

## Overall Information

*Table1- Overall Information*

Vehicle plate number	33637 (34119)
CPK data logger number	LN: 001492, DN: 1933, Sim +989210000000
Bus line	Number 2 (west to east bus line)
Bus Terminals	Khavaran Bus Terminal - Western Bus Terminal
Total path distance	19 km
DPF company producer	Dinex_02 (Passive system with FBC)
Installation date	02/Jun/2015
Report period	23/Aug/2015 – 01/Sep/2015 (ten days)
K value - DPF upstream	2.00 [1/m]
K value – DPF downstream	0.02 [1/m]

*Table 2- DPF Maintenance History*

Filter maintenance date	DPF has been removed after two weeks working on Jun 17 <sup>th</sup> . After receiving cleaning machine DPF was cleaned on Aug 10 <sup>th</sup> and was installed on Aug 22 <sup>nd</sup> .
Dosing status	Additive dosing was increased to 160% of its initial value.

*Table 3- Fuel and Additive Consumption Information*

Bus mileage over the period	1662 km
Working days over the period	9 days
Stop days	1 day
Data logger working days	9 days
Working hours over the period	162 hours 23 minutes
Average working hours per day (including stop days)	16 hours 15 minutes
Bus average speed	10.22 km/hr
idle speed time to all working time ration	54 %
Total Bus fuel consumption over the period	1166 lit
Fuel consumption per hour	7.2 lit/hr
Average fuel consumption	0.70 lit/km
Total Bus additive consumption over the period	0.467 lit
Average additive consumption	281 cc/km
Additive consumption to fuel ration	400 cc/1000lit

## Temperature, Pressure and Engine Speed Overview

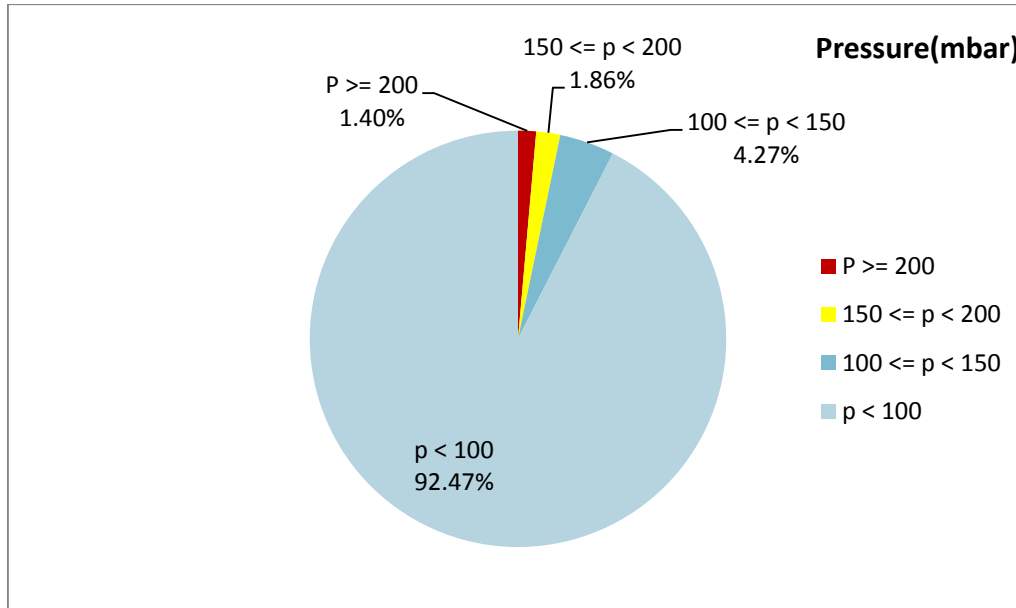


Figure 1- Pressure distribution over the working hours

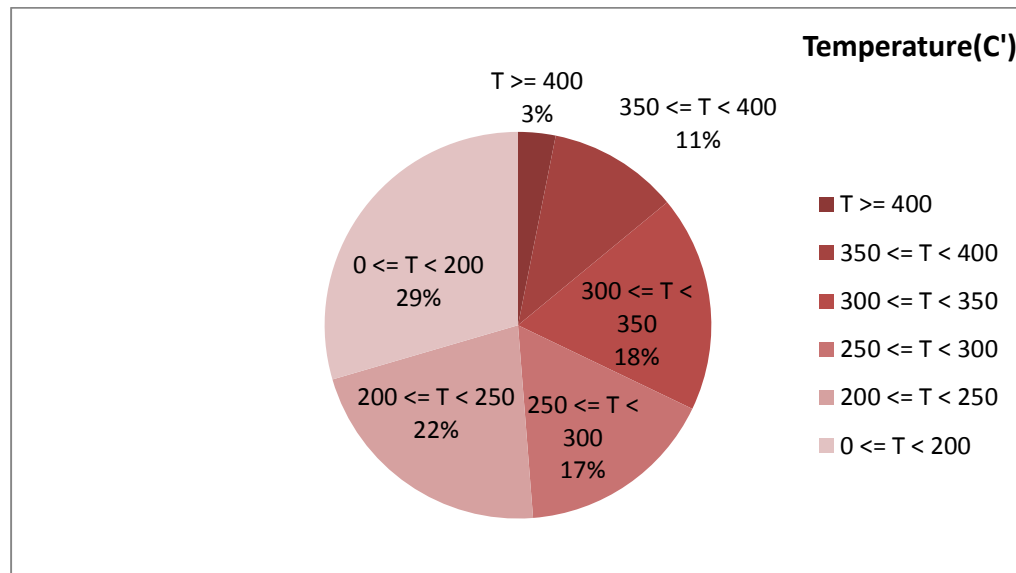


Figure 2-Temperature distribution over the working hours

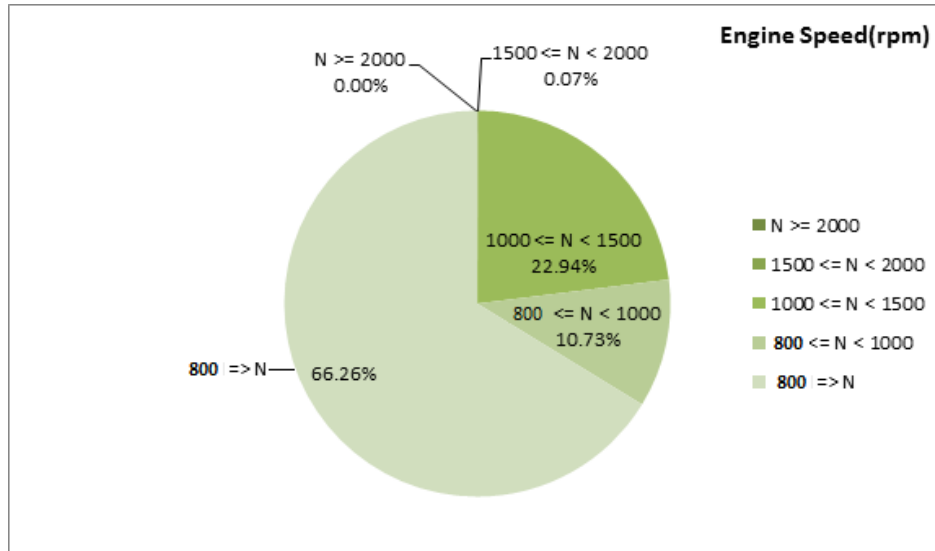


Figure 3- Engine speed distribution over the working hours

Table 4- Mean values

Mean temperature (C)	Mean pressure(mbar)	Mean engine speed(rpm)
249.78	32.06	800

Table 5- Mean values without idling

Mean temperature (C)	Mean pressure(mbar)	Mean engine speed(rpm)
275.25	46.15	980

Table 6- Max-min values

Max-min temperature(C)	Max-min pressure(mbar)	Max-min engine speed(rpm)
542-50	483-0	1776-32

## Detailed Pressure Analysis

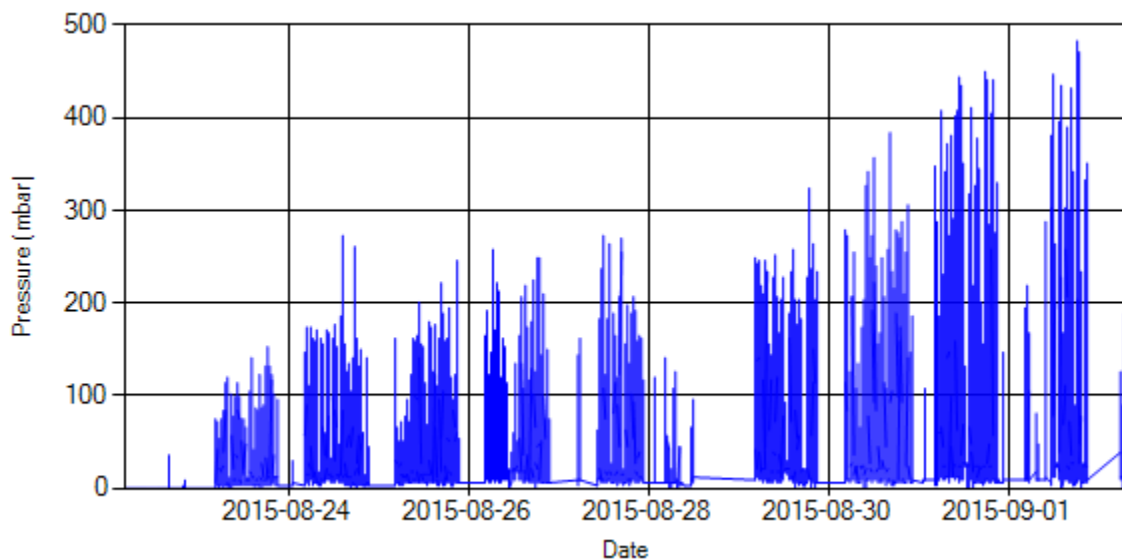


Figure 4- Pressure distribution over the period

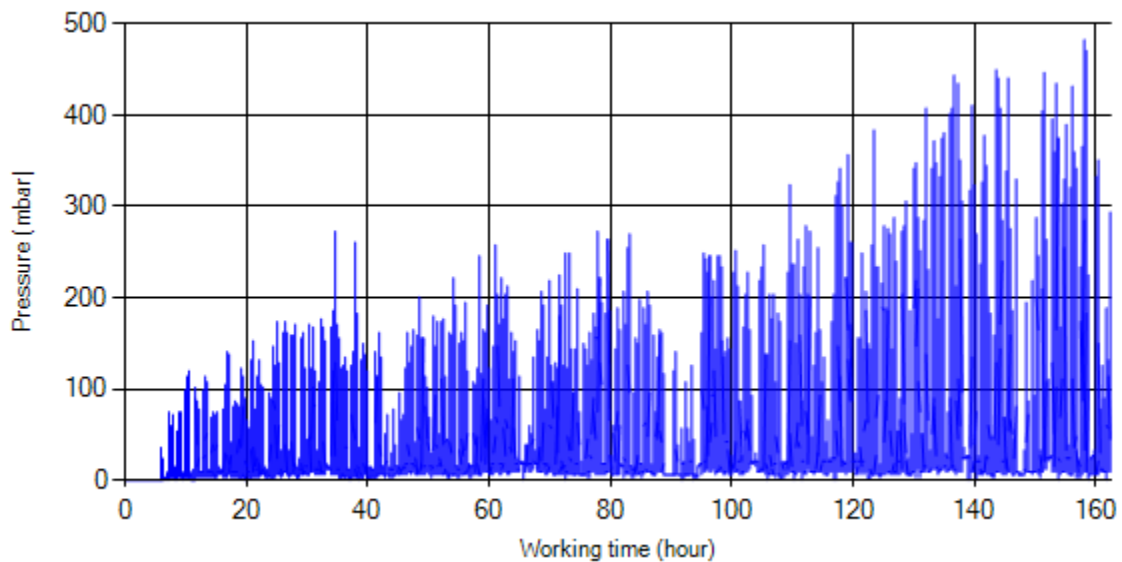


Figure 5- Pressure vs. working hours

Notice: backpressure distribution was shown into two diagrams. As obvious in figure 5, stop-working periods were eliminated and pressure was displayed along working hours.

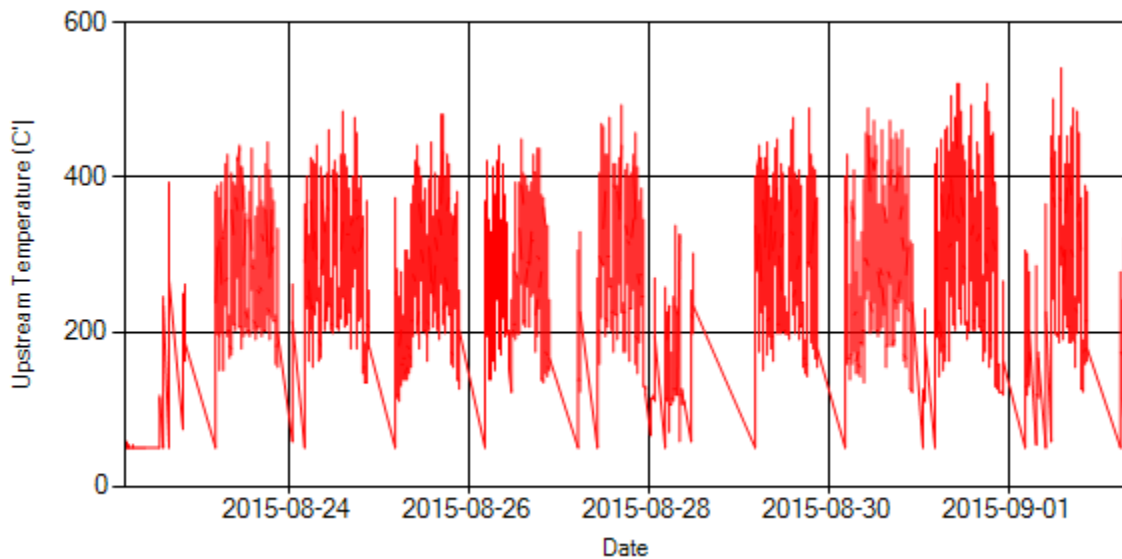
Notice: For getting more information about pressure distribution and DPF loading rate table 7 can be useable.

*Table 7. Pressure Statistics*

Date	P-Average(mbar)	P>150 mbar	P>200 mbar	P>300 mbar	P-max(mbar)
08/23	18.13	0.03%	0.00%	0.00%	153
08/24	27.08	0.75%	0.05%	0.00%	273
08/25	26.58	0.64%	0.11%	0.00%	264
08/26	31.99	1.15%	0.25%	0.00%	258
08/27	34.66	1.19%	0.39%	0.00%	273
08/28	-	-	-	-	-
08/29	40.24	3.17%	0.98%	0.02%	324
08/30	44.46	5.3%	1.96%	0.11%	384
08/31	53.15	10.03%	5.58%	1.22%	450
09/01	47.47	8.18%	4.87%	1.21%	483

Notice: 08/28 was stop day.

### Detailed Temperature Analysis



*Figure 6- Temperature distribution over the period*

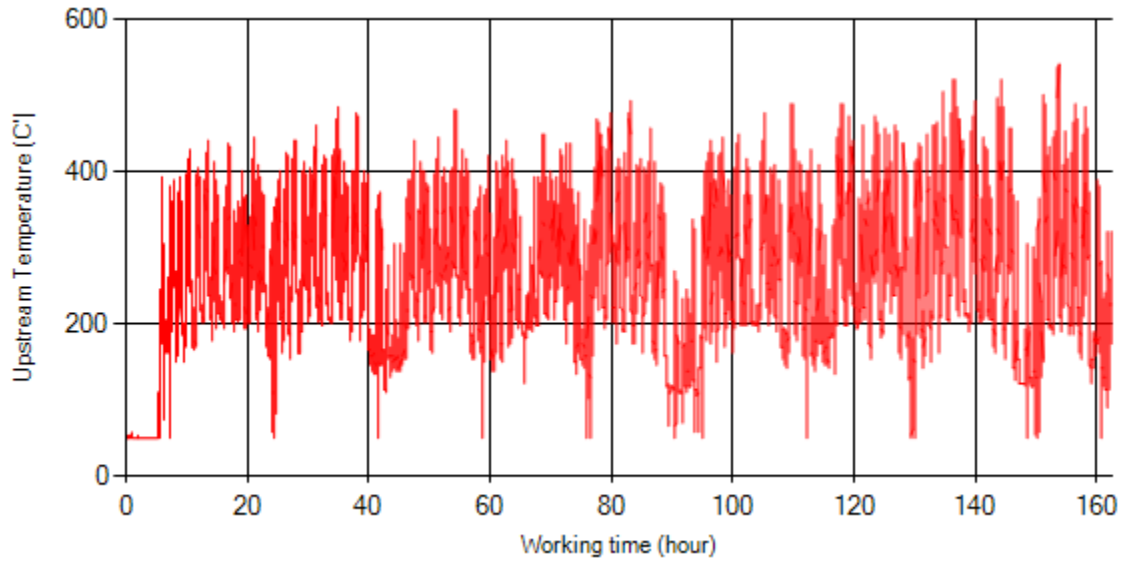


Figure 7- Temperature vs. working hours

### Engine Speed Diagrams

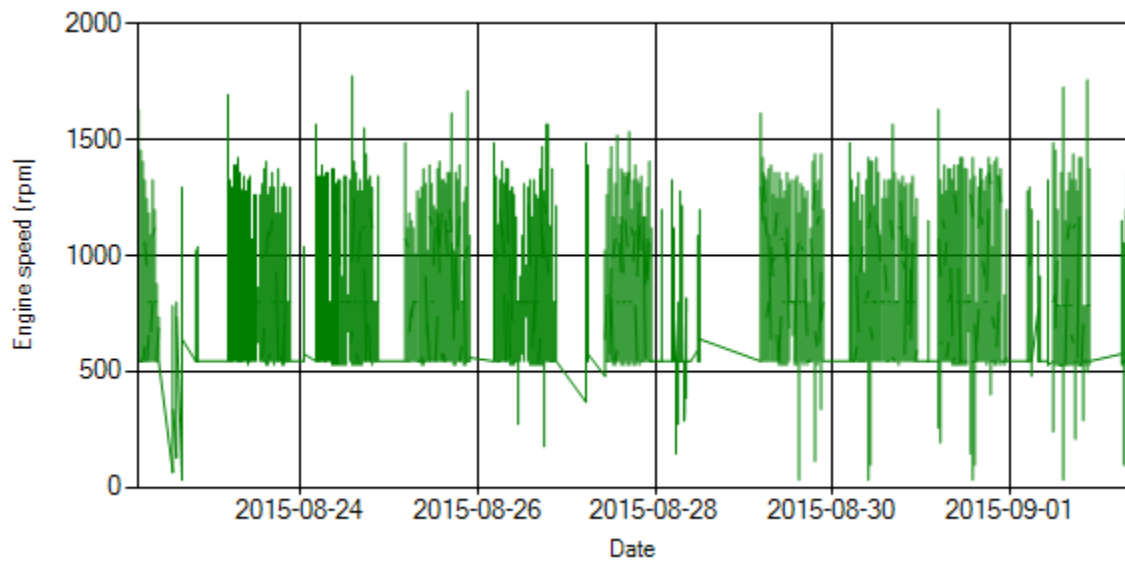


Figure 8- Engine speed distribution over the period

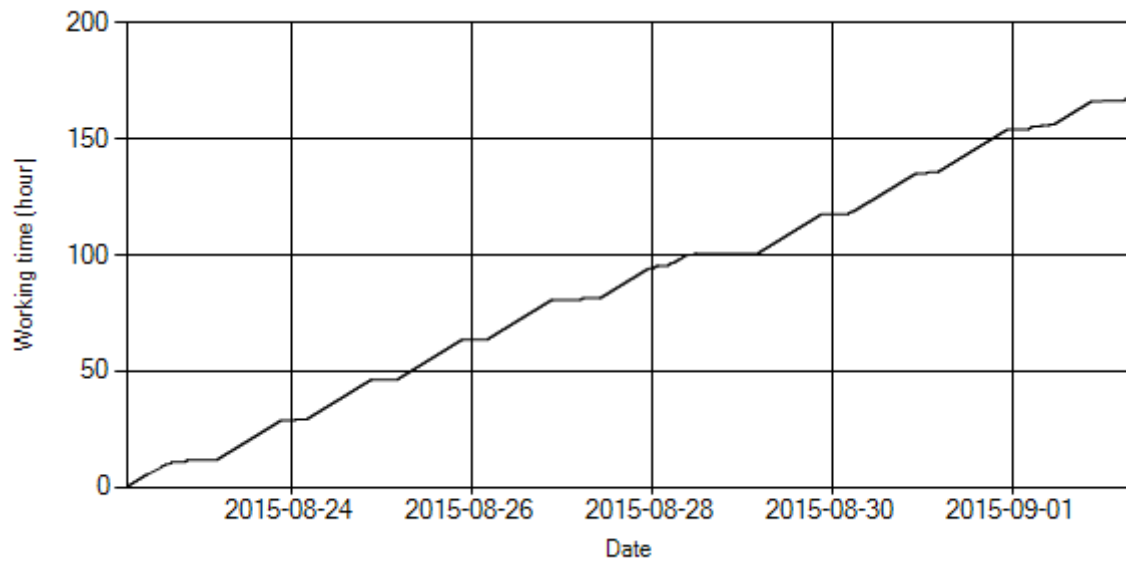


Figure 9- Time diagram for calculating CPK's working days

Notice: Data logger sampling time can be calculated from Figure 12. The lines parallel with Date axis show days without data logger data. As depicted in the picture, Aug 28<sup>th</sup> was stop day.

### Pressure-Engine Speed diagrams

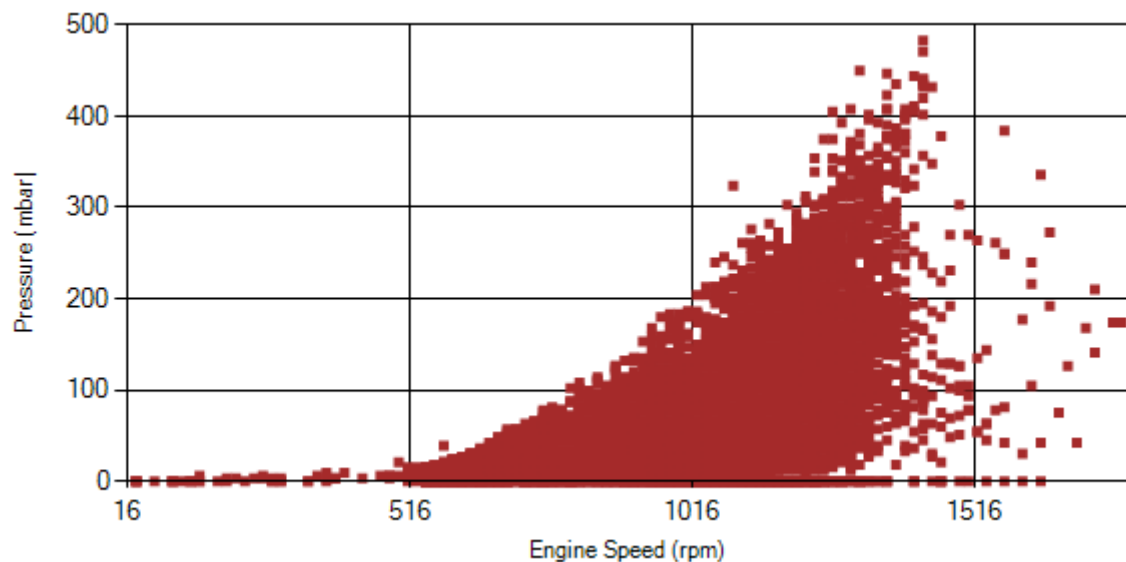


Figure 10- Pressure against engine speed



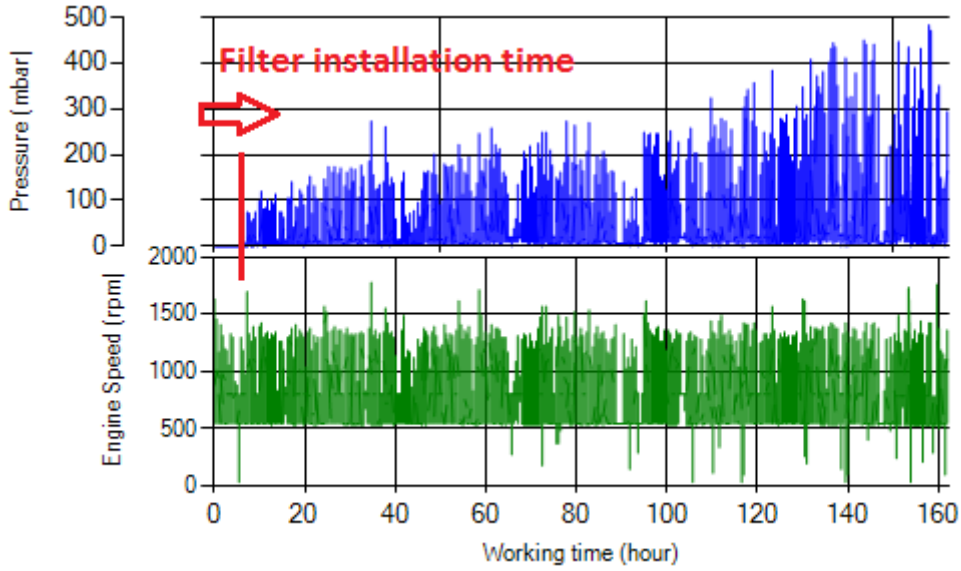


Figure 11- P, N distribution vs. working hours

### Temperature-Engine Speed diagrams

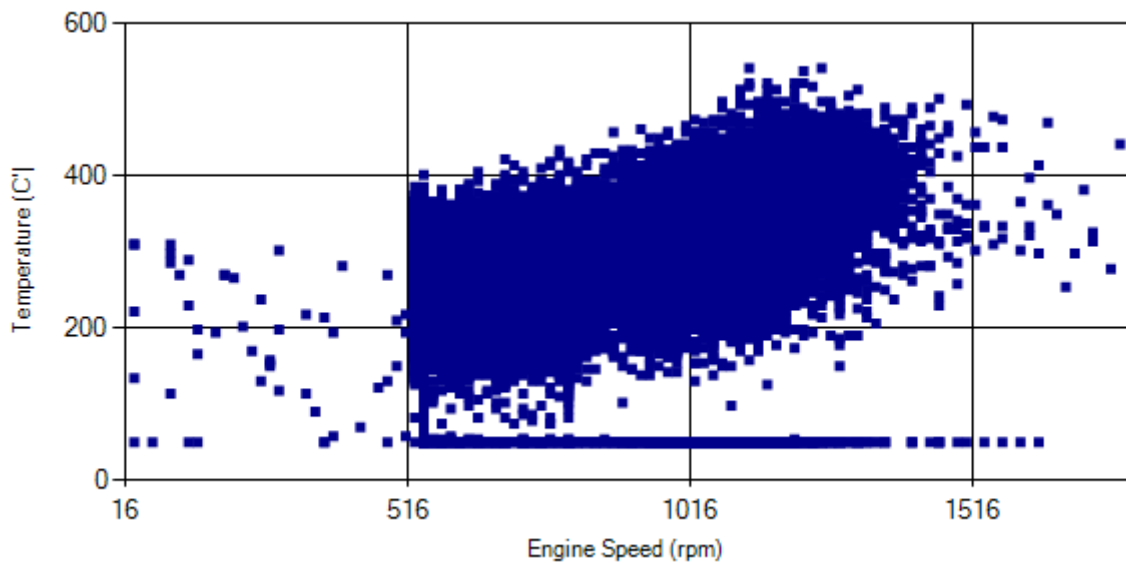


Figure 12- Temperature against engine speed

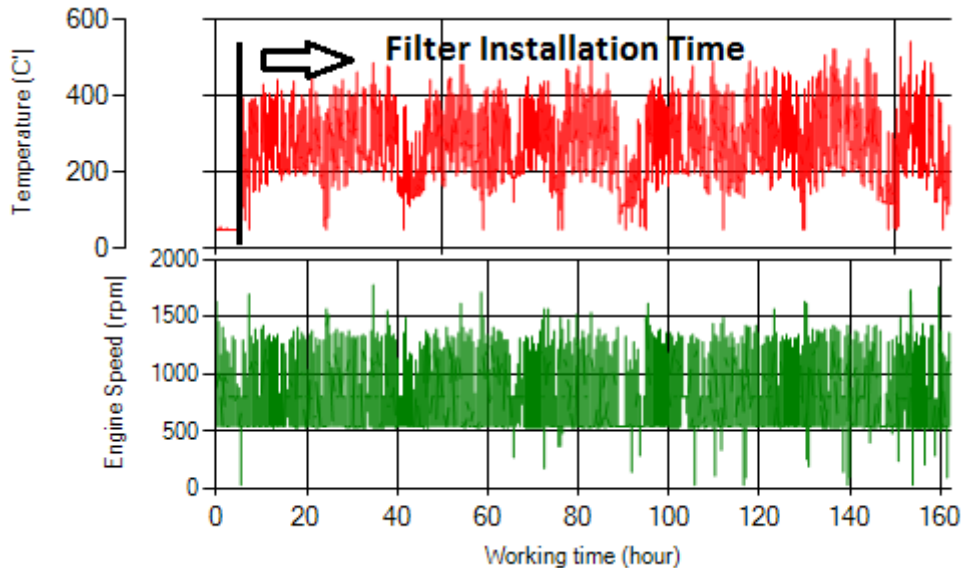


Figure 13- T, N distribution vs. working hours

### Filter Operation Analysis

- As depicted in figure 1, 1.14% of total working time pressure is above 200 mbar and 3.26% above 150mbar.
- Figure 2 displays flow temperature before the DPF. It can be obviously observed that 3% of total working time temperature is above 400 °C. Considering temperature distribution of this line's buses ( $T_{400} \ll 1\%$ ), it is clear this distribution was because of high back pressure.
- According to table 7 data and considering only 9 days working from installation day and bus company's warning about engine performance, vehicle was stopped on Sep 2<sup>nd</sup>. This result was obtained from system checking on Sep 2<sup>nd</sup> and 3<sup>rd</sup>:
  - 1- Due to increasing back pressure engine worked at very bad mood. (abnormal engine noise)
  - 2- DPF was fully plugged and some black smoke was detected from joints.
- Pressure test was done on low, medium and high idle speed. Following pictures show the outcomes.

Engine Speed	Pressure
Low Idle (550 rpm)	72 mbar
Medium Idle (1000 rpm)	450 mbar
High Idle (1500 rpm)	600 mbar



Figure 14. Low Idle  
(N=550 rpm)



Figure 15. Medium Idle  
(N=1000 rpm)



Figure 16. High Idle  
(N=1500 rpm)

- After data analysis during period and considering final pressure test, DPF was removed and cleaned on Sep 4<sup>th</sup>.



Figure 17. Before cleaning



Figure 18. After Cleaning

Filter operation status	Excellent <input type="checkbox"/>	Good <input type="checkbox"/>
	Maintenance required <input checked="" type="checkbox"/>	Failed <input type="checkbox"/>

- **Notice:** DPF was cleaned on Sep 4<sup>th</sup> but was not installed on bus.