Germany, e. g., several retrofit projects for construction machines were carried out. E. g., systems in Berlin, Bremen, Frankfurt and Stuttgart were equipped with DPFs. Germany also accepts VERT rules for its environmental zones.

China

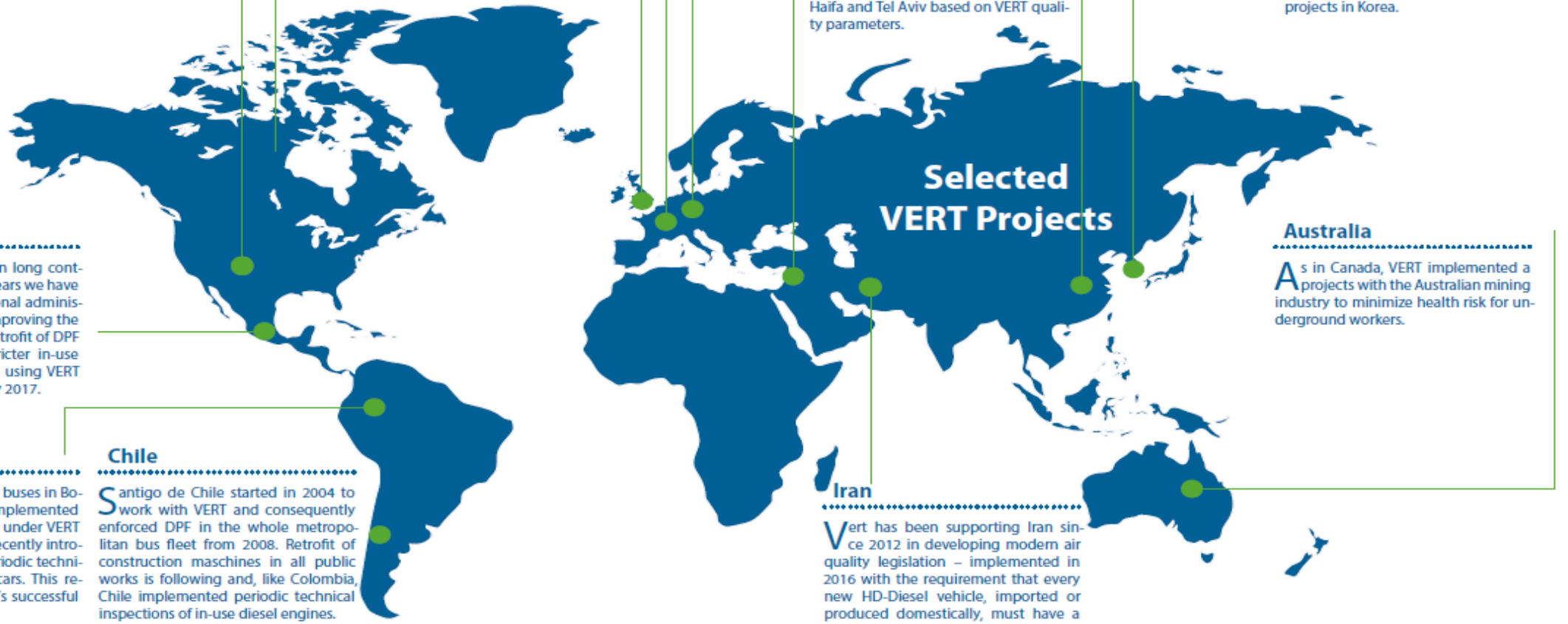
China is widely known for its poor air quality in its megacities. It was one of the first international VERT projects to support regional authorities with retrofit projects for city buses, transit buses and construction machines in Beijing, Nanjing and Xiamen. VERT elaborated the new PN-based legislation with the Chinese Government.

Israel

Most railway lines in Israel are not electrified. Therefore, many diesel locomotives are still in-use. VERT members retrofitted the locomotives with modern DPFs in addition to retrofit of buses, trucks and waste collectors in Haifa and Tel Aviv based on VERT quality parameters.

South Korea

Quite new is the cooperation of VERT with South Korea. Korea Automobile Environmental Association (KATA) and VERT agreed upon a mutual recognition of its filter certificates. VERT members have access to the upcoming projects in Korea.



Mexico

Mexico City has been in long contact with VERT. Over years we have been supporting the regional administration of Mexico City in improving the air quality, e. g., with the retrofit of DPF systems, implemented stricter in-use compliance checks of cars using VERT particle number metrology 2017.

Colombia

Colombia retrofitted city buses in Bogota with a DPF and implemented a new emission legislation under VERT guidance from 2012 and recently introduced a law that forces periodic technical inspections of diesel cars. This regulation is based on VERT´s successful European project NPTI.

Chile

Santigo de Chile started in 2004 to work with VERT and consequently enforced DPF in the whole metropolitan bus fleet from 2008. Retrofit of construction maschines in all public works is following and, like Colombia, Chile implemented periodic technical inspections of in-use diesel engines.

Iran

Vert has been supporting Iran since 2012 in developing modern air quality legislation – implemented in 2016 with the requirement that every new HD-Diesel vehicle, imported or produced domestically, must have a VERT qualified DPF.

Australia

As in Canada, VERT implemented a projects with the Australian mining industry to minimize health risk for underground workers.

Empa Akademie

Bern University of Applied Sciences

Number of installed DPFs (retrofit) with VERT certification in thousands of systems / 2001-2020 (*NR = Non-road)

	2001 - 2005			2006-2010			2011-2015			2016-2020			
	Bus	Truck	NR*	Bus	Truck	NR	Bus	Truck	NR	Bus	Truck	NR	Total
Switzerland	3	1	7	2	1	11	3	2	16	-	1	8	55
Germany	20	-	-	25	50	-	5	50	0	-	-	40	190
Italy	10	-	-	20	-	-	15	-	-	-	-	-	45
France	7	-	-	3	-	-	2	-	-	-	-	10	22
Great Britain	9	11	-	3	-	12	-	10	1	-	-	5	48
EU Rest	15	-	-	15	-	-	15	-	-	-	-	-	45
EU indoor	-	-	50	-	-	75	-	-	75	-	-	50	250
USA	20	10	-	12	22	2	20	28	7	10	20	10	161
Latin America	-	-	-	3	-	-	1	-	-	10	40	10	64
Iran	-	-	-	-	-	-	-	-	-	8	35	2	45
Israel	-	-	-	-	-	-	-	-	-	4	5	2	11
Korea	10	20	-	20	130	-	20	80	-	20	70	-	370
Japan	30	30	-	30	30	-	30	30	-	-	-	-	180
China	-	-	-	4	4	-	15	10	1	50	30	50	164
Asia Rest	15	-	-	15	-	-	15	-	-	25	-		70
Sum	139	72	57	149	249	88	141	210	100	127	201	187	22
Total		268			486			451			515		7
Total					1,205 (Europe: 541)						7		1,720

Why is **NPTI** so **important** ?

A European working group, initiated by VERT in December 2016, has developed a new tamper-proof method to check the quality of exhaust after-treatment systems of diesel vehicles.

New devices for tailpipe measurements were developed. The systems count the Particle Number (PN) of the exhaust gas flow in the tailpipe. Amongst others, the Netherlands, Germany, Belgium, and, as the first two non-European countries, Chile and Colombia have decided to introduce the new method.

In Germany, the so-called NPTI ("New periodic technical inspection") will start on January 1, 2021. The PN value is considered to be much more reliable than the current OBD method (On-board diagnosis) and the former inaccurate opacity test. OBD means that the test engineer plugs a device into the car. The diagnosis of the after-treatment system sends only an electronic message of failure modes to the display of the connected testing device. There is no exhaust assessment. The new mobile measuring method makes it, e. g., for the police possible to reliably check on-site in less than a minute whether the exhaust system is defect or has been tampered.

Control measurements of vehicles randomly selected from traffic, carried out by VERT together with the Netherlands Organisation for Applied Scientific Research (TNO, Netherlands), the GOCA Institute (Belgium) and by the Agency for Waste, Water, Energy and Air (AWEL, Switzerland), showed that up to 12 percent of Euro 5 and Euro 6 diesel vehicles had no correct working particulate filter. The new portable measuring instruments were presented for the first time in Duebendorf near Zurich at the annual VERT Forum in March 2019.

So far, around ten manufacturers have developed devices in accordance with the new standard of the Dutch Metrology Institute (NMI), which came into force in June 2019. Garages and testing institutes can buy the devices to carry out the new method. Systems will cost around 5,000 to 8,000 Euros.

12 %

of all Diesel cars drive with a defect DPF

Mr. Mayer, can you tell us, why NPTI is so important?

Every car with a defect DPF exceeds limit values by far. Measurements of VERT show, that a new EURO VI car with a correct working DPF distributes nearly no particles. During a test, a car with a new DPF emitted about 200 particles per cubic centimeter. The ambient air had serveal thousands particles per cubic centimeter. A diesel car with a defect DPF emitted about four million particles.

How is it possible that so many DPFs fail?

DPFs like any other car component tend to malfunction over time, e. g., by mechanical damage. Besides that, it is quite common that car owners manipulate or remove DPF systems.

How did the NPTI initiative start?

In September 2016 we attended on behalf of VERT an expert hearing in the German parliament. Politicians were looking for an alternative for the OBD method. There were simply too many manipulations. The test was easy to tamper and therefore useless.

Who were the members of the NPTI working group?

Several technical inspection institutes, e. g., TNO from the Netherlands and Spain but also the German TUEV Sued, became members of the VERT initiative. The European Commission also supported us. The measuring device industry has been very active and developed new systems.

How long will the test last and what will consumers have to pay for it?

In Germany, the test can be carried out during the regular inspection at testing facilities like the TUEV. It will take only half a minute and the car owner will have to pay about 30 Euros. This is a good investment in air quality.

What will happen in case of a defect DPF?

The DPF has to be cleaned, repaired or replaced. VERT believes that in this case, often the car manufacturers are also obliged to take action.

They guarantee the statutory emission level of the type approval for five years or 160,000 kilometres. It will be very interesting to see how the automotive industry will react.

About Andreas Mayer

Dr. h. c. Andreas Mayer is globally recognized as a leading senior expert in the field of nanoparticles. Andreas Mayer is holding the position as Chief Scientific Officer of VERT since 1998.

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We keep on going

- Solutions for ocean going vessels
- Solutions for small and handheld machinery
- Solutions for DeNOx Retrofit solutions
- Solution against Virus contamination
- …

Thank you for your attention

your contribution and interest

for your collaboration to work with VERT on clean air programs