



DPF Retrofit and DPF First Fit for all New Diesel Vehicles in Iran

VERT forum, 2017- Mahdi Doozandegan

- Diesel vehicles' new legislation in Iran**
- DPF retrofit programs**
- DPF first fit for new diesel vehicles**

Diesel vehicles' new legislation in Iran

The history

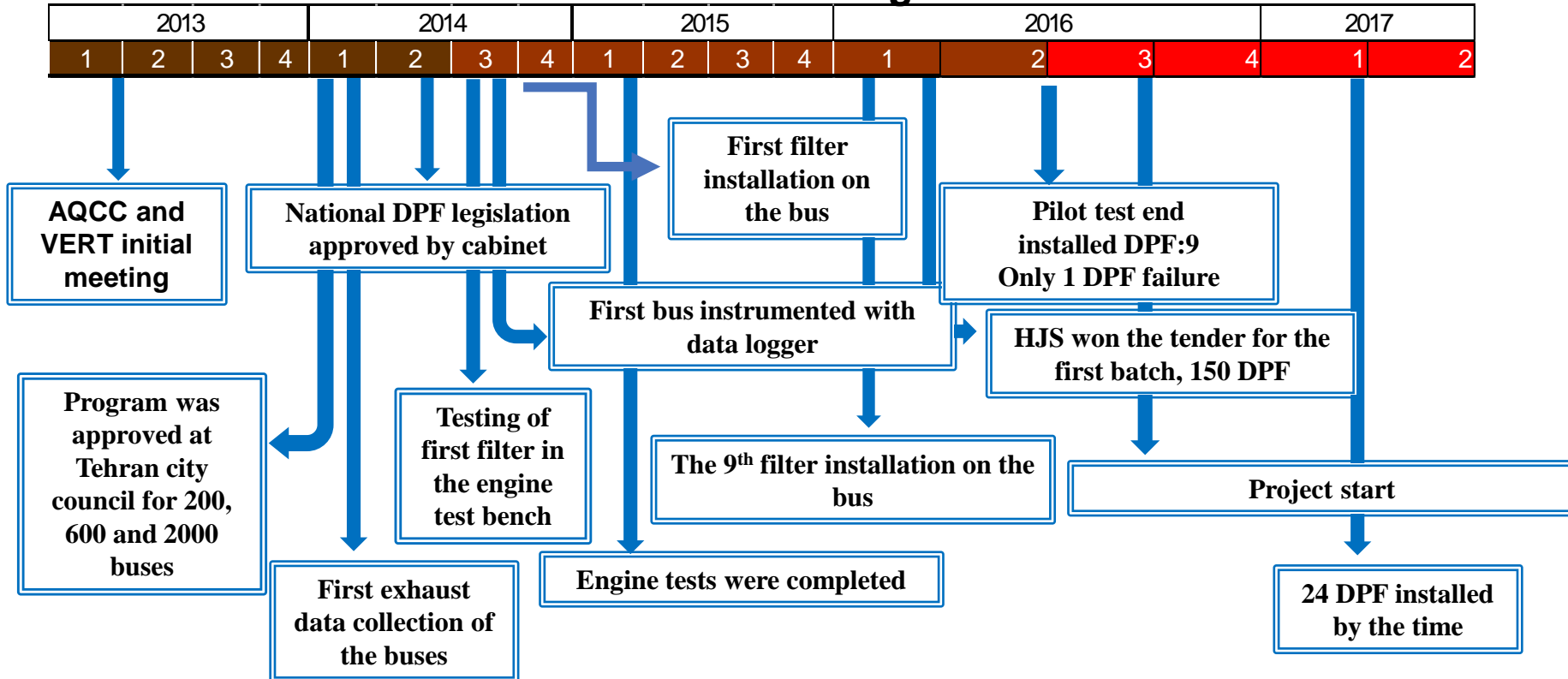
- ❑ The issue with particles, especially traffic-generated particles became clear for Tehran Municipality in 2012.
- ❑ AQCC was mandated to put together a comprehensive program to reduce combustion generated particles.
- ❑ VERT was approached in March 2013 for diesel particles mitigating measures.
- ❑ At national level, in April 2014, a legislation was approved by cabinet to retrofit diesel buses in all major cities of Iran with DPF.
- ❑ For new vehicles, EURO IV + DPF was approved by cabinet in April 2014.
- ❑ The implementation date was delayed to end of March 2017 for all vehicles.
- ❑ The legislation was updated to “EURO IV + DPF or EEV” in February 2017.
- ❑ Tehran city council approved the necessity of DPF retrofit for all diesel vehicles and machines which operating in the city are.

DPF retrofit programs

Tehran municipality plan



Actual Progress



DPF retrofit programs

Pilot test, test bench activities

Stage 1: Instruments and filters



We care for air.



Stage 2: engine test cell preparation

- The engine lab in IDEM Co., Tabriz, Iran is a hot test engine lab at the end of production line of Mercedes engine.
- The lab was equipped and instrumented by AQCC
- The data acquisition and control software was set to be able to run the soot loading, balance point, and filter efficiency tests.
- Low, medium, and high sulfur diesel was prepared and re-analyzed.
- Enough FBC was supplied for engine tests

Stage 2: engine test cell preparation




Stage 3: Engine test cell results

DPF No.	DPF type and technology			Tested fuel sulfur content			Cause of failure
	Active/Passive	Regeneration method	Core type	50 ppm	229 ppm	7000 ppm	
1	Active	Electrical heater+ FBC	Sintered metal	-	✓	✓	-
2	Passive	DOC upstream of filter (CRT)	Sintered metal	✗	✗	-	Fuel sulfur content Low PM efficiency
3	Passive	FBC	Silicon carbide	-	✓	✓	-
4	Passive	FBC + Catalyst upstream of DPF	Cordierite	-	✓	✓	-
5	Passive	Catalyzed DPF (CDPF)	Cordierite	-	✓	-	-
6	Passive	DOC upstream of filter (CRT)	Silicon carbide	-	✗	-	Fuel sulfur content Low PM efficiency
7	Passive	DOC upstream of filter (CRT)	Silicon carbide	-	✗	-	Fuel sulfur content Low PM efficiency
8	Passive	FBC	Silicon carbide	-	✗	-	Filter cracking
9	Active	diesel burner technology	Silicon carbide	-	✗	✗	Safety issue
10	Passive	FBC	Silicon carbide	-	✓	-	-

DPF retrofit programs

Pilot test, field test

Stage 1: The sample buses were mobilized to CPK online data logger

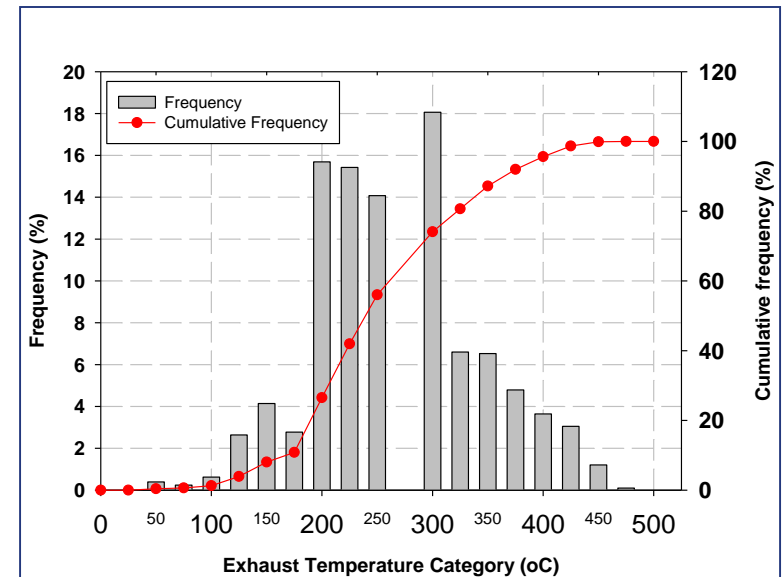


Welcome Project Iran -

Filter

Project	Vehicle ID	System	Install. Date	Vehicle Description	Fleet	Date, Time	Status	last known position	Action
	78-524	LN: 001443 DN: 1930	17.02.2014	Line 4	Iran	02.11.2014 23:41	In Motion	35.63275 : 51.4052	
	78-515	LN: 001490 DN: 1954		Line 4 - Dinex installed (22/10/2014)	Iran	04.11.2014 12:16	In Motion	35.63256 : 51.40575	
	85-156	LN: 001491 DN: 1930		Line 10	Iran	04.11.2014 23:08	In Motion	35.677 : 51.30753	
	33-637	LN: 001492 DN: 1933		Line 2	Iran	02.11.2014 14:50	In Motion	35.63296 : 51.48338	
	32-938	LN: 001493 DN: 1927		Line 3 - (CPK Temp Sensor Error)	Iran	04.11.2014 21:53	In Motion	35.73371 : 51.50686	
	85-162	LN: 001494 DN: 1952		Line 10	Iran	04.11.2014 23:47	In Motion	35.67775 : 51.30685	
	33-457	LN: 001495 DN: 1927		Line 1 - Engin problem / Out of Service	Iran	27.10.2014 13:42	In Motion	35.74661 : 51.49253	
	78-514	LN: 001496 DN: 1914		Line 4 - HJS installed (10/09/2014)	Iran	03.11.2014 11:53	In Motion	35.63188 : 51.40455	
	33-592	LN: 001497 DN: 1953		Line 2 - BUS STOP for wheel problem	Iran	06.10.2014 14:34	In Motion	35.62961 : 51.48126	
	33-469	LN: 001499 DN: 1948		Line 1 - (CPK Pressure Sensor Error)	Iran	03.11.2014 22:04	Alarm	35.72303 : 51.52048	

Legend



Stage 2: DPF installation on the buses



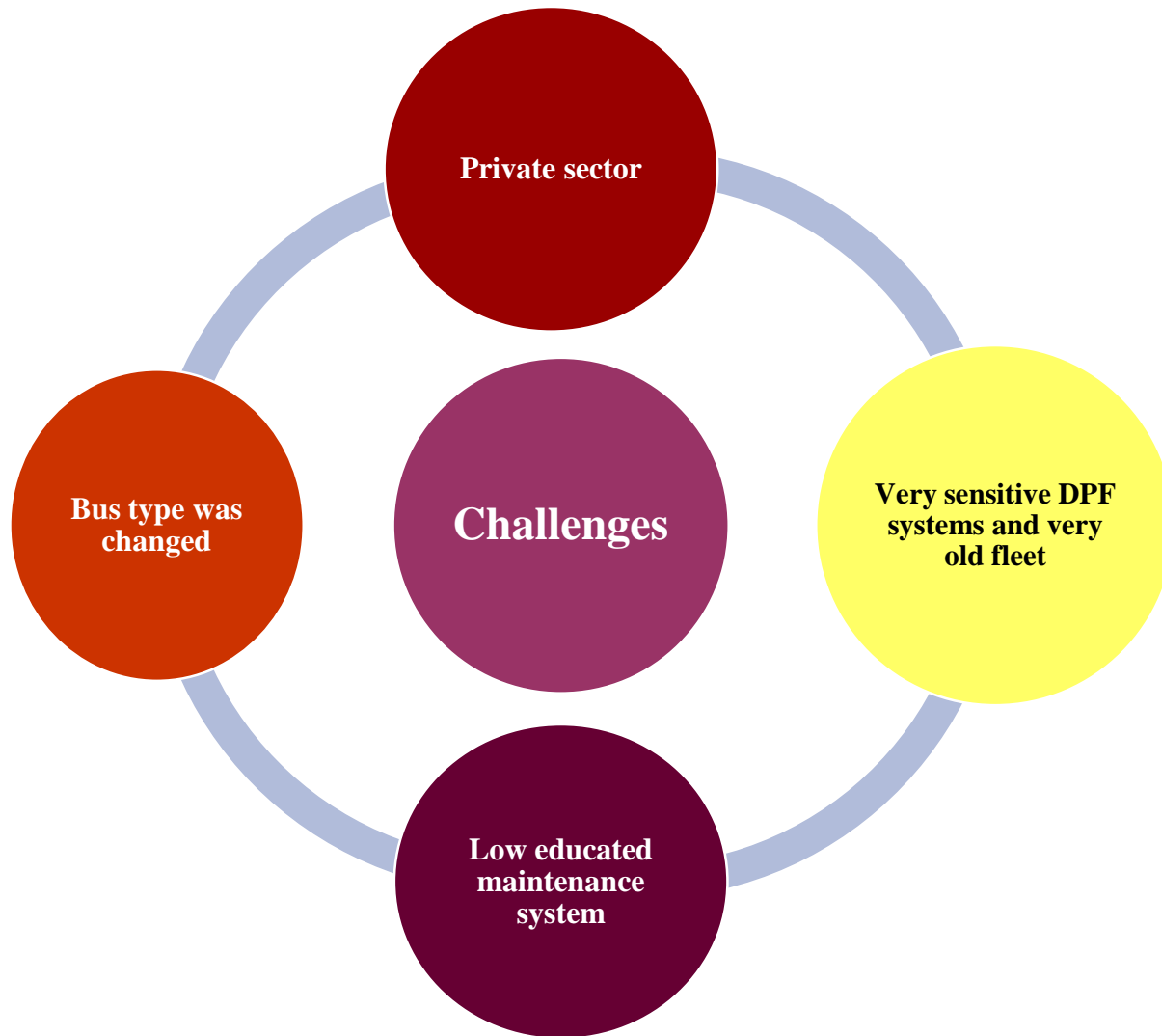
Total selected buses: 17
Total installed DPFs :9

Stage 3: Pilot test results at the end of the project

DPF	Operation Report		
	Installation date	Working days	Bus mileage
Passive system with FBC/V. ID: 78514 (line 4) (DPF No.1 without electrical heater)	10/Sep/2014	613 days	92406 km
Passive system with FBC/V. ID: 78515 (line 4) (DPF No.3)	22/Oct/2014	436 days	49616 km
Passive system with FBC/V. ID: 78524 (line 4) (DPF No.4)	28/Jan/2015	473 days	77062 km
Active system with FBC/V.ID: 85423 (line 4) (DPF No.1)	19/Feb/2015	455 days	78093 km
Active system with FBC/V.ID: 33572 (line 2) (DPF No.1)	19/Feb/2015	445 days	73049 km
Passive system with FBC/V.ID:85476 (line 10) (DPF No.1 without electrical heater)	23/Feb/2015	478 days	85692 km
Passive system with FBC/V.ID: 33637 (line 2) (DPF No.3)	02/Jun/2015	This system works with DPF only for 21 days.	-
Passive - Catalyzed DPF/V.ID: 85182 (line 10) (DPF No.5)	24/Sep/2015	185 days	10557 km
Passive- Catalyzed DPF/V.ID: 33592 (line 2) (DPF No.5)	25/Jan/2016	112 days	5000 km

DPF retrofit programs

First batch



❑ Change in bus type

Pilot project:

- Kinglog- MAN EU 3
- Temperature profile: high
- BRT lines, less traffic
- Average old: 7 years

First batch project:

- IKD- OM 457, EU 2 or EU 3
- Temperature profile: low
- Ordinary line, city traffic
- Average old: 10 years



عکس: مازیار قام نویس

Preparation to overcome challenges

- ❑ K-value measurement of more than 200 buses to choose appropriate buses for DPF installation
- ❑ Set k-value limits on 1 (1/m)

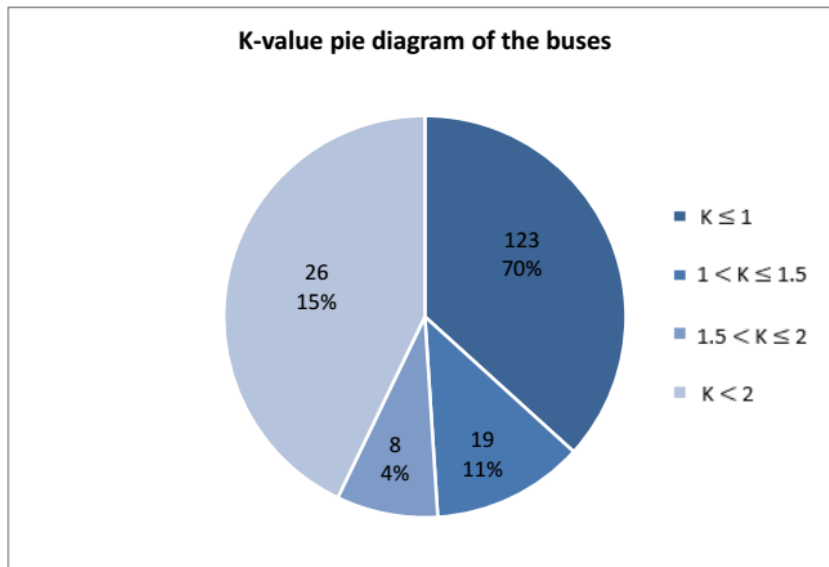


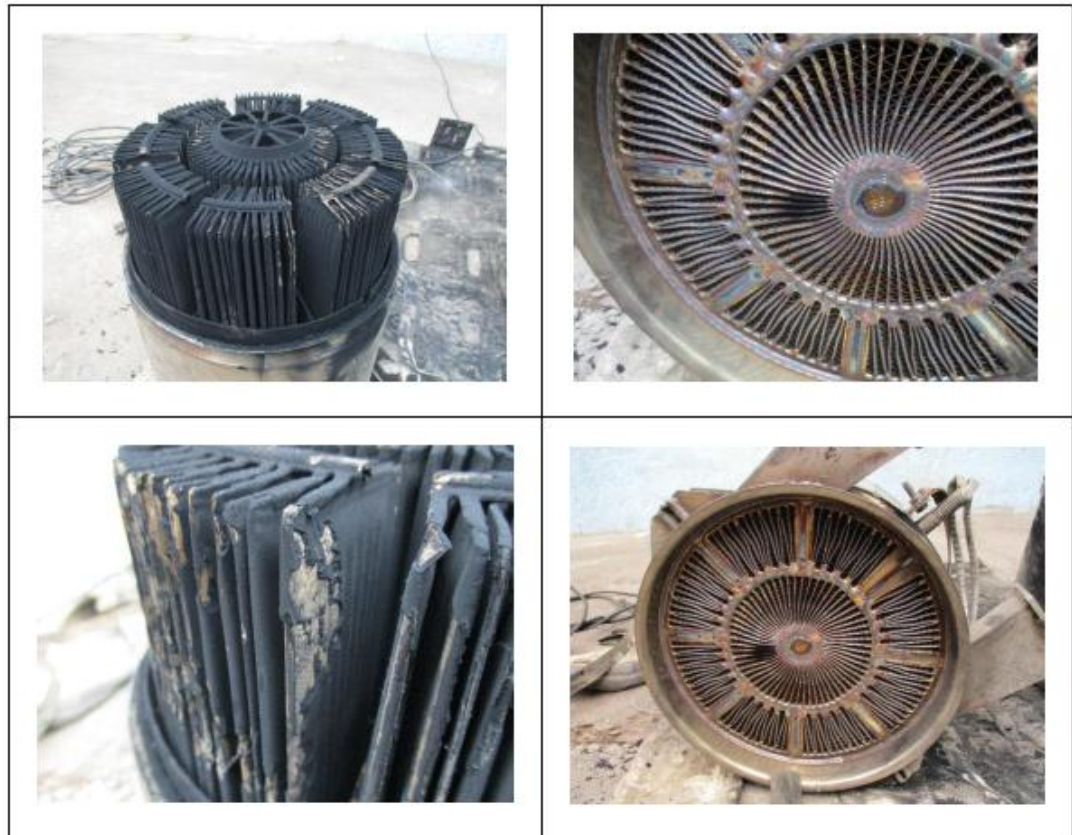
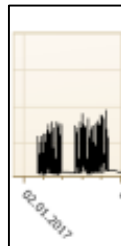
Figure 1- AVL DiCOM 4000 smoke measurement analyzer

Preparation to overcome challenges

- ❑ Fuel level gauge changing.
 - ❑ There were failures due to level fuel gauge problem which cause problem in FBC dosing systems.

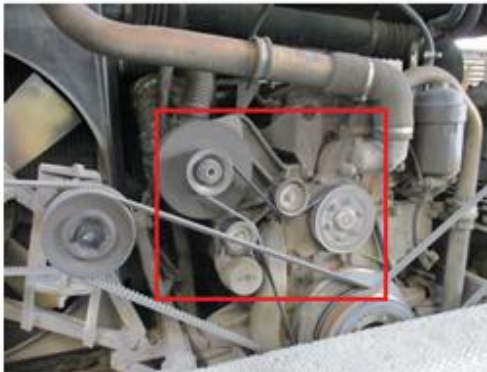
Acquisition	Actual Values
Revolutions per min.	571 rpm
Additive consumption	135 ml
Additive in filter	135 ml
Additive concentrat.	missing
Additive consumptio.	30.000 ppm
Last regeneration b.	41 min
Heating capacity - .	0.0 W
Heating capacity - .	0.0 W
Heating status	0x0000
Electricity - heate.	0.0 A
Electricity - heate.	0.0 A
Status of metering .	0x6303
Filter load	78 %
Operating hours	366 h

Insufficient FBC

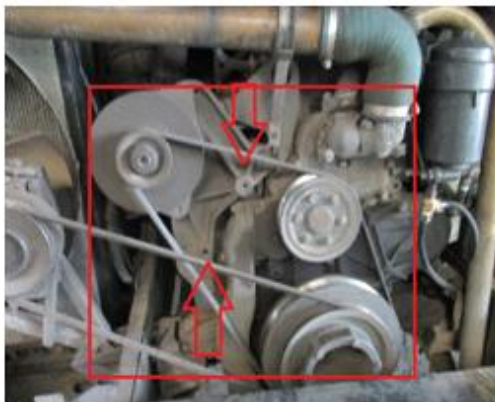
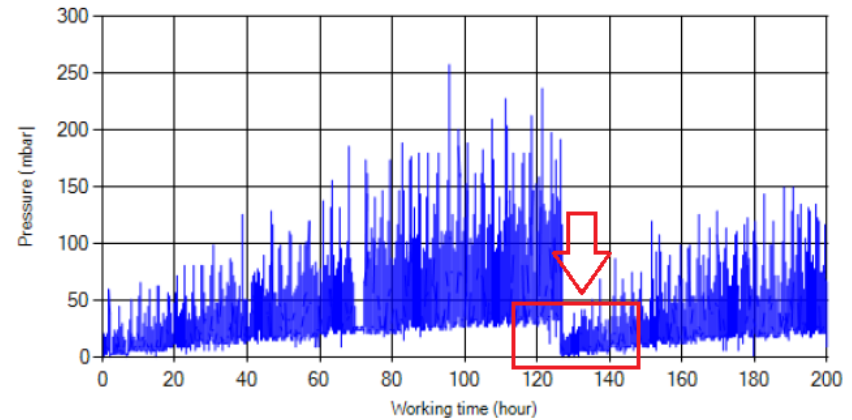


Preparation to overcome challenges

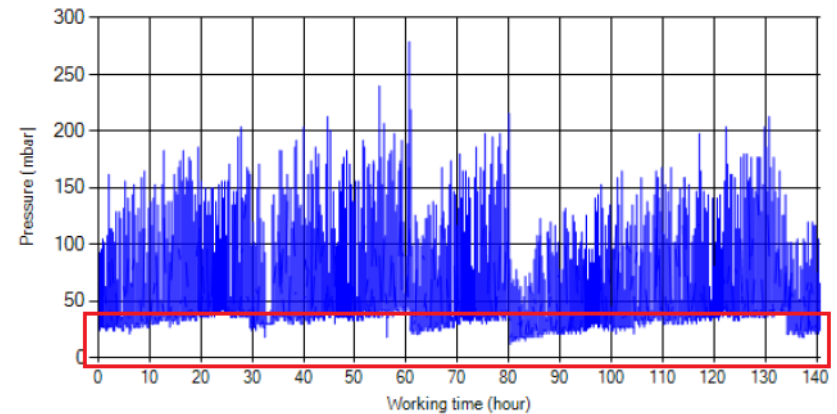
- ❑ Over voltage problem
 - ❑ Producer reduced their system sensitivity to bus operating voltage fluctuations



Normal operation



Unormal operation



Stage 1: 50 DPF installation on the buses by the end of May, 2017



23 Installed by the
time...



- Workshop for UBCT managers, technicians and buses' drivers to reduce project risks (11th March, 2017)



DPF retrofit programs

Construction machines retrofit (Tehran)

- ❑ According to the last approval of city council of Tehran (March 2017), all Diesel engines and vehicles can't operate in Tehran without DPF.
- ❑ ASA will start new project with AQCC regarding construction machineries in Tehran
 - ❑ Identification
 - ❑ Studies
 - ❑ Emission inventory
 - ❑ Legislation
 - ❑ ...





New market in
Iran will be
created for DPF
producers

DPF retrofit programs

Other cities

Isfahan

- ❑ Several meetings with AQCC of Isfahan and mayor deputy, ASA
- ❑ Workshop on solutions for eliminating Diesel soot from urban air, Isfahan, December 13th, 2016
- ❑ Isfahan municipality plan to retrofit 100 buses with DPF for the first stage, at the current year
- ❑ VERT plan to invite deputy mayor of Isfahan to visit DPF producer companies in Europe.



Transport and traffic deputy of Isfahan Municipality and VERT
association of BAT soot filters

Present:

**Workshop on solutions for eliminating Diesel soot from
urban air**

(Background, lessons learned in Europe, Best practices in Tehran)

Date: December 13th, 2016
Venue: Floor 2 Hall, Building No. 3 of Isfahan Municipality, Teyeb
Street, Isfahan, Iran

(Attendance only by invitation is awarded to attendees)

Isfahan


- Workshop on solutions for eliminating Diesel soot from urban air, Isfahan, December 13th, 2016



DPF first fit for new diesel vehicles


Option fit

- ❑ Option fit for new vehicles means choose appropriate DPF for engine without any changes at the base engine system.
- ❑ ASA cooperated with IKD company and tested different DPFs for their products.




IKD's Road Map to Select Suitable DPF for Their Productions
Results, Suggestions and Test Planning

By



Azmoon Sanat Arvin Co.
info@asarvin.com
www.ASArvin.com



Technical and Engineering Dept.



Test cycle:	Gaseous emissions			Particulate emissions		
	CO (g/kWh)	HC (g/kWh)	NOx (g/kWh)	PN (#/kWh)	PM (g/kWh)	
ESC	0.3	0.13	4.5	1E12	Solid	Total
Iran IVa	1.5	0.46	5.0	1E12	0.02	

* PM_{solid}: Solid particles only (estimated from solid particle numbers)

Considering the last update of new legislation, option fit market is not available for DPF producer companies in Iran

DPF first fit for new diesel vehicles

OEM, Cooperation

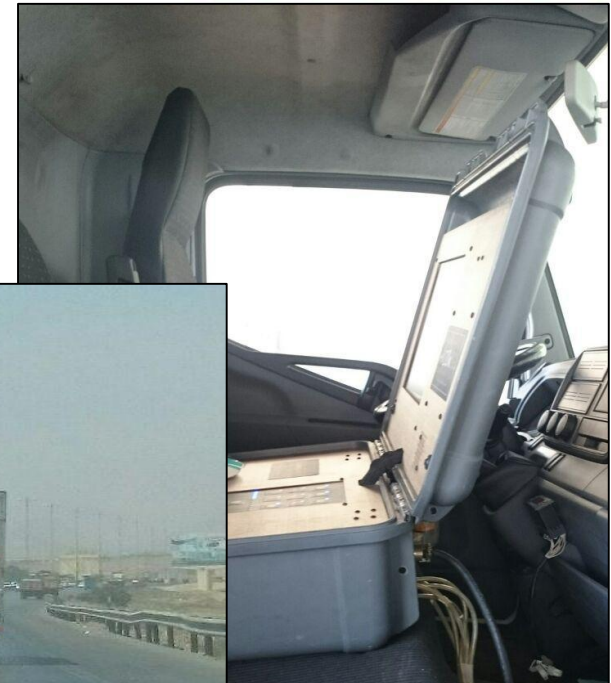
ASA has started cooperation with Mammut, Mayan and Saipa.



Proposed to:



PEMS test for Mayan Co.



Road test for Saipa diesel

- Online data-logger installation.
- Emission measurement before road test.
- Field test , mileage: 50,000 km.
- Emission measurement at the half and end of the road test.
- Fuel analyzing.
- Standard report.



PN test for Mammut (Scania products)

Proposed to:



Figure 3. SCANIA R450 (1/1)



Vehicle	Stages			
	1	2	3	4
SCANIA R450	9.11 E+03	1.39 E+04	8.13 E+03	9.78 E+03
SCANIA R460	9.11 E+03	3.93 E+07	3.75 E+07	3.47 E+07

Discussions are welcome
Thank you for your attention

M.Doozandegan@asarvi.com

