

Diesel Particulate Filters' Feasibility Study Report

Report's Period:

2015/10/01 - 2015/10/31

Tehran - Iran



شرکت کنترل کیفیت هوا
وابسته به شهرداری تهران



معاونت حمل و
نقل و ترافیک
شهرداری تهران
دفتر محیط زیست



هسته پژوهشی سوخت،
احتراق و آلودگی



Abstract

Iran's big cities air pollution is one of the major challenges to authorities in view of public health. Tehran City, with about 12 Million resident, has been facing more and more air quality problems over the last decade. The criteria pollutants in Tehran are PM_{2.5}, PM₁₀ and NO₂. Particulates and especially ultrafine particles have been identified as the most toxic component of the polluting mixture. Considering diesel engine operation concepts, these types of engines are one of the main source emission of ultrafine particles in urban areas. So controlling particulates emitted from these sources, is one of the first steps to improve air quality. Diesel Particulate Filters (DPFs) are well-known and effective way to reduce particles number and mass. Lately, the Iranian government decided to legislate DPF installation for High Duty diesel Vehicles (HDV). Both, national and international engine industries and experts are now challenged to comply according to the new upcoming standards.

Tehran city bus Company with more than 3500 diesel engine buses is one of the organization that can play important role in improving air quality. In January 2014, the City Council of Tehran decided to order the retrofit of the public bus fleet of the capital. So DPFs' feasibility study project is organized by Tehran Air Quality Control Company (AQCC). The project consists of two phases. Phase 1 is particle filter tests on engine lab was provided in Tabriz for approval of DPFs in Iran. During this phase different types of DPFs from various companies were tested according to VTF1¹ test procedure, by FCE² under supervision of VERT association. Table 1 gives some information about phase 1.

Table 1. Phase 1 test procedures

Task Master	AQCC	
Executer	FCE	
Adviser	VERT	
Test Process	Evaluated data	Measurements devices
Engine baseline test – 4PTS³	<ul style="list-style-type: none"> Exhaust Gas mixture. emitted PM, PN during test points 	<ul style="list-style-type: none"> MRU (Gas Analyzer) NM3 (Particle counter)
Engine Equipped with DPF	<ul style="list-style-type: none"> Temperature and pressure analysis 	<ul style="list-style-type: none"> AVL sampling unit (particle mass)

¹ . VERT filtration test

² . Fuel ,Combustion and Emissions group

³ . Stationary 4-points-test cycle

Regeneration test	before and after DPF	collector) <ul style="list-style-type: none"> Pressure and Temperature sensors
PM and PN efficiency test		

After analyzing phase 1 results, approved DPFs were sent to Tehran, for fieldwork tests. 18 BRT⁴ from different lines with various working paths, were selected and equipped with data logger by ASA⁵ Company. By the time, 8 DPFs were installed on these samples and their data have been collected and analyzed from installation date. Analyzed data were published as monthly reports, including separated reports for first and second half of the months, and specified DPFs' operation status. Table 2 shows summary information about installed DPFs until 31/Oct/2015.

Table 2. Installed DPFs

DPF Producer Company	Operation Report			Maintenance and Cleaning History
	Installation date	Working days	Bus mileage	
HJS_01 (Passive system with FBC) V. ID: 78514 (line 4)	10/Sep/2014	416 days	65320 km	DPF core was cleaned on Jun 13th after about 36000 km for the first time.
Dinex_01 (Passive system with FBC) V. ID: 78515 (line 4)	22/Oct/2014	375 days	49616 km	Filter core was changed on Feb 15th after 13253 km working. (High K-value and low additive dosage were reasons of the early cleaning.)

⁴ . Bus rapid transient

⁵ . Azmoon Sanat Arvin

<p>PURItch (Passive system with FBC) V. ID: 78524 (line 4)</p>	<p>28/Jan/2015</p>	<p>277 days</p>	<p>43202 km</p>	<p>DPF core was cleaned on Aug 12th after about 26500 km, for the first time. DPF was replaced with muffler on Sep 16th due to isolation problems and will be reinstalled as soon as possible.</p>
<p>HJS_02 (Active system with FBC - Electrical Heater) V.ID: 85423 (line 4)</p>	<p>19/Feb/2015</p>	<p>255 days</p>	<p>42233 km</p>	<p>DPF has been working from installation date until now without any cleaning.</p>
<p>HJS_03 (Active system with FBC - Electrical Heater) V.ID: 33572 (line 2)</p>	<p>19/Feb/2015</p>	<p>255 days</p>	<p>34511 km</p>	<p>DPF core was cleaned on Oct 5th after about 30801 km, for the first time.</p>
<p>HJS_04 (Passive system with FBC) V.ID:85476 (line 10)</p>	<p>23/Feb/2015</p>	<p>251 days</p>	<p>38447 km</p>	<p>DPF was cleaned on Jul 22nd after 23644 km for the first time.</p>
<p>Dinex_02 (Passive system with FBC) V.ID: 33637 (line 2)</p>	<p>02/Jun/2015</p>	<p>This system works with DPF only for 21 days.</p>	<p>-</p>	<p>DPF had been removed after two weeks working on Jun 17th. After receiving cleaning machine, DPF was cleaned on Aug 10th and installed on Aug 22nd but worked only for ten days. The last cleaning was done on Sep 24th but cleaning issue was unavoidable after only three days working. Finally DPF was replaced by muffler on Sep 8th and system has been working from that date without DPF.</p>

Tehag_01 (Catalyzed DPF) V.ID: 85182 (line 2)	24/Sep/2015	38 days	3771 km	DPF has been working from installation date until now without any cleaning.
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Table 3 represents DPFs' operation status during October. DPFs detailed information could be found in the next section.

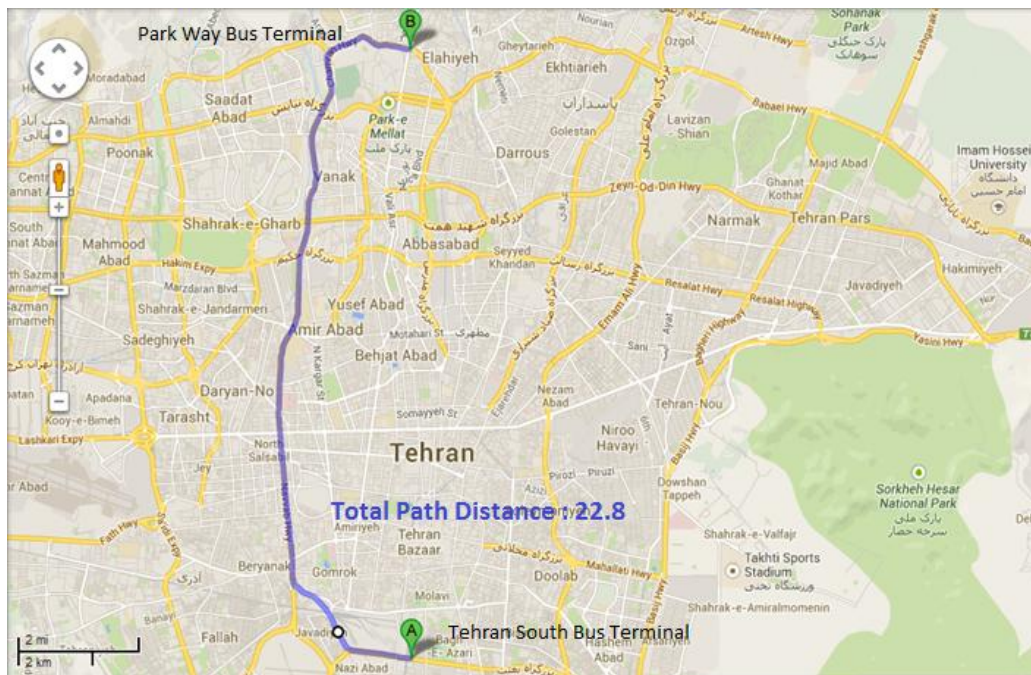
Table 3. DPFs' operation status during Oct

Vehicle ID	DPF Producer Company	Operation Status	
		Oct/01/2015 - Oct/15/2015	Oct/16/2015 - Oct/31/2015
78514 (line 4)	HJS_01	1	1
85423 (line 4)	HJS_02	1	1
78515 (line 4)	Dinex_01	6	6
78524 (line 4)	PURltech	5	5
33572 (line 2)	HJS_03	1	1
33637 (line 2)	Dinex_02	5	5
85476 (line 10)	HJS_04	2	2
85182 (line 10)	Tehag_01	1	1

Status Number	Operation Status	Description
1	Excellent	Pressure above 200 mbar<0.1% (P200~0)

2	Good	$0.1\% \leq P_{200} \leq 3\%$
3	Maintenance required	$P_{200} > 3\%$ or DPF system blocking
4	Failed	DPF defect, black smoke, holes in the filter element
5	NO DPF	DPF was removed for cleaning or other issues
6	Bus was stationary	Bus related problems

Vehicle plate number	78514
Bus line	Number 4 (south to north bus line)
DPF producer company	HJS_01 (Passive system with FBC)



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Overall Information

Table1- Overall Information

Vehicle plate number	78514
CPK data logger number	LN: 001496, DN: 1914, Sim +989218355923
Bus line	Number 4 (south to north bus line)
Bus Terminals	Tehran South Bus Terminal - Park Way Bus Terminal
Total path distance	22.8 km
DPF producer company	HJS_01 (Passive system with FBC)
Installation date	10/Sep/2014
Report period	01/Oct/2015 – 15/Oct/2015 (fifteen days)
K value - DPF upstream	1.70 [1/m]
K value – DPF downstream	0.02 [1/m]

Table 2- DPF Maintenance History

Filter maintenance date	DPF core was cleaned on Jun 13 th .
Dosing status	Dosing value has been kept constant from installation date until now.

Table 3- Fuel and Additive Consumption Information

Bus mileage (from DPF installation date)	62274 km
Bus mileage over the period	2469 km
Working days over the period	13 days
Stop days	2 days
Data logger working days	13 days
Working hours over the period	177 hours 10 minutes
Average working hours per day (including stop days)	11 hours 48 minutes
Bus average speed	13.94 km/hr
idle speed time to all working time ration	41.04 %
Total Bus fuel consumption over the period	1356 lit
Fuel consumption per hour	7.65 lit/hr
Average fuel consumption	0.55 lit/km
Total Bus additive consumption over the period	0.570 lit
Average additive consumption	230 cc/km
Additive consumption to fuel ration	420 cc/1000lit

Temperature, Pressure and Engine Speed Overview

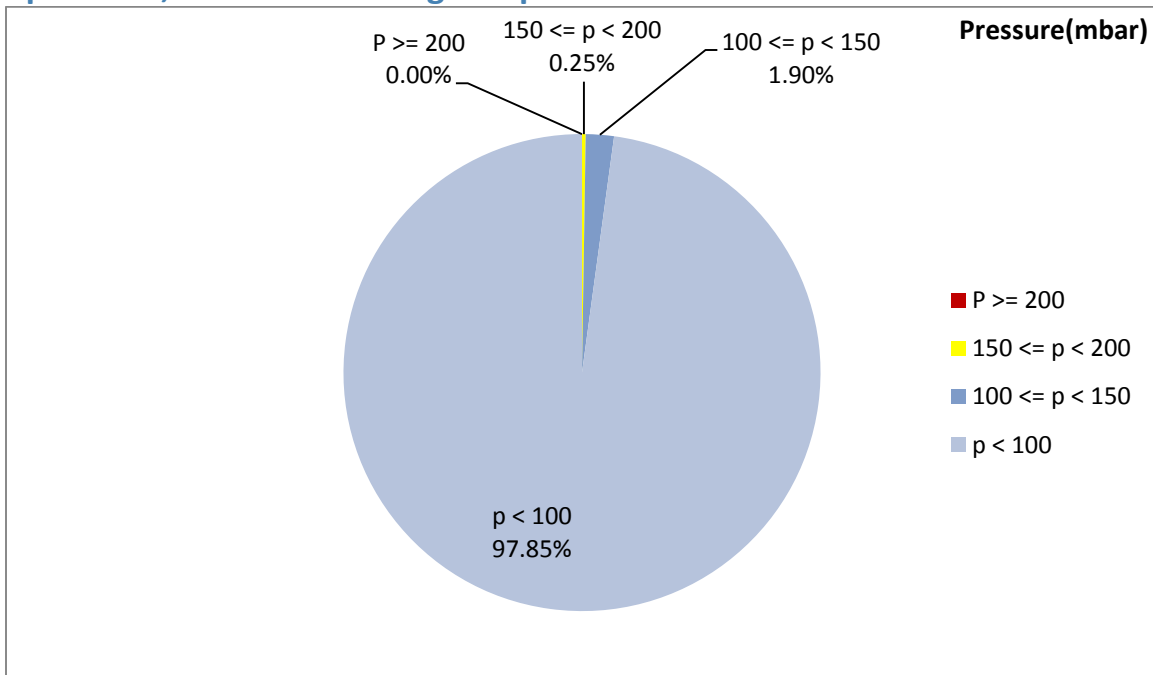


Figure 1- Pressure distribution over the working hours

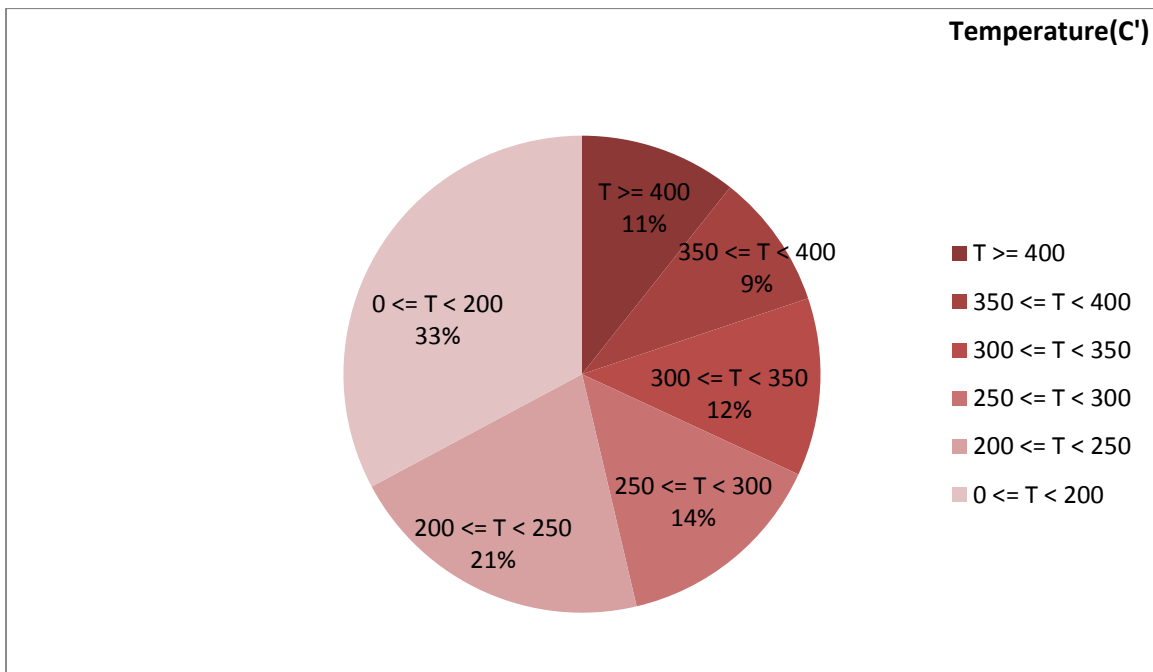


Figure 2-Temperature distribution over the working hours

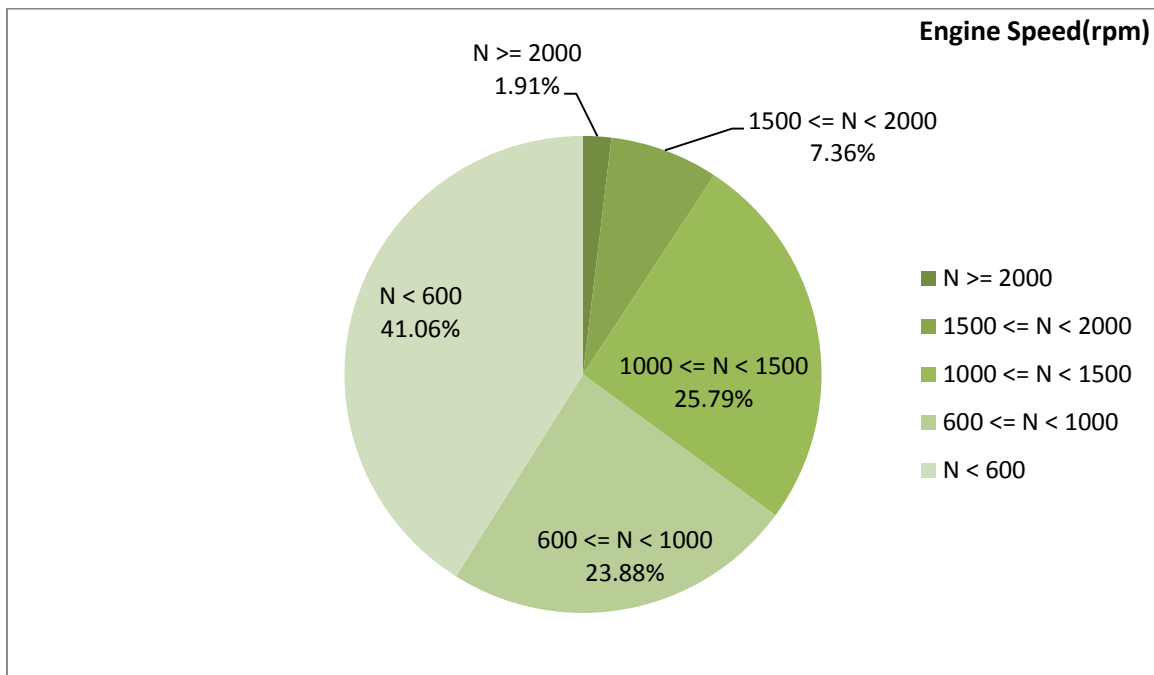


Figure 3- Engine speed distribution over the working hours

Table 4- Mean values

Mean temperature (C)	Mean pressure(mbar)	Mean engine speed(rpm)
258.47	17.25	894

Table 5- Mean values without idling

Mean temperature (C)	Mean pressure(mbar)	Mean engine speed(rpm)
296.96	26.59	1136

Table 6- Max-min values

Max-min temperature(C)	Max-min pressure(mbar)	Max-min engine speed(rpm)
538-50	174-0	2272-272

Detailed Pressure Analysis

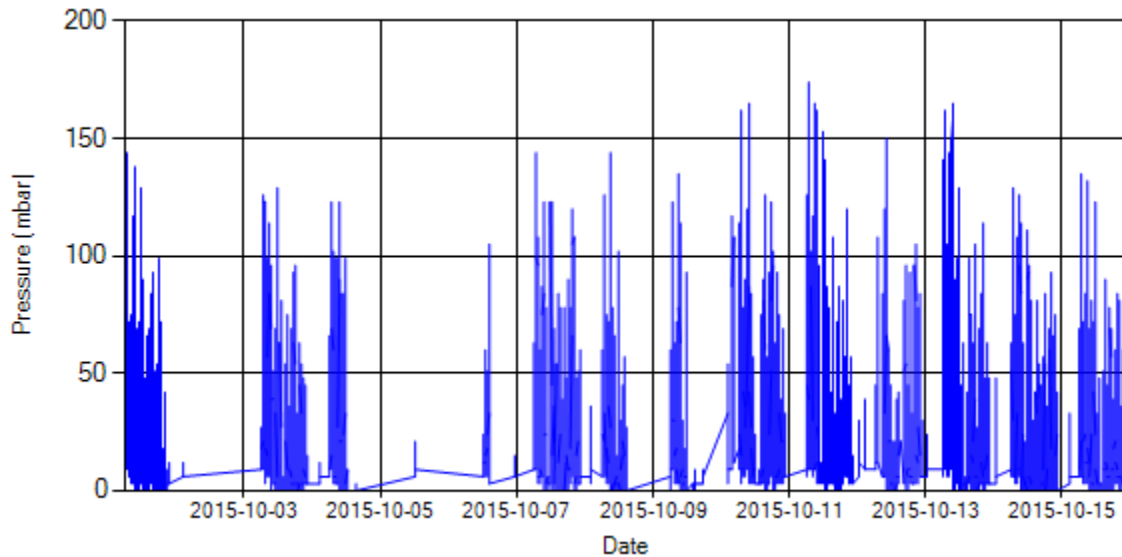


Figure 4- Pressure distribution over the period

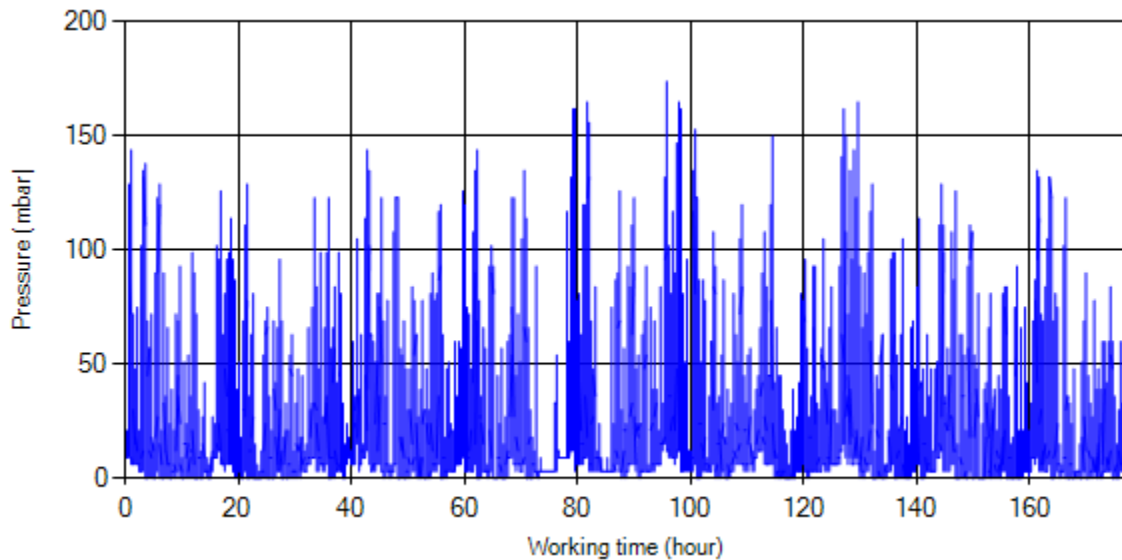


Figure 5- Pressure vs. working hours

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.

Detailed Temperature Analysis

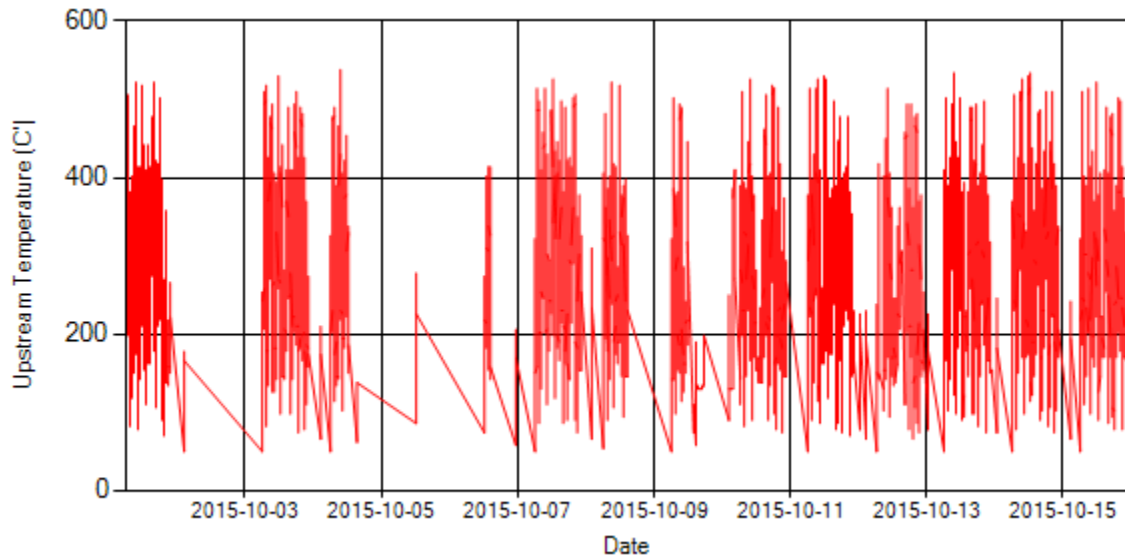


Figure 6- Temperature distribution over the period

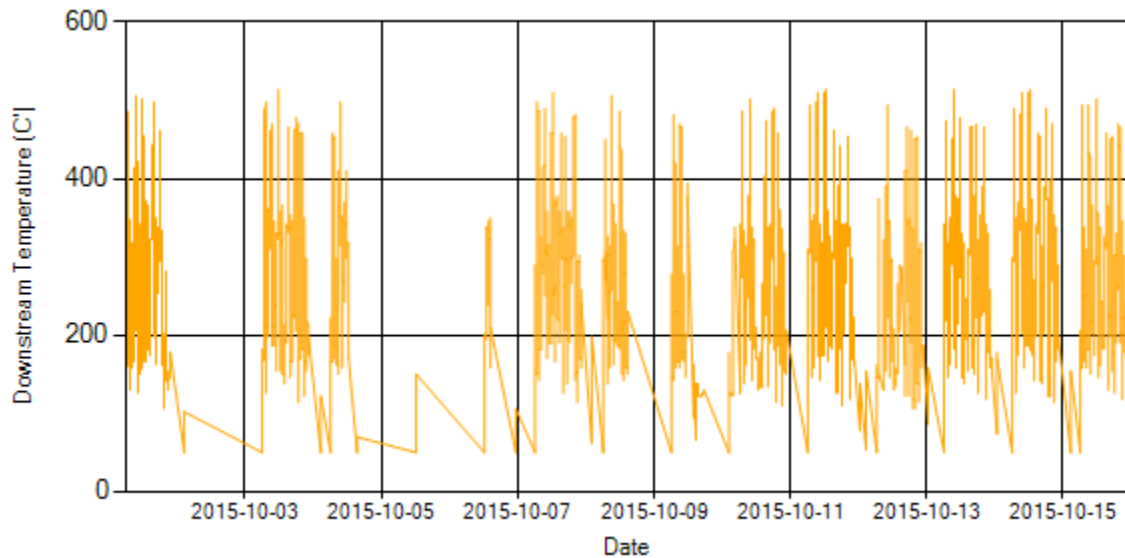


Figure 7- Temperature distribution over the period

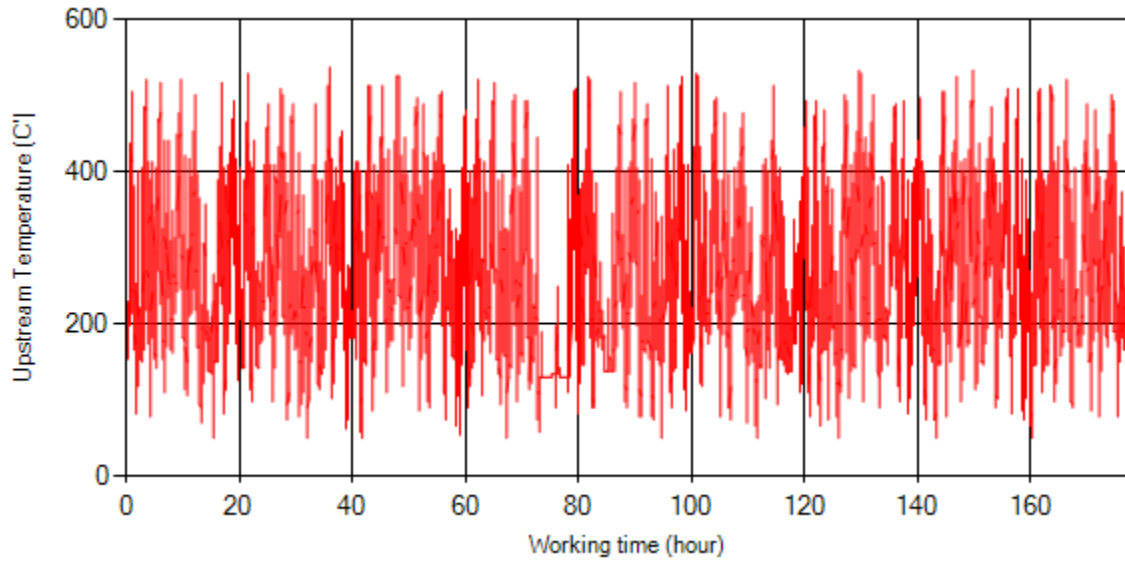


Figure 8- Temperature vs. working hours

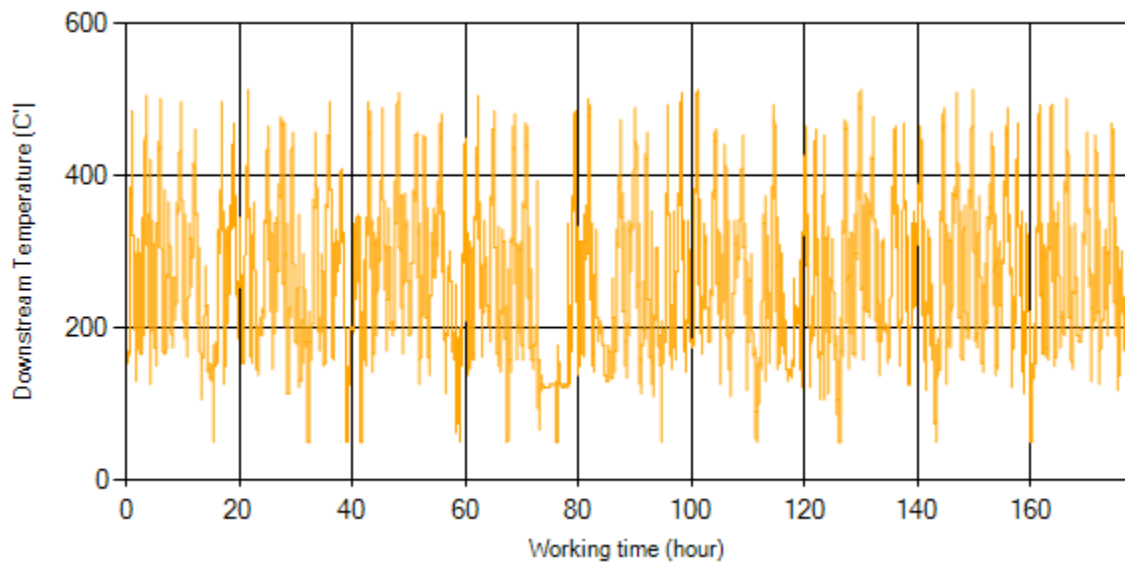


Figure 9- Temperature vs. working hours

Engine Speed Diagrams

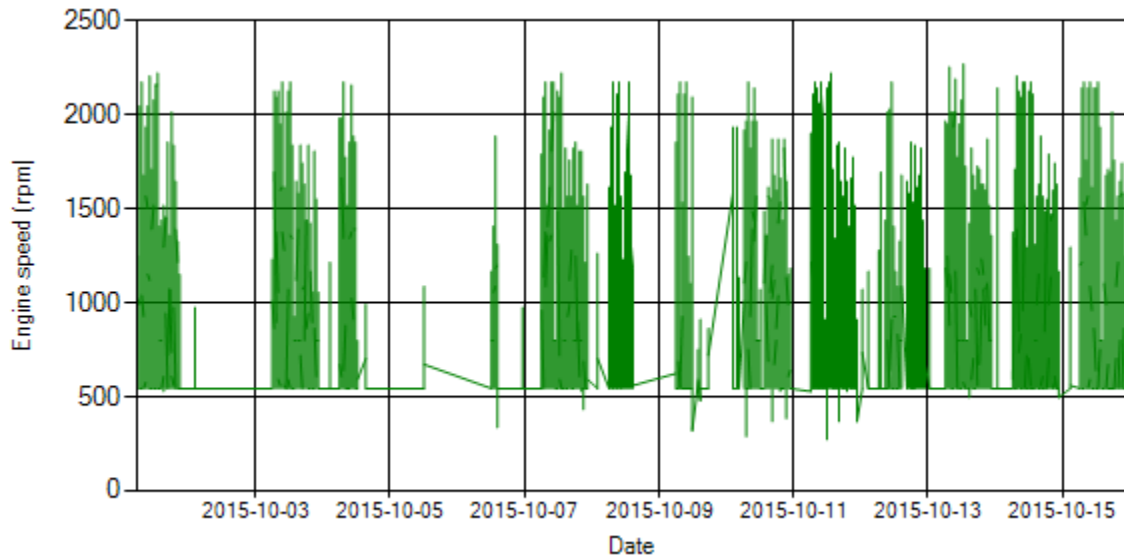


Figure 10- Engine speed distribution over the period

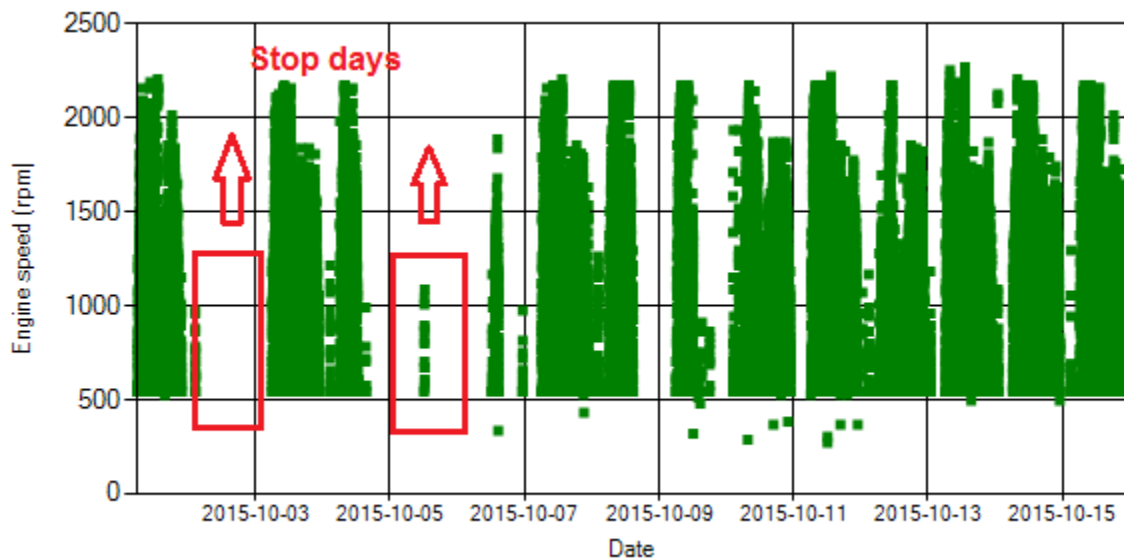


Figure 11- Engine speed diagram for calculating CPK's working days

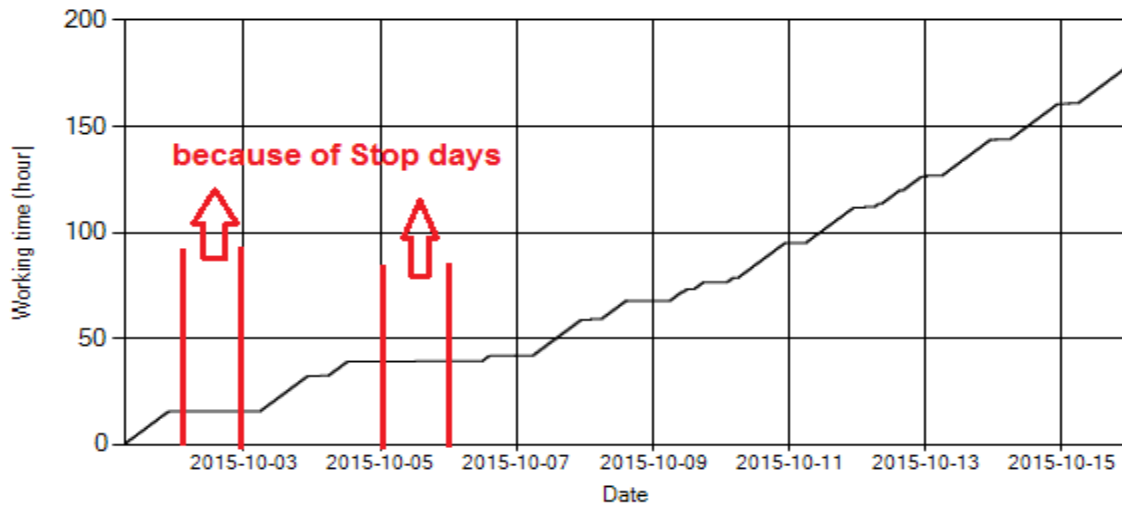


Figure 12- Time diagram for calculating CPK's working days

Notice: Data logger sampling time can be calculated from Figure 12. The lines parallel with Date axis show days without data logger data.

Pressure-Engine Speed diagrams

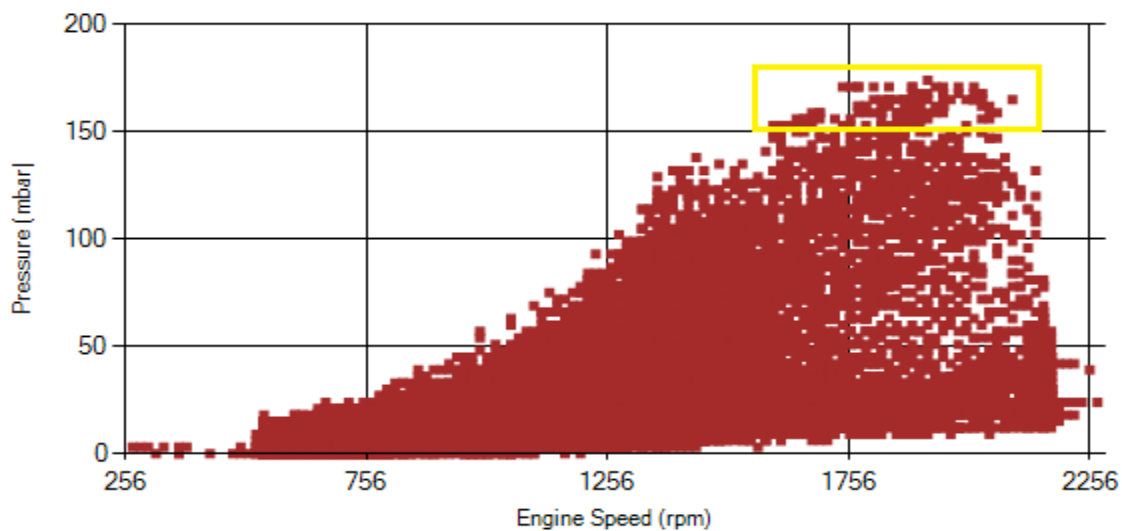


Figure 13- Pressure against engine speed

Notice: Yellow alarm ($200 > \text{pressure} > 150$) range was indicated in figure 13.

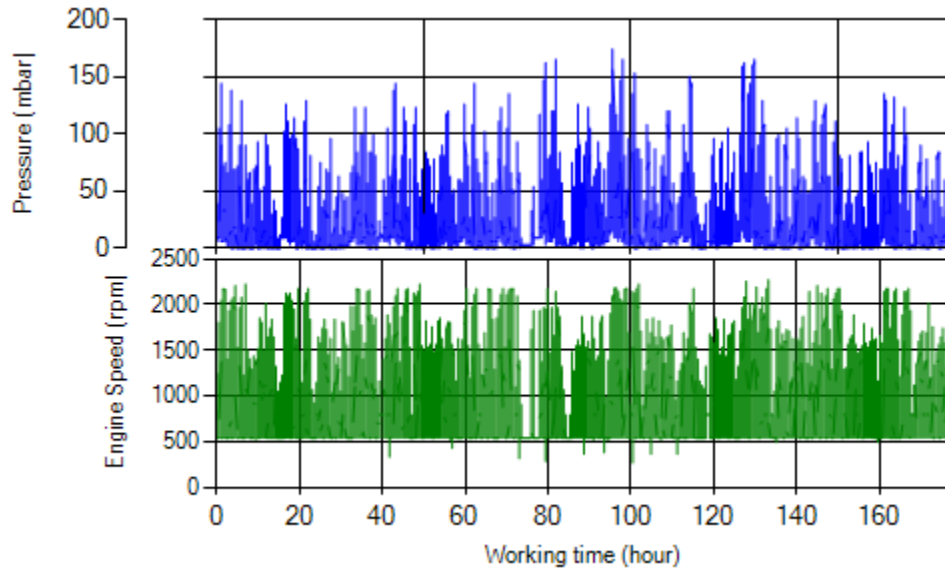


Figure 14- P, N distribution vs. working hours

Temperature-Engine Speed diagrams

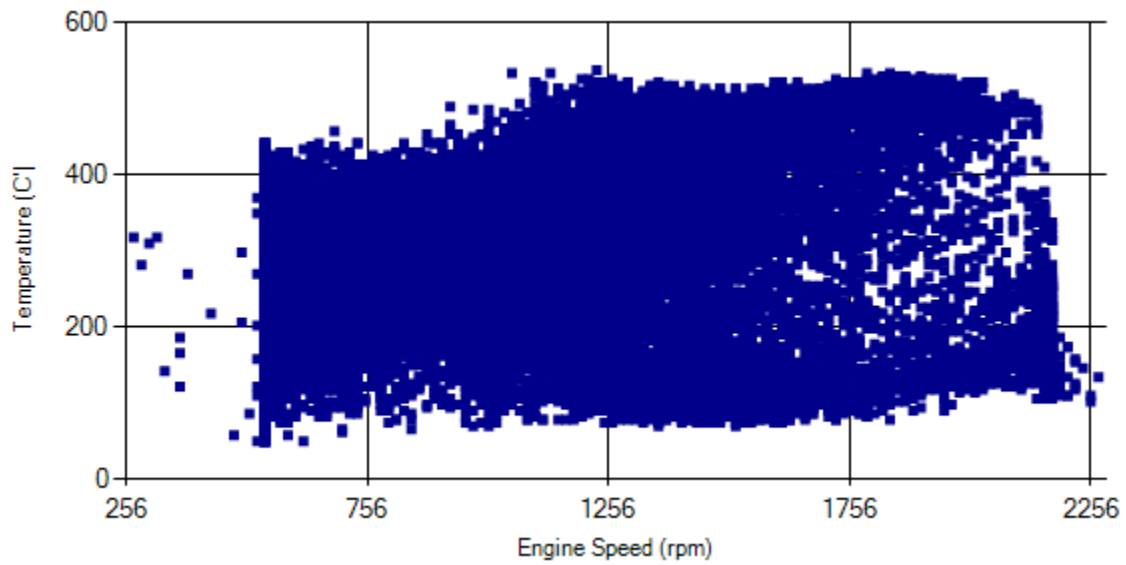


Figure 15- Temperature against engine speed

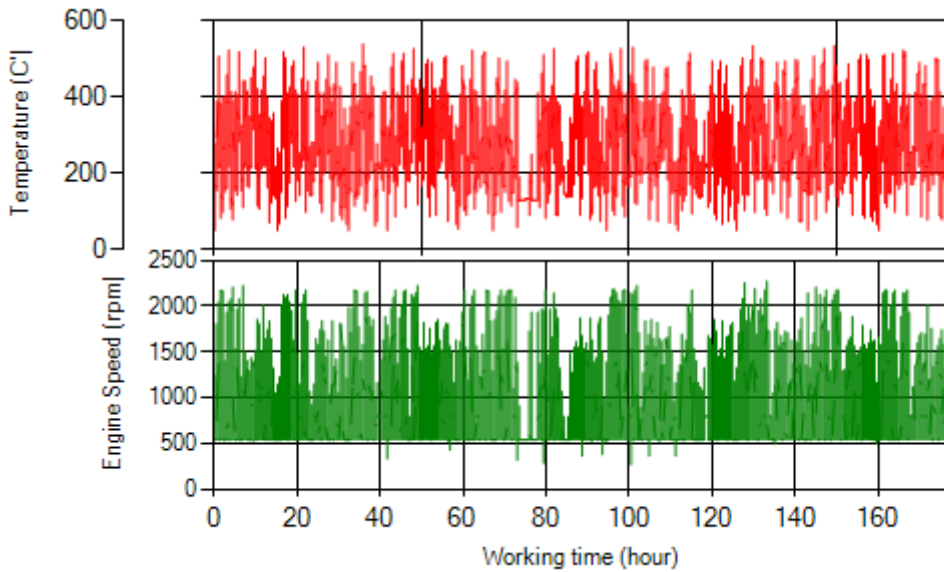


Figure 16- T, N distribution vs. working hours

Filter Operation Analysis

- As depicted in Figure 1, pressure above 200 couldn't be observed and only 0.25% of total working time pressure is above 150mbar.
- Figure 2 displays flow temperature before the DPF. It can be obviously observed that 11% of total working time temperature is above 400 °C and 20% above 350°C. This high temperature distribution is one of the important factors for filter excellent operation during the period.

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

Overall Information

Table1- Overall Information

Vehicle plate number	78514
CPK data logger number	LN: 001496, DN: 1914, Sim +989218355923
Bus line	Number 4 (south to north bus line)
Bus Terminals	Tehran South Bus Terminal - Park Way Bus Terminal
Total path distance	22.8 km
DPF producer company	HJS_01 (Passive system with FBC)
Installation date	10/Sep/2014
Report period	16/Oct/2015 – 31/Oct/2015 (sixteen days)
K value - DPF upstream	1.70 [1/m]
K value – DPF downstream	0.02 [1/m]

Table 2- DPF Maintenance History

Filter maintenance date	DPF core was cleaned on Jun 13 th .
Dosing status	Dosing value has been kept constant from installation date until now.

Table 3- Fuel and Additive Consumption Information

Bus mileage (from DPF installation date)	65320 km
Bus mileage over the period	3046 km
Working days over the period	13 days
Stop days	3 days
Data logger working days	13 days
Working hours over the period	219 hours 25 minutes
Average working hours per day (including stop days)	12 hours 54 minutes
Bus average speed	13.88 km/hr
idle speed time to all working time ration	49 %
Total Bus fuel consumption over the period	1611 lit
Fuel consumption per hour	7.34 lit/hr
Average fuel consumption	0.53 lit/km
Total Bus additive consumption over the period	0.693 lit
Average additive consumption	228 cc/km
Additive consumption to fuel ration	430 cc/1000lit

Temperature, Pressure and Engine Speed Overview

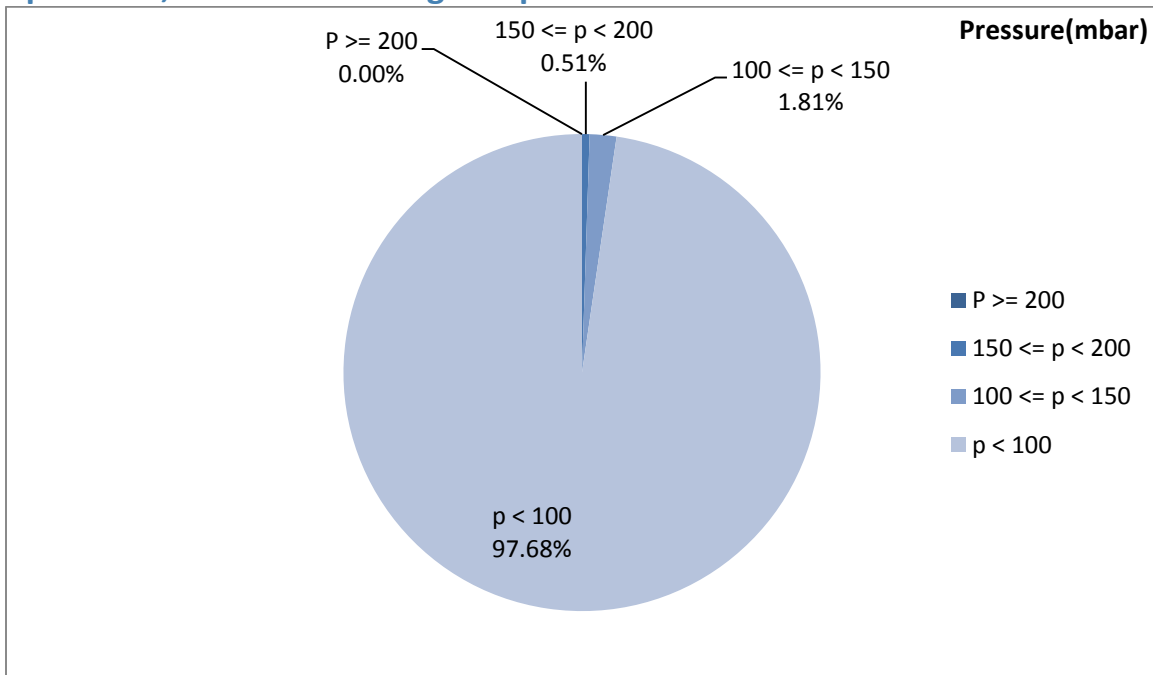


Figure 1- Pressure distribution over the working hours

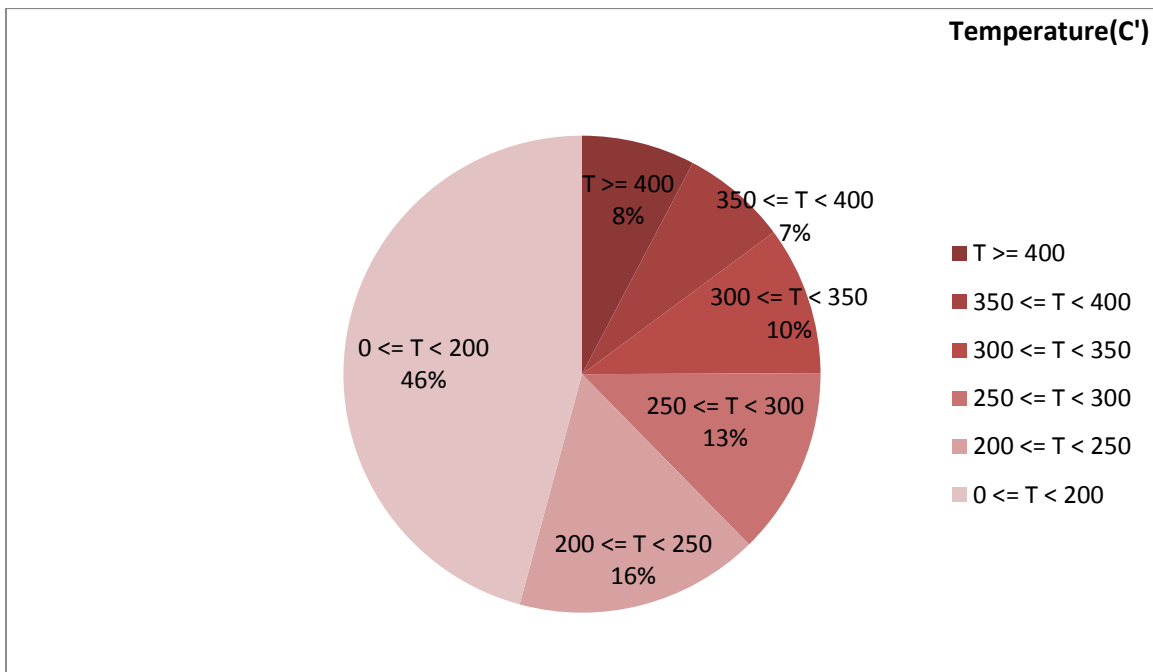


Figure 2-Temperature distribution over the working hours

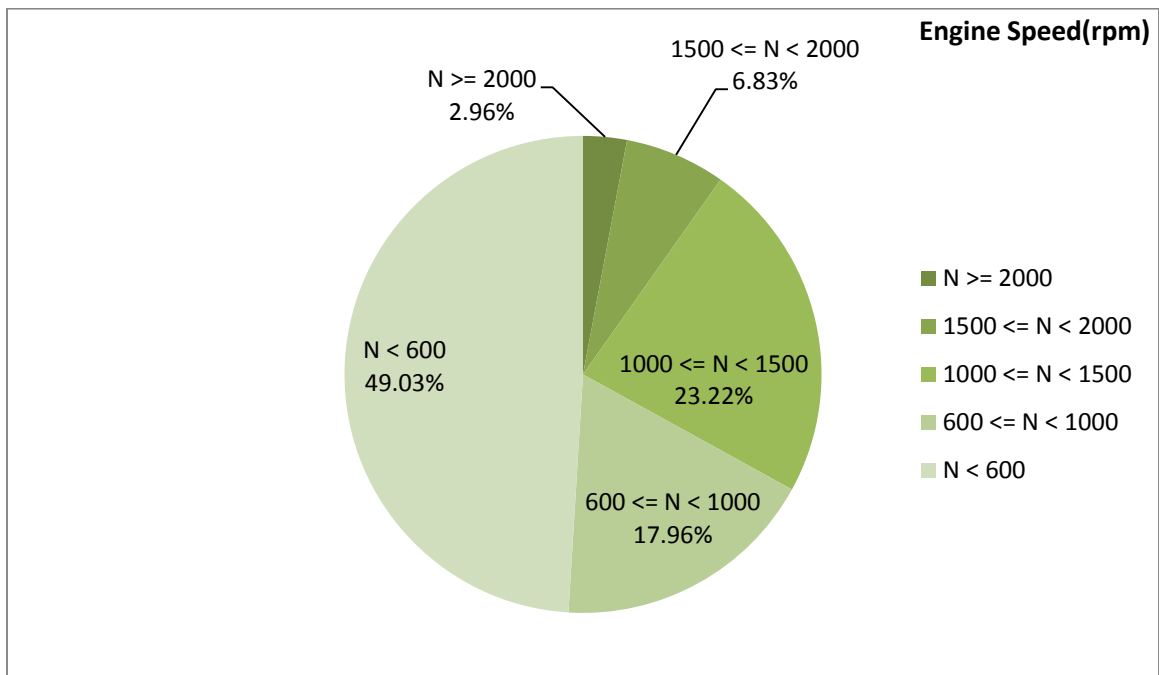


Figure 3- Engine speed distribution over the working hours

Table 4- Mean values

Mean temperature (C)	Mean pressure(mbar)	Mean engine speed(rpm)
234.97	17.05	872

Table 5- Mean values without idling

Mean temperature (C)	Mean pressure(mbar)	Mean engine speed(rpm)
286.8	29.49	1184

Table 6- Max-min values

Max-min temperature(C)	Max-min pressure(mbar)	Max-min engine speed(rpm)
534-50	204-0	2256-256

Detailed Pressure Analysis

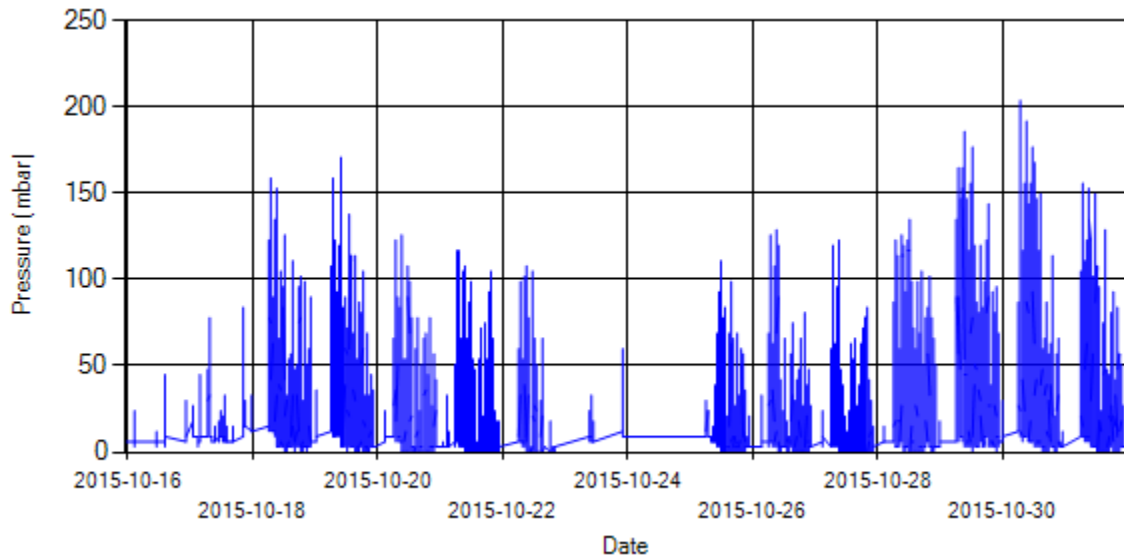


Figure 4- Pressure distribution over the period

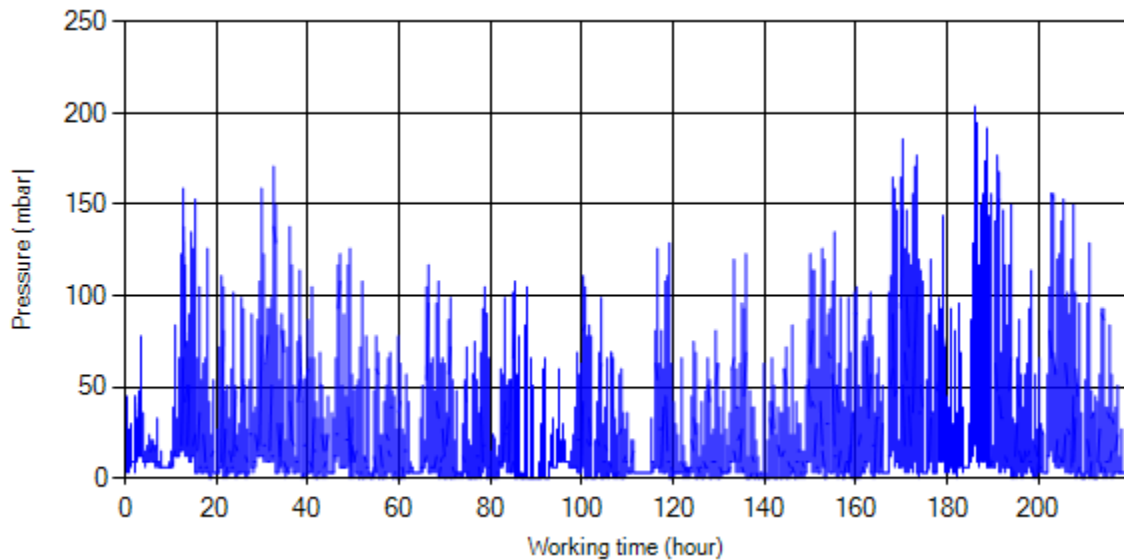


Figure 5- Pressure vs. working hours

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.

Detailed Temperature Analysis

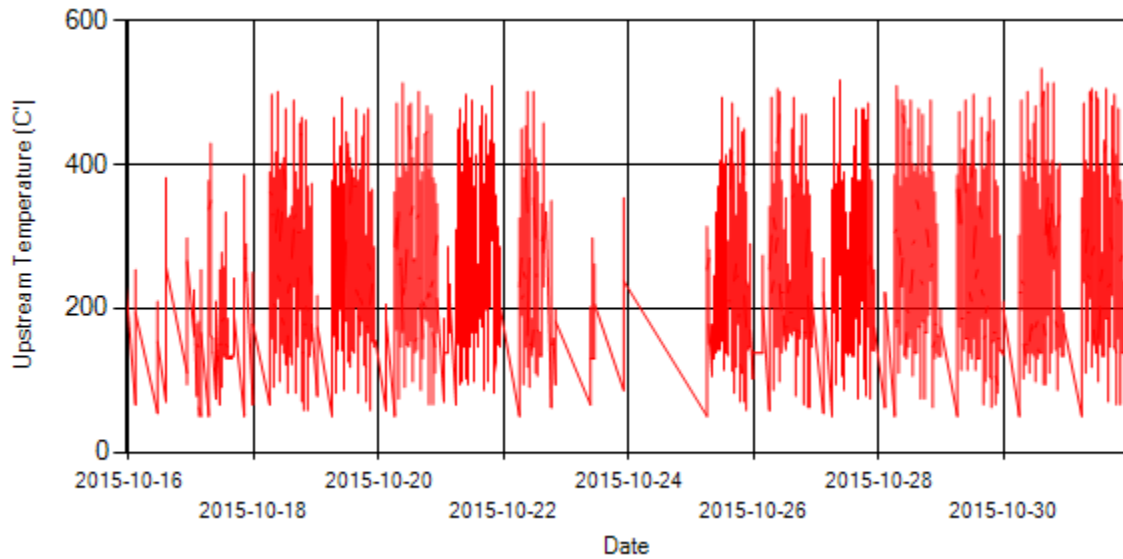


Figure 6- Temperature distribution over the period

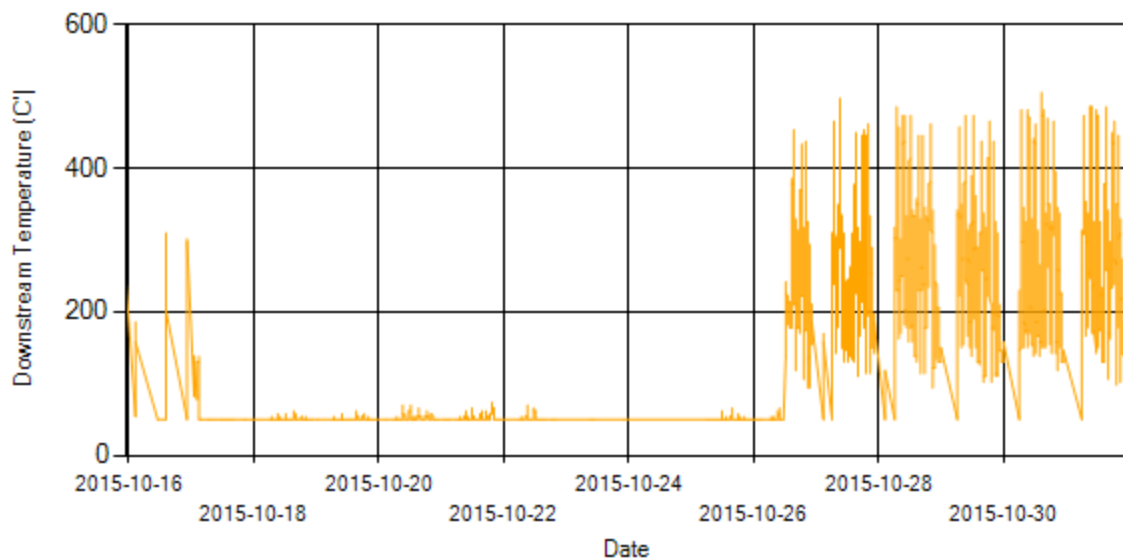


Figure 7- Temperature distribution over the period

Notice: Temp 2 sensor got problem on Nov 16th and was fixed on Nov 26th.

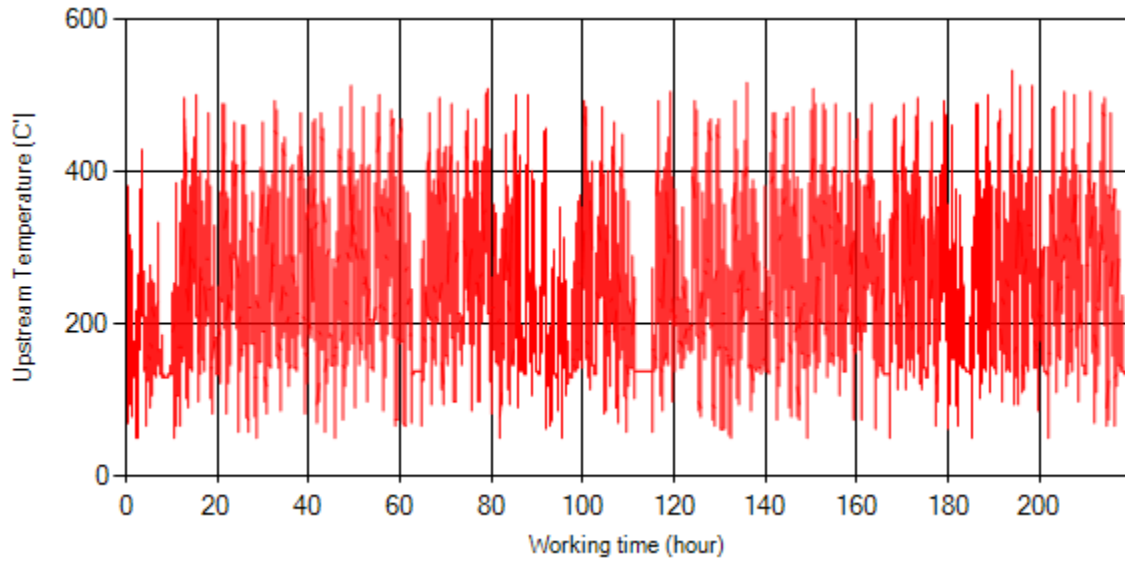


Figure 8- Temperature vs. working hours

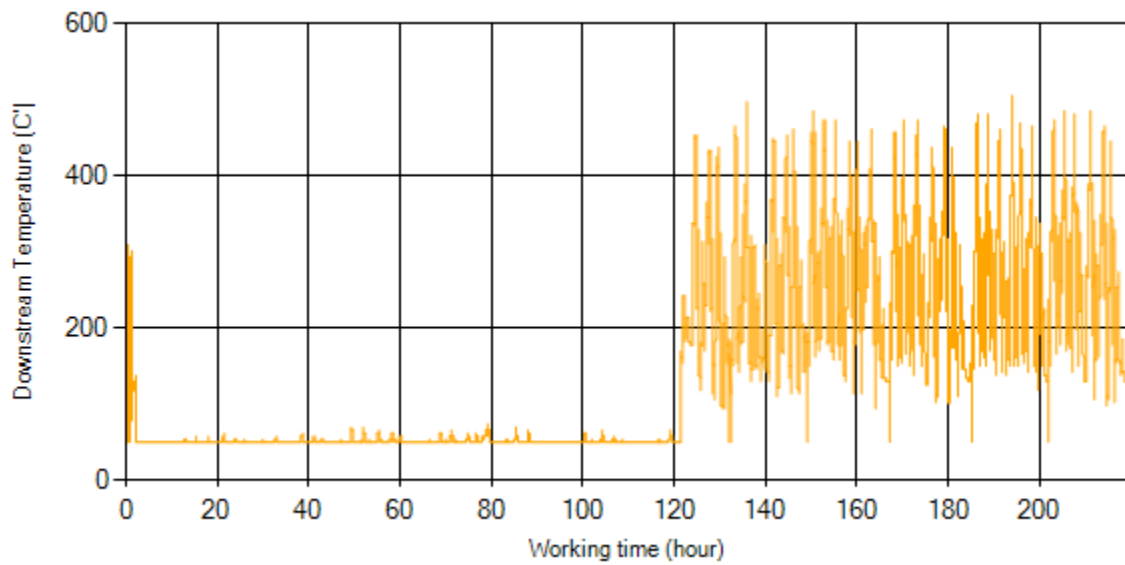


Figure 9- Temperature vs. working hours

Engine Speed Diagrams

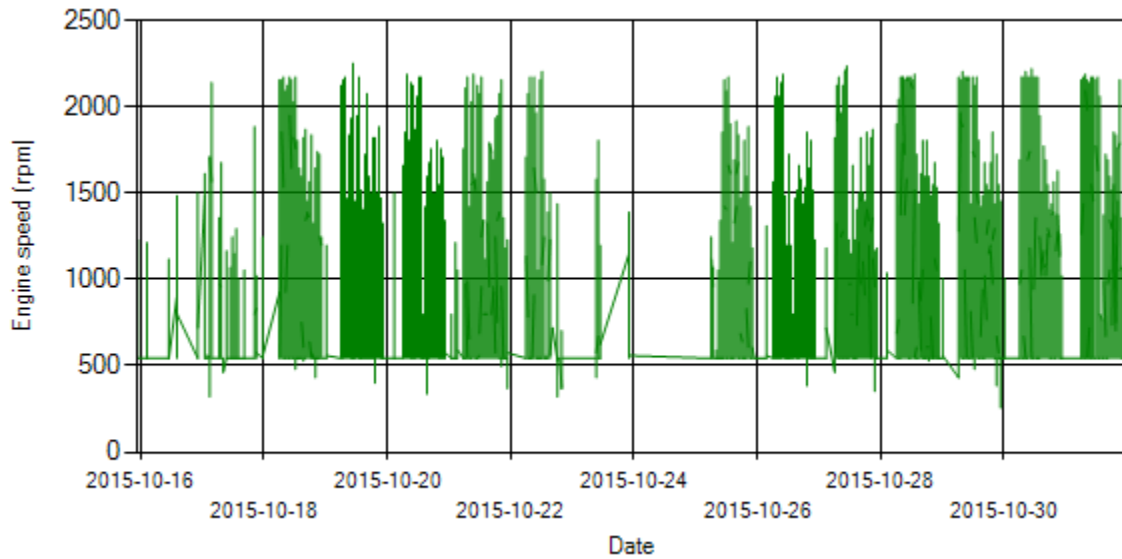


Figure 10- Engine speed distribution over the period

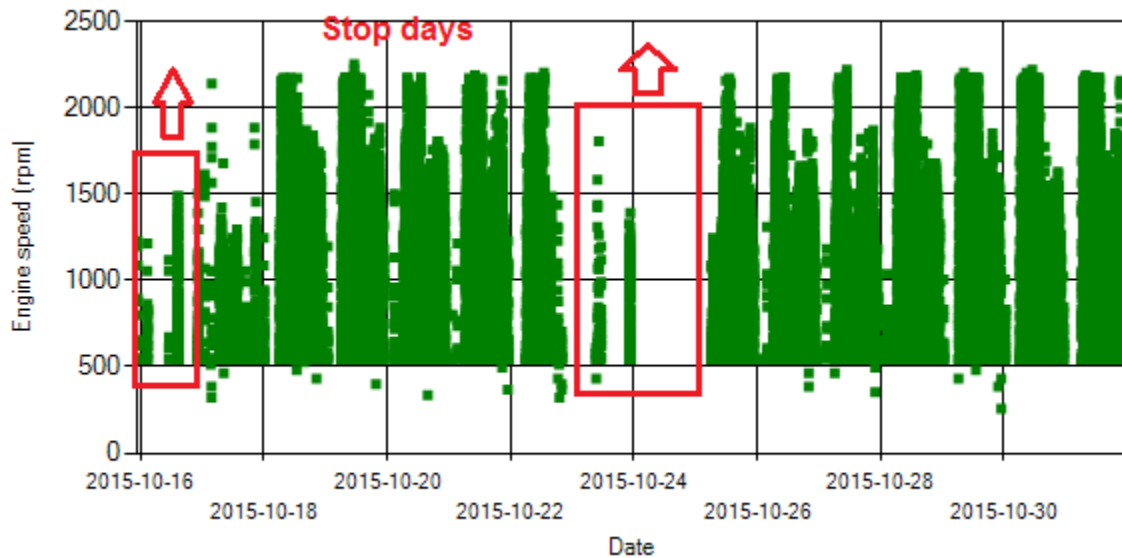


Figure 11- Engine speed diagram for calculating CPK's working days

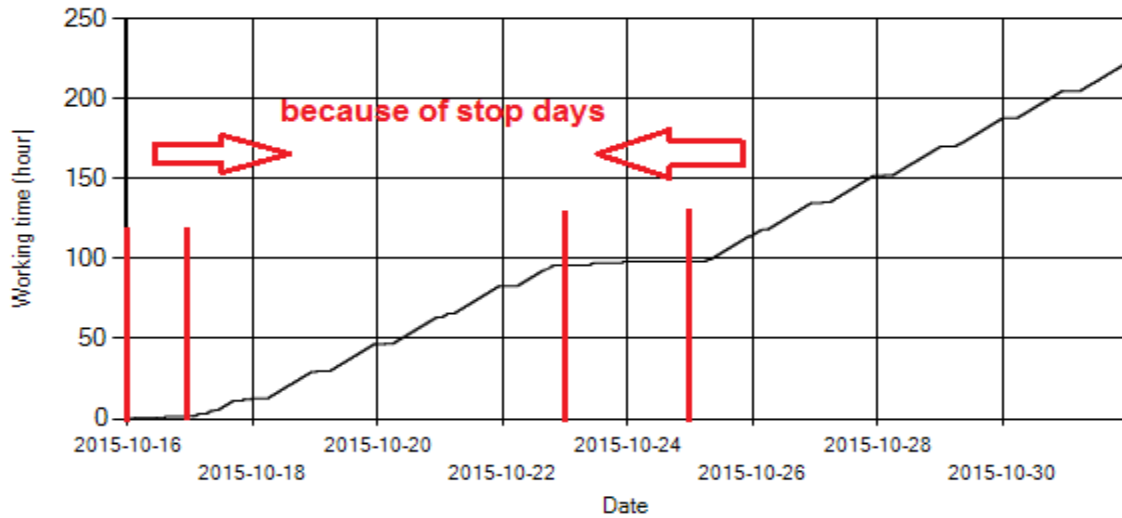


Figure 12- Time diagram for calculating CPK's working days

Notice: Data logger sampling time can be calculated from Figure 12. The lines parallel with Date axis show days without data logger data.

Pressure-Engine Speed diagrams

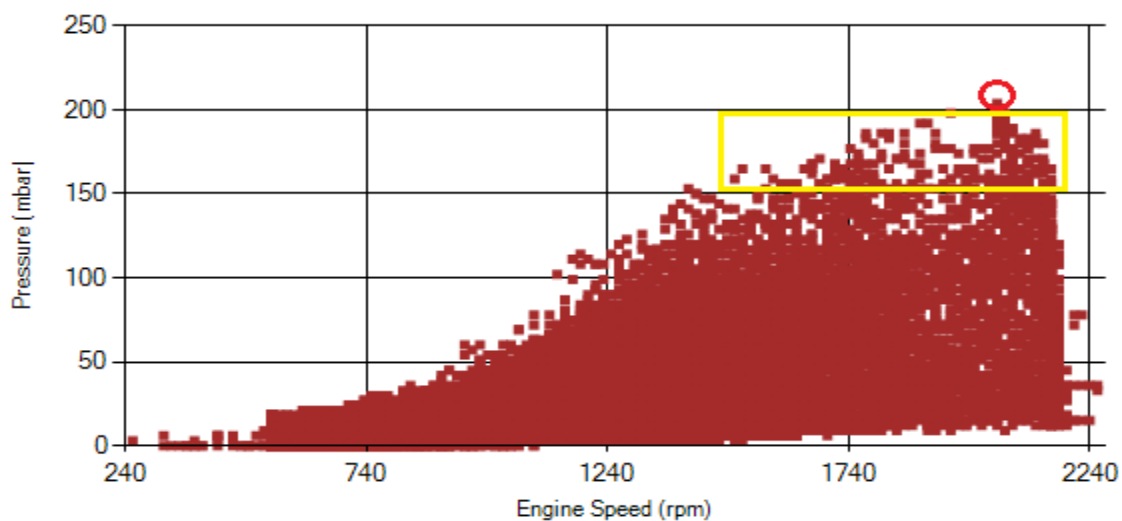


Figure 13- Pressure against engine speed

Notice: Red alarm (pressure>200 mbar) and yellow alarm (200>pressure>150) ranges were indicated in figure 13.

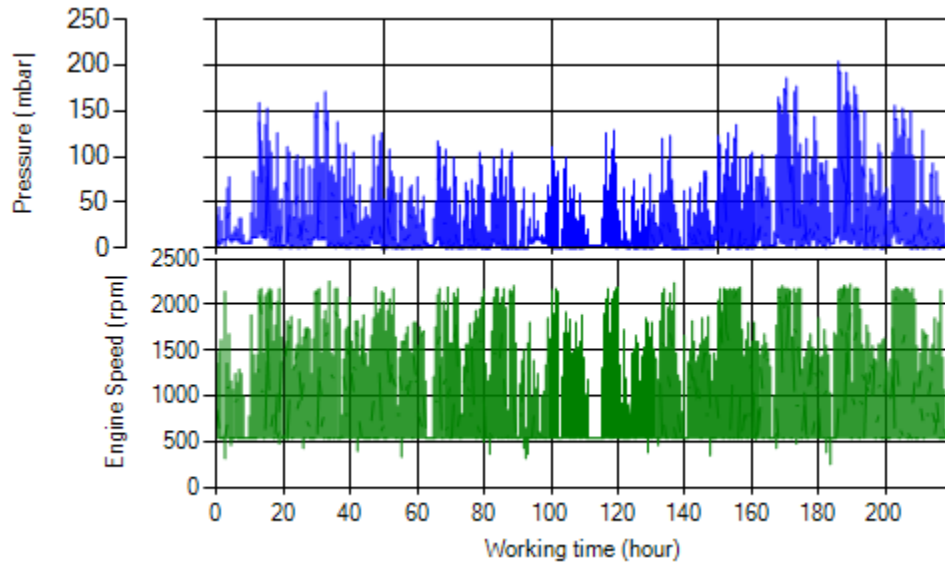


Figure 14- P, N distribution vs. working hours

Temperature-Engine Speed diagrams

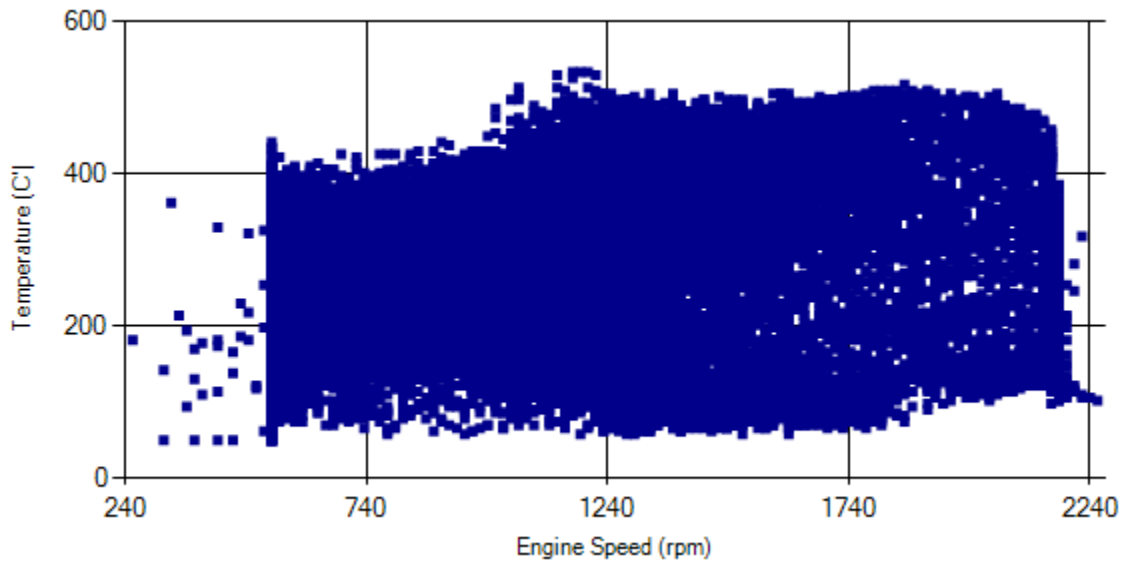


Figure 15- Temperature against engine speed

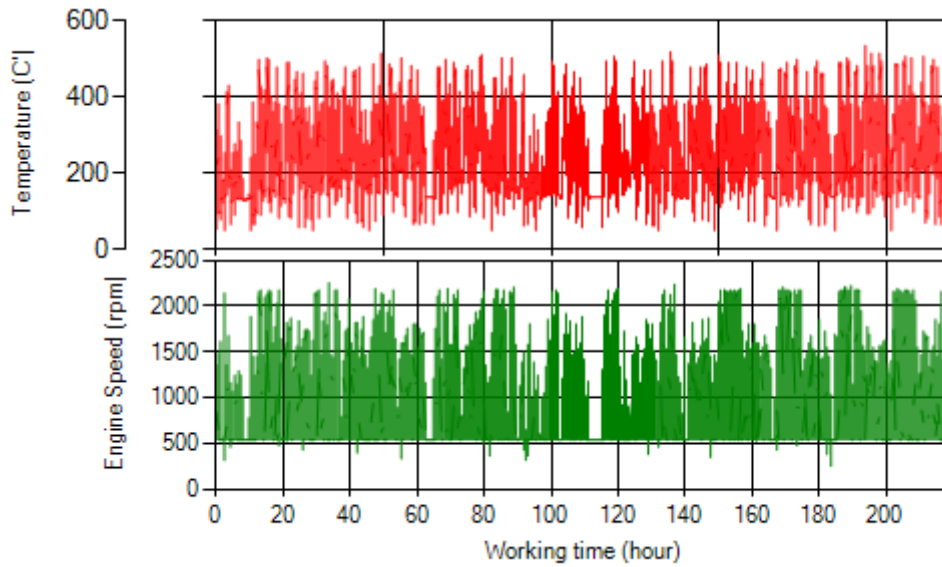


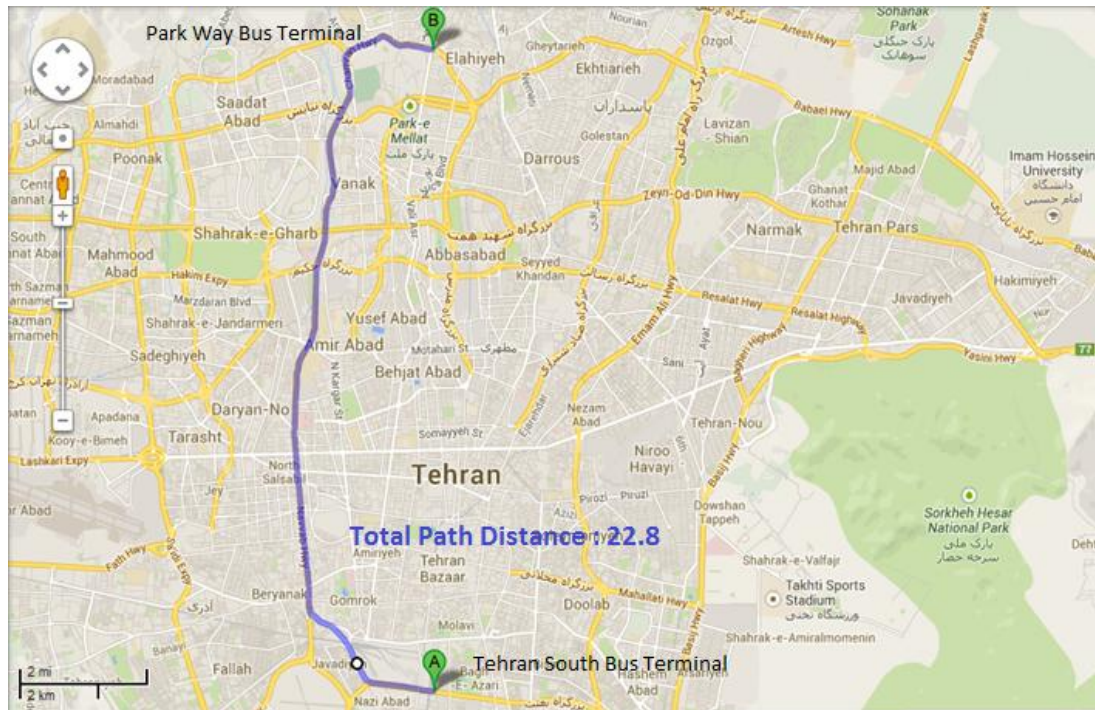
Figure 16- T, N distribution vs. working hours

Filter Operation Analysis

- As depicted in Figure 1, pressure above 200 couldn't be observed and only 0.50% of total working time pressure is above 150mbar.
- Figure 2 displays flow temperature before the DPF. It can be obviously observed that 8% of total working time temperature is above 400 °C and 15% above 350°C. This high temperature distribution is one of the important factors for filter excellent operation during the period.

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

Vehicle plate number	85423
Bus line	Number 4 (south to north bus line)
DPF producer company	HJS_02 (active system with FBC – electrical heater)



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Overall Information

Table1- Overall Information

Vehicle plate number	85423
CPK data logger number	LN: 001505, DN: 2001, Sim Number +989218469621
Bus line	Number 4 (south to north bus line)
Bus Terminals	South Bus Terminal - Park Way Bus Tehran Terminal
Total path distance	22.8 km
DPF producer company	HJS_02 (active system with FBC – electrical heater)
Installation date	19/Feb/2015
Report period	01/Oct/2015- 15/Oct/2015 (fifteen days)
K value - DPF upstream	1.85 [1/m]
K value – DPF downstream	0.04 [1/m]

Table 2- DPF Maintenance History

Filter maintenance date	DPF has been working from installation date until now without any cleaning.
Dosing status	Dosing value has been kept constant from installation date until now.

Table 3- Fuel and Additive Consumption Information

Bus mileage (from DPF installation date)	39229 km
Bus mileage over the period	2469 km
Working days over the period	13 days
Stop days	2 days
Data logger working days	4 days
Working hours over the period	-
Average working hours per day (including stop days)	-
Bus average speed	-
idle speed time to all working time ration	55.25 %
Total Bus fuel consumption over the period	1342 lit
Fuel consumption per hour	-
Average fuel consumption	0.54 lit/km
Total Bus additive consumption over the period	0.671 lit
Average additive consumption	272 cc/km
Additive consumption to fuel ration	500 cc per 1000 lit (batch dosing with tank level)

Notice: Data logger sampled only for four days during this period, so some information like working hours and related parameters were missing.

Temperature, Pressure and Engine Speed Overview

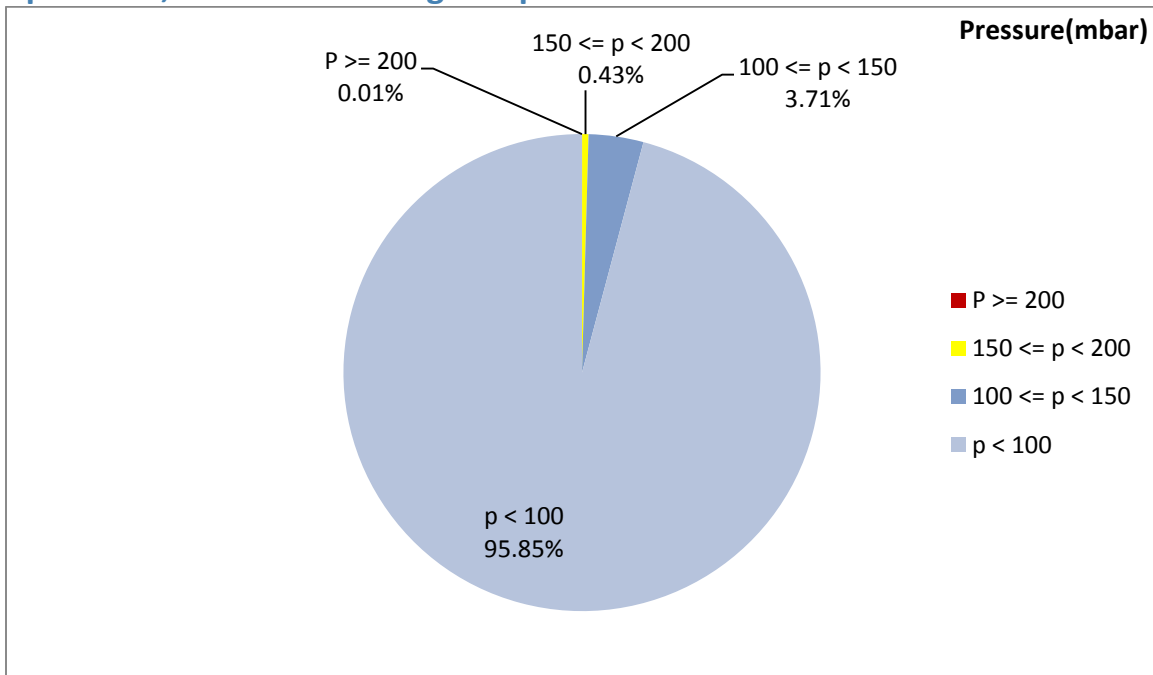


Figure 1- Pressure distribution over the working hours

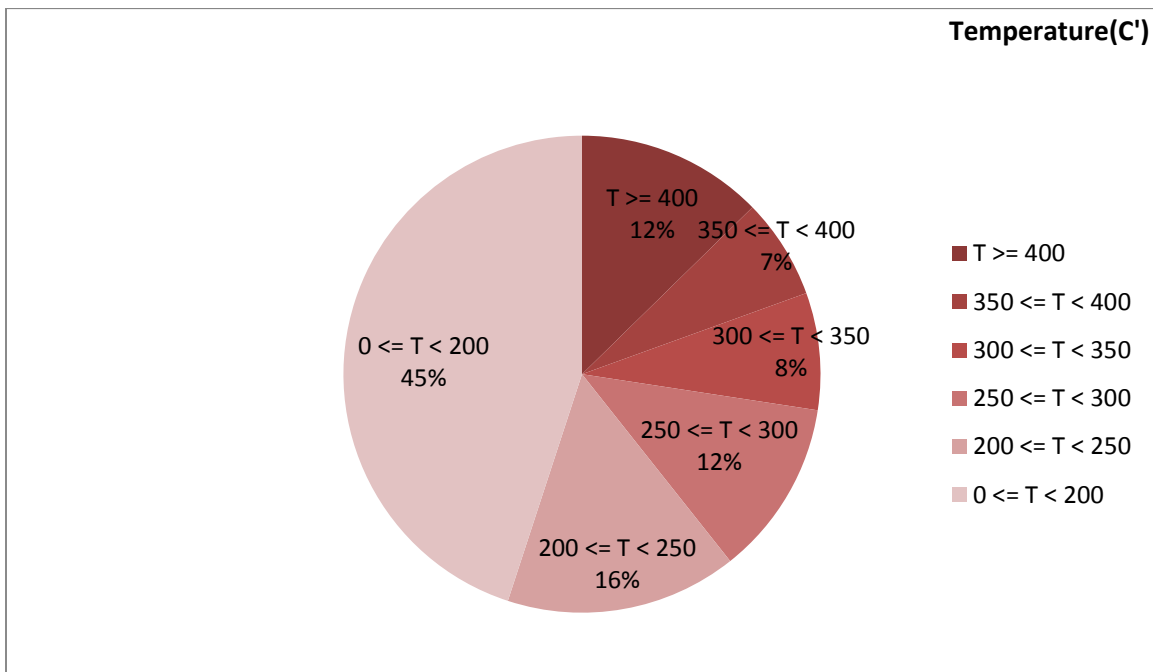


Figure 2-Temperature distribution over the working hours

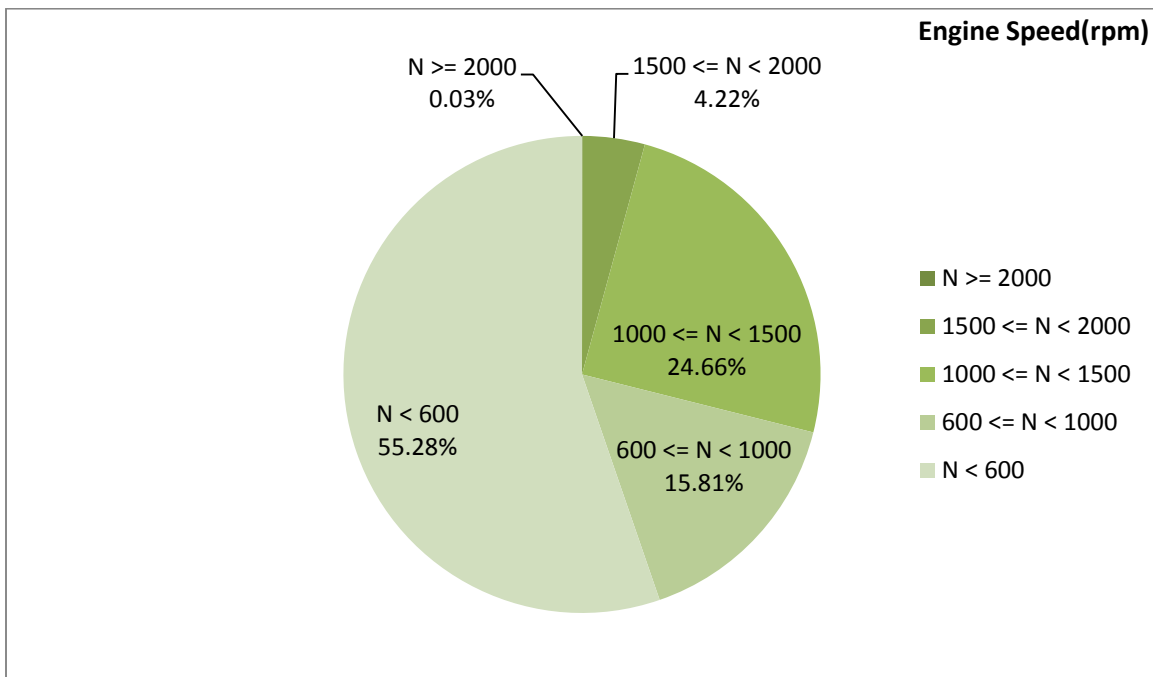


Figure 3- Engine speed distribution over the working hours

Table 4- Mean values

Mean temperature (C)	Mean pressure(mbar)	Mean engine speed(rpm)
247.71	19.28	798

Table 5- Mean values without idling

Mean temperature (C)	Mean pressure(mbar)	Mean engine speed(rpm)
326.74	38.03	1110

Table 6- Max-min values

Max-min temperature(C)	Max-min pressure(mbar)	Max-min engine speed(rpm)
662-50	210-0	2032-288

Detailed Pressure Analysis

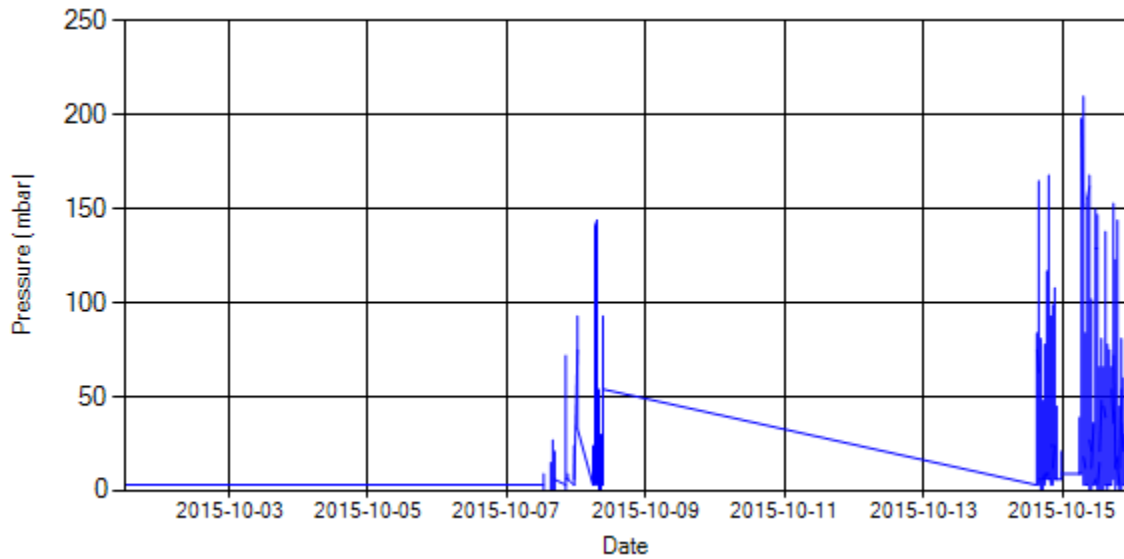


Figure 4- Pressure distribution over the period

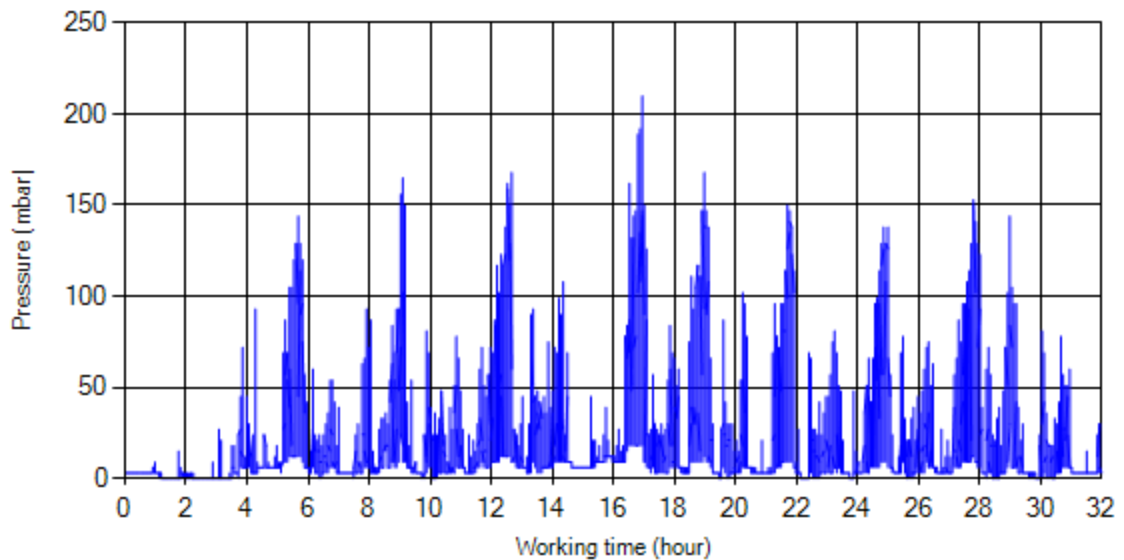


Figure 5- Pressure vs. working hours

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.

Detailed Temperature Analysis

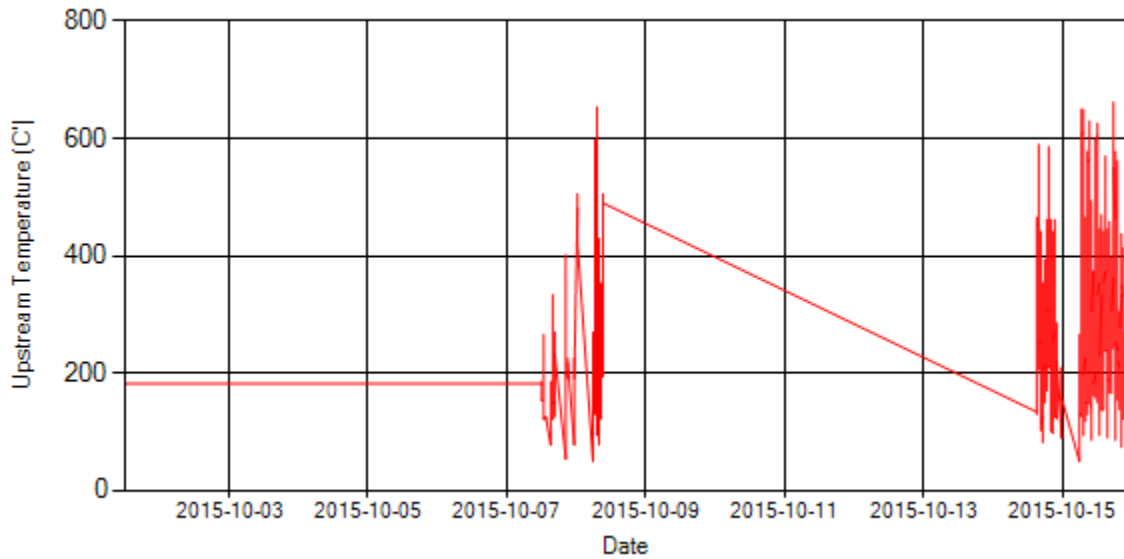


Figure 6- Temperature distribution over the period

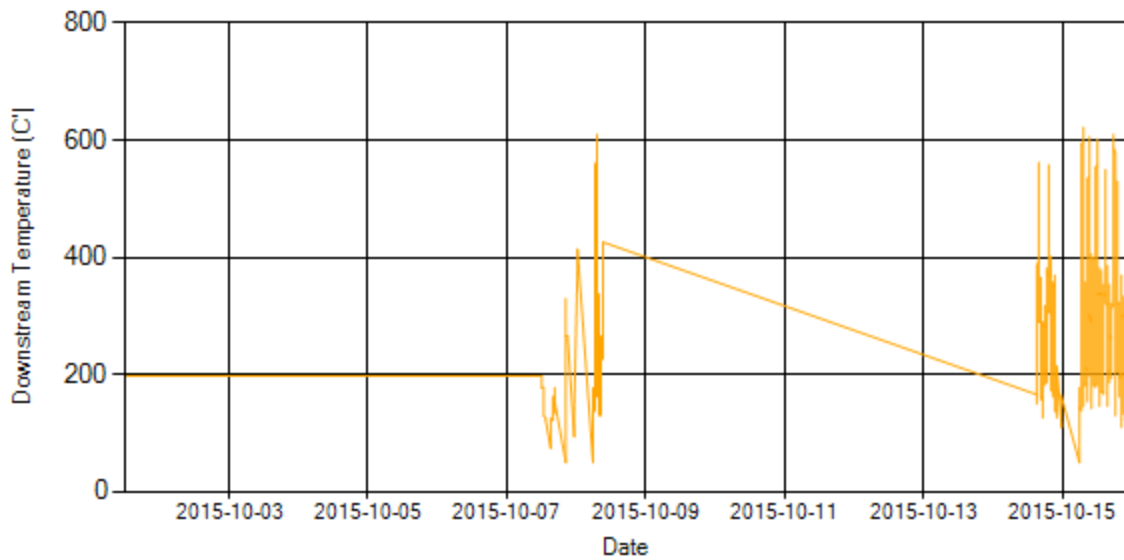


Figure 7- Temperature distribution over the period

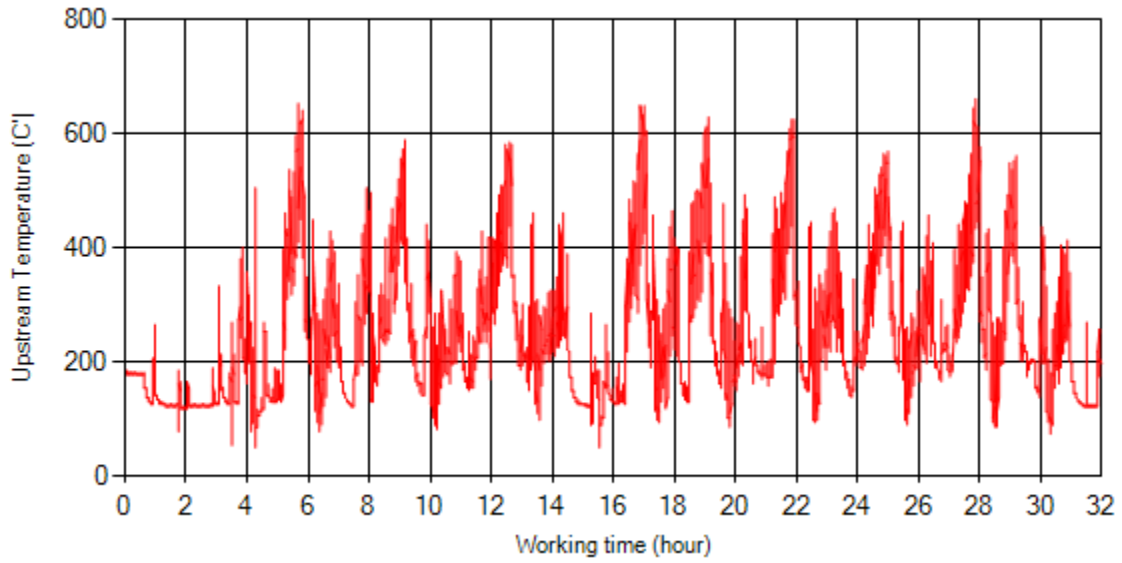


Figure 8- Temperature vs. working hours

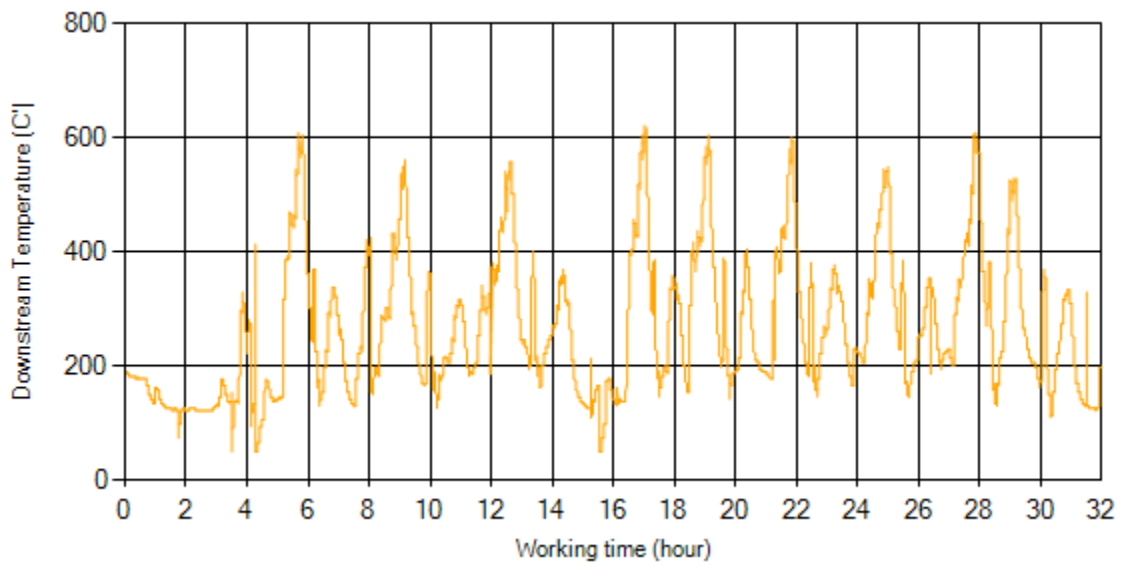


Figure 9- Temperature vs. working hours

Engine Speed Diagrams

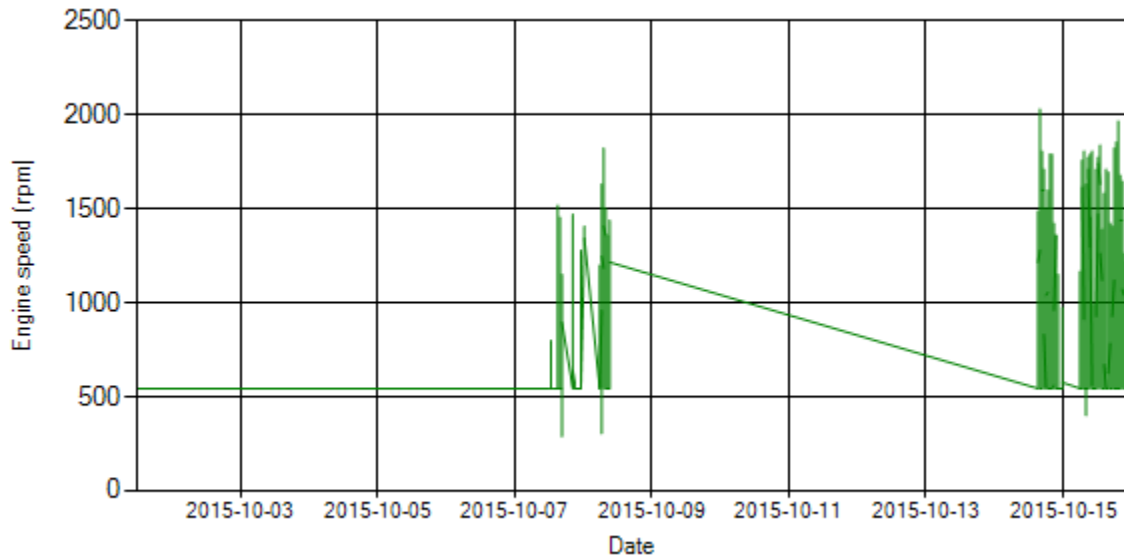


Figure 10- Engine speed distribution over the period

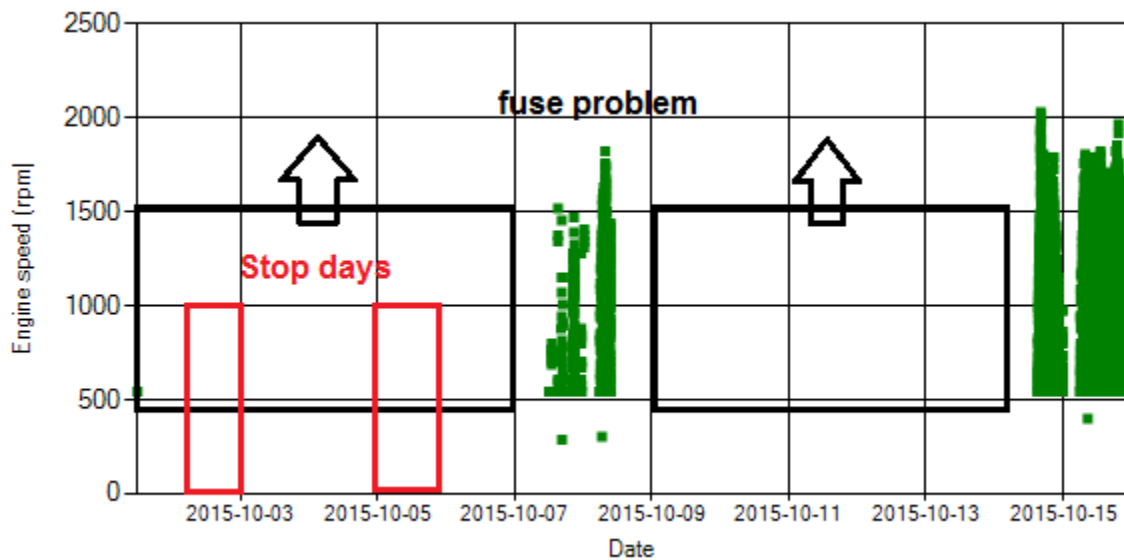


Figure 11- Engine speed diagram for calculating CPK's working days

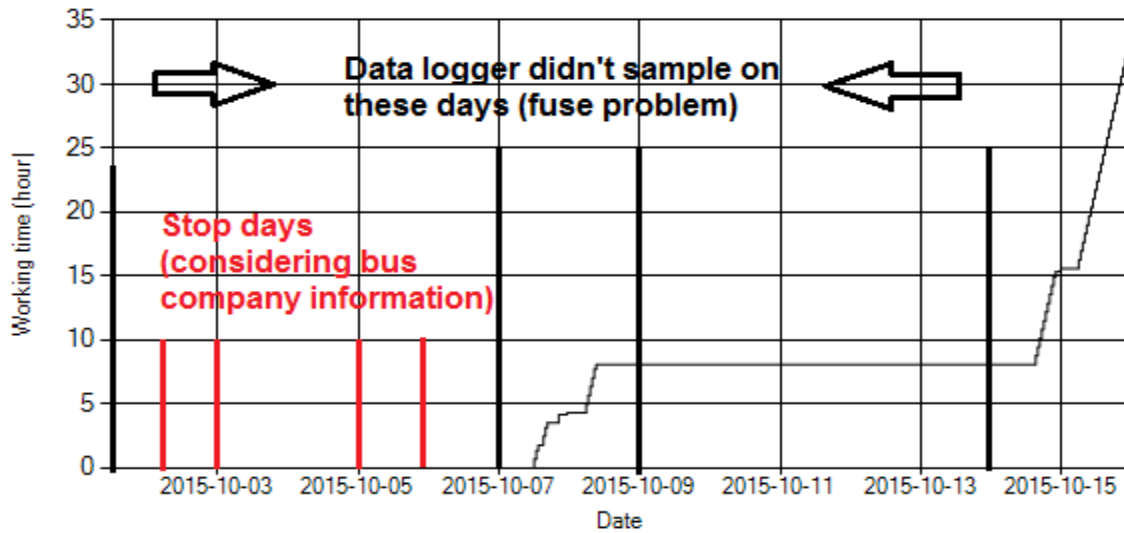


Figure 12- Time diagram for calculating CPK's working days

Notice: Data logger sampling time can be calculated from Figure 12. The lines parallel with Date axis show days without data logger data.

Pressure-Engine Speed diagrams

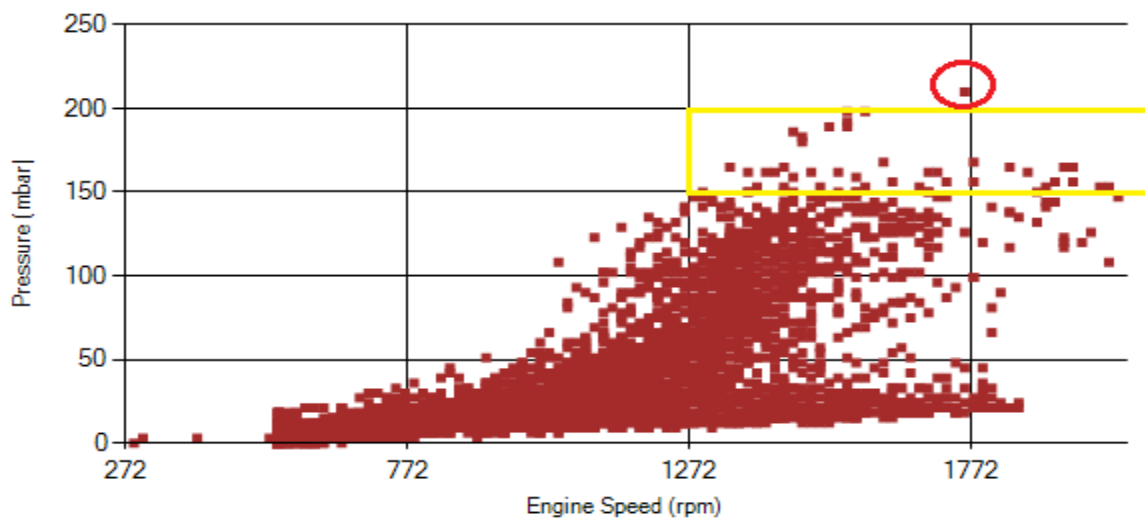


Figure 13- Pressure against engine speed

Notice: Red alarm (pressure>200 mbar) and yellow alarm (200>pressure>150) ranges were indicated in figure 13.

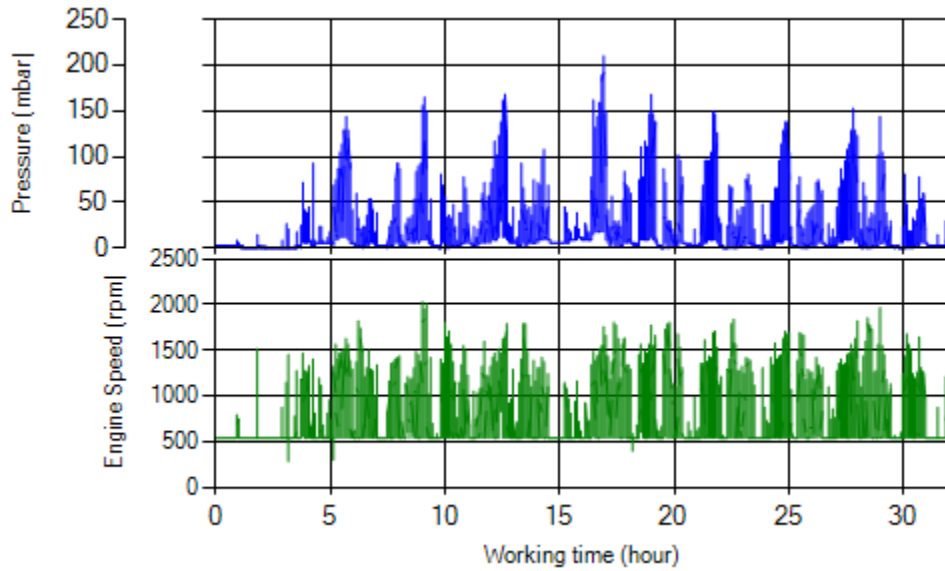


Figure 14- P, N distribution vs. working hours

Temperature-Engine Speed diagrams

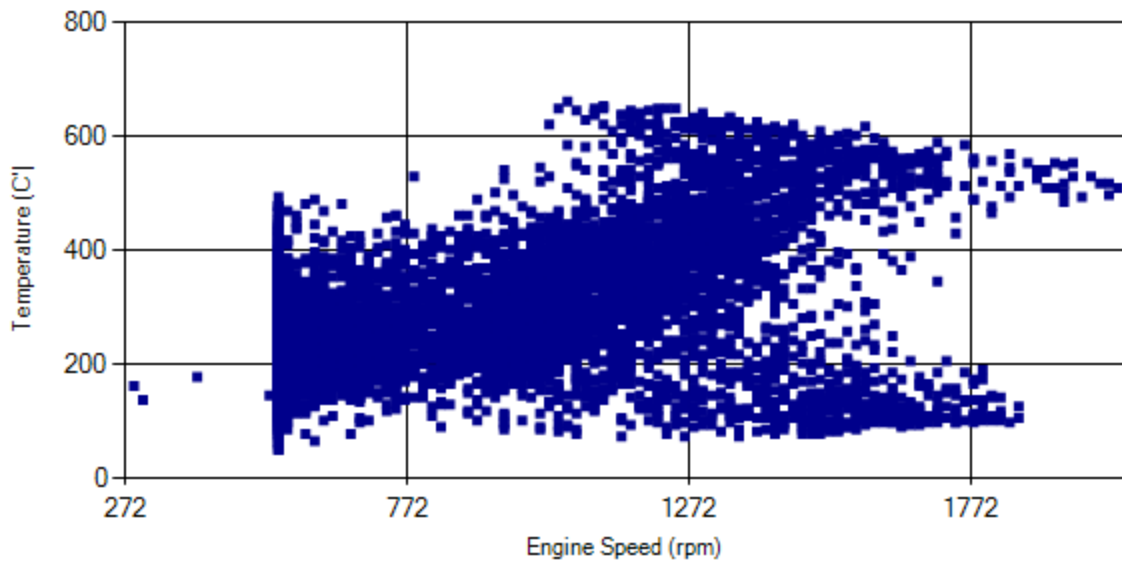


Figure 15- Temperature against engine speed

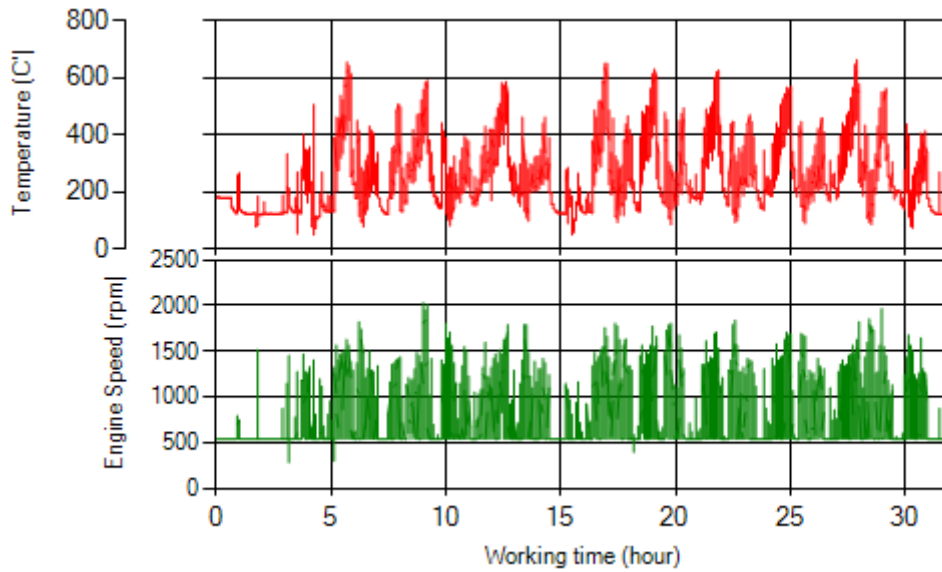


Figure 16- T, N distribution vs. working hours

Filter Operation Analysis

- As depicted in figure 1, only 0.01% of time pressure was above 200 mbar and 0.44% above 150 mbar during this period.
- Figure 2 displays flow temperature distribution for DPF's upstream. It can be obviously observed that 12% of total working-time temperature is above 400 °C and 19% above 350°C.

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

Overall Information

Table1- Overall Information

Vehicle plate number	85423
CPK data logger number	LN: 001505, DN: 2001, Sim Number +989218469621
Bus line	Number 4 (south to north bus line)
Bus Terminals	South Bus Terminal - Park Way Bus Tehran Terminal
Total path distance	22.8 km
DPF producer company	HJS_02 (active system with FBC – electrical heater)
Installation date	19/Feb/2015
Report period	16/Oct/2015- 31/Oct/2015 (sixteen days)
K value - DPF upstream	1.85 [1/m]
K value – DPF downstream	0.04 [1/m]

Table 2- DPF Maintenance History

Filter maintenance date	DPF has been working from installation date until now without any cleaning.
Dosing status	Dosing value has been kept constant from installation date until now.

Table 3- Fuel and Additive Consumption Information

Bus mileage (from DPF installation date)	42131 km
Bus mileage over the period	2902 km
Working days over the period	12 days
Stop days	4 days
Data logger working days	12 days
Working hours over the period	155 hours 4 minutes
Average working hours per day (including stop days)	11 hours 4 minutes
Bus average speed	18.71 km/hr
idle speed time to all working time ration	49.08 %
Total Bus fuel consumption over the period	1560 lit
Fuel consumption per hour	10.06 lit/hr
Average fuel consumption	0.54 lit/km
Total Bus additive consumption over the period	0.788 lit
Average additive consumption	271 cc/km
Additive consumption to fuel ration	505 cc per 1000 lit (batch dosing with tank level)

Temperature, Pressure and Engine Speed Overview

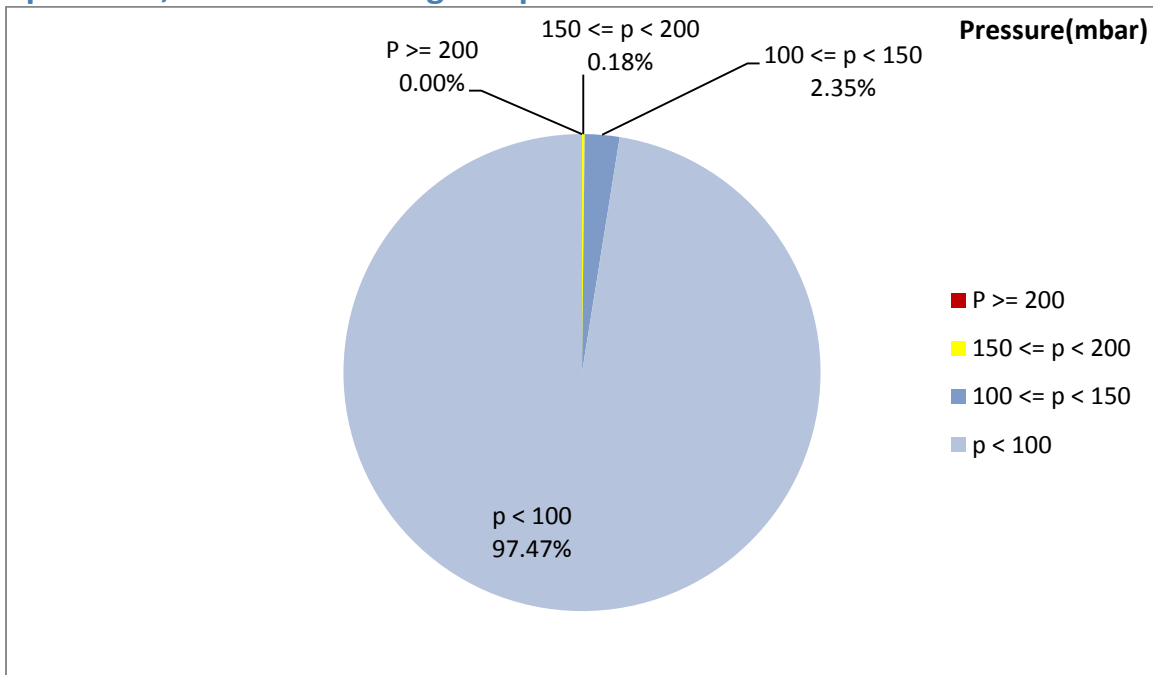


Figure 1- Pressure distribution over the working hours

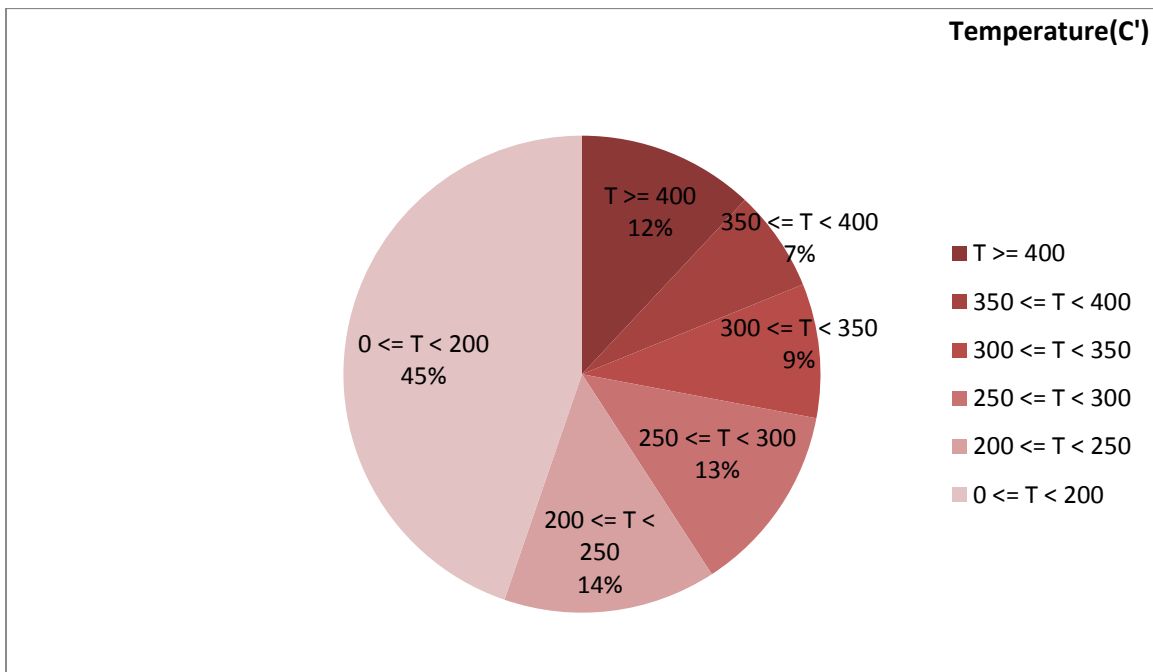


Figure 2-Temperature distribution over the working hours

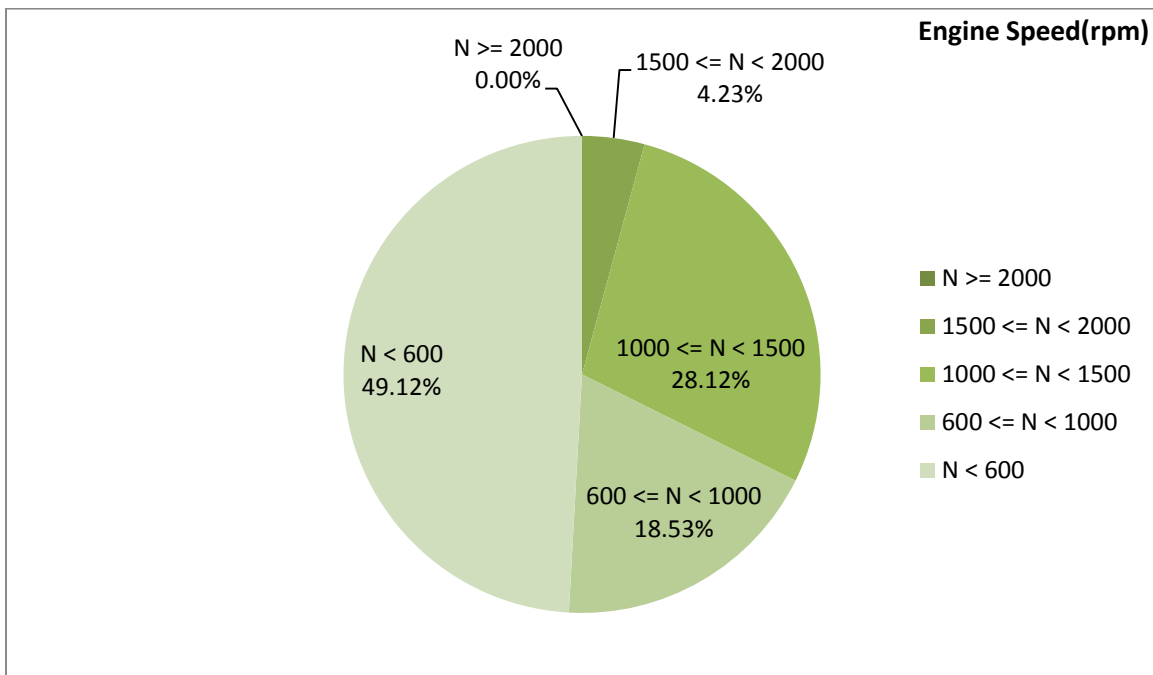


Figure 3- Engine speed distribution over the working hours

Table 4- Mean values

Mean temperature (C)	Mean pressure(mbar)	Mean engine speed(rpm)
245.48	17.9	827

Table 5- Mean values without idling

Mean temperature (C)	Mean pressure(mbar)	Mean engine speed(rpm)
309.93	31.4	1097

Table 6- Max-min values

Max-min temperature(C)	Max-min pressure(mbar)	Max-min engine speed(rpm)
654-50	177-0	2016-256

Detailed Pressure Analysis

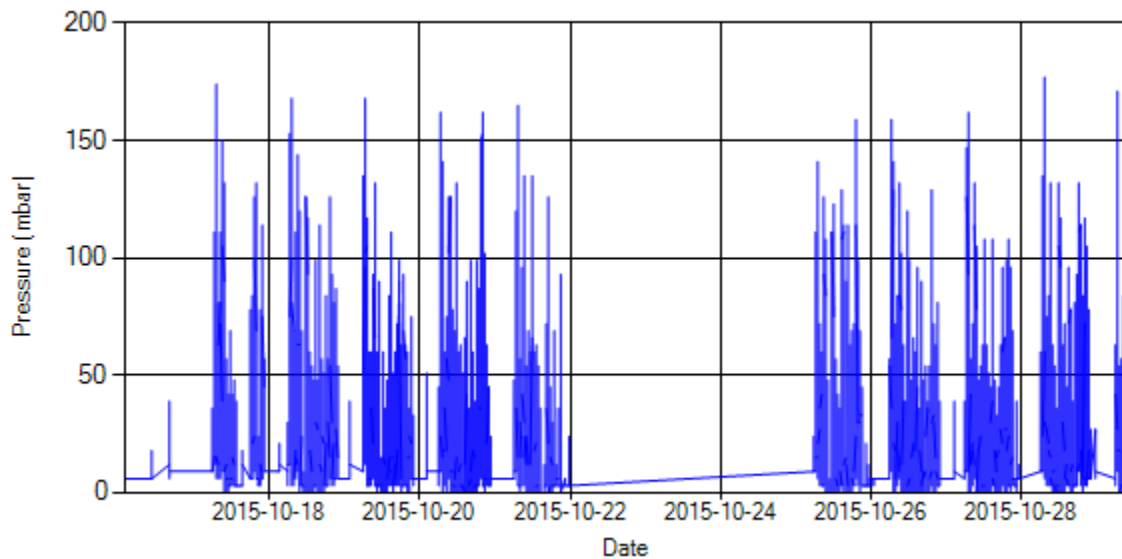


Figure 4- Pressure distribution over the period

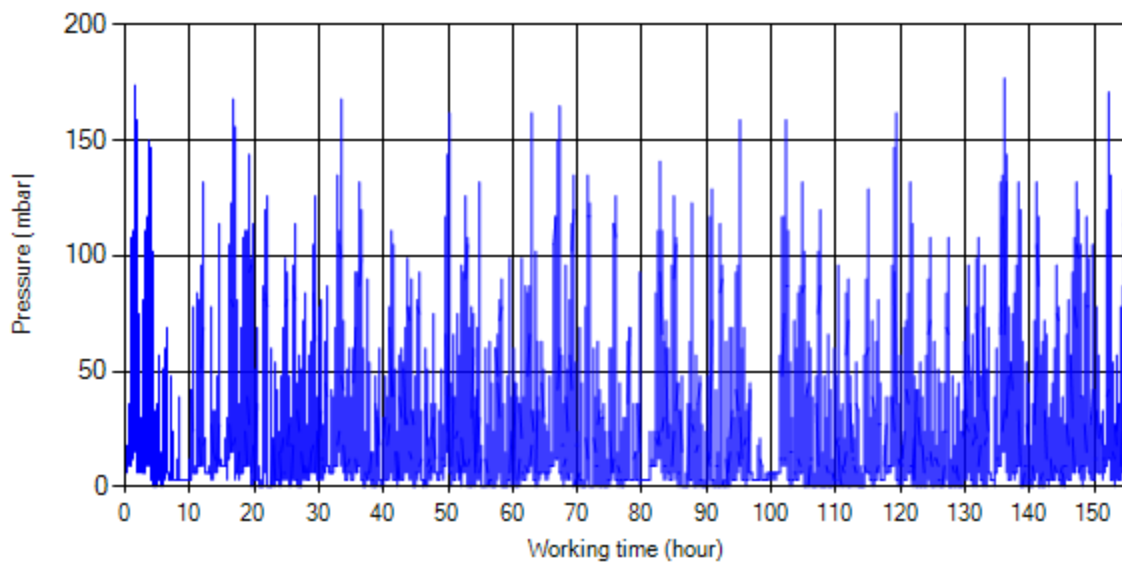


Figure 5- Pressure vs. working hours

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.

Detailed Temperature Analysis

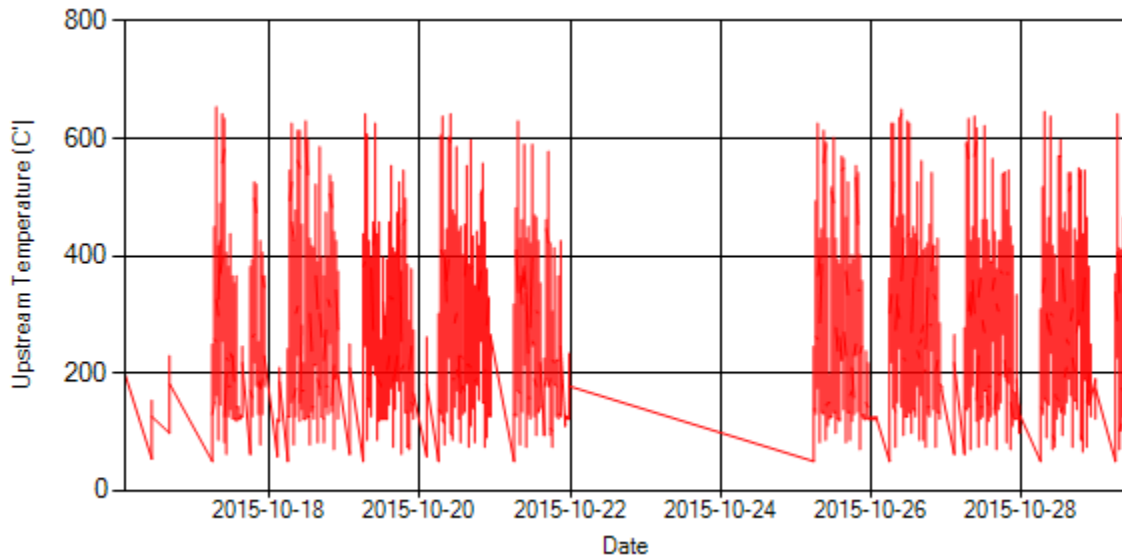


Figure 6- Temperature distribution over the period

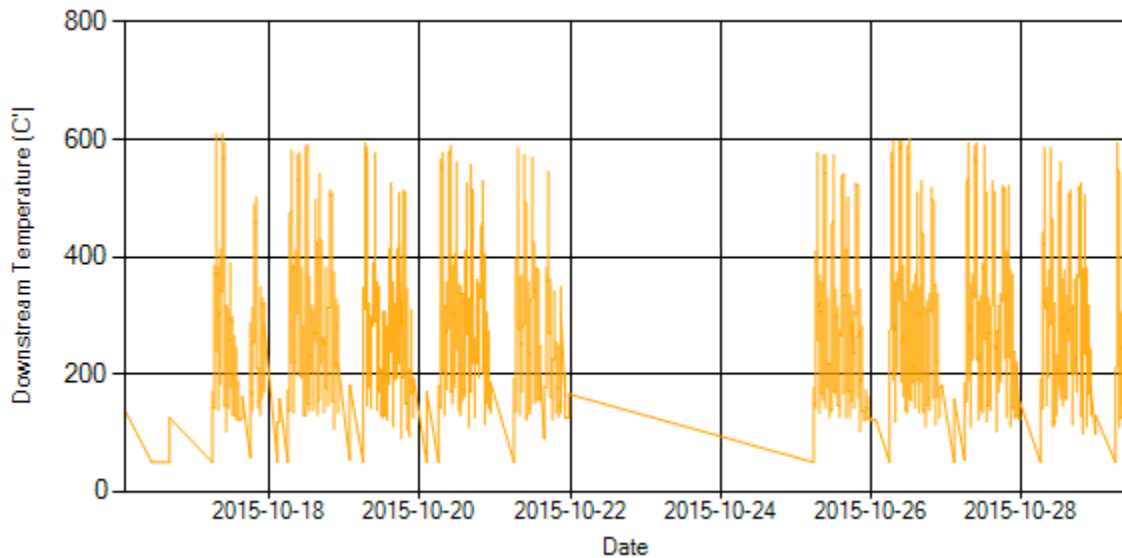


Figure 7- Temperature distribution over the period

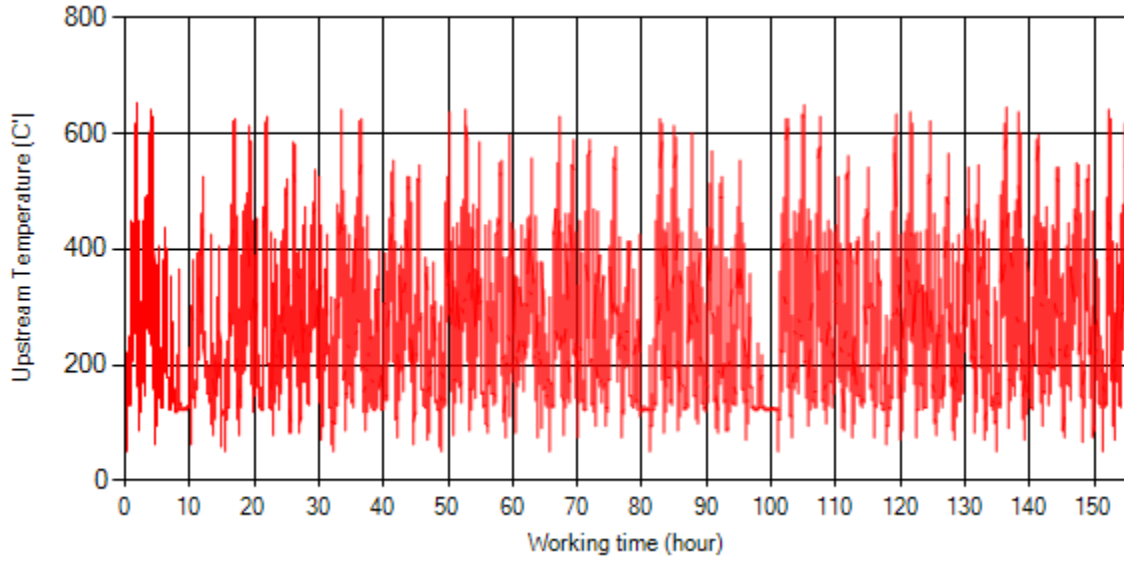


Figure 8- Temperature vs. working hours

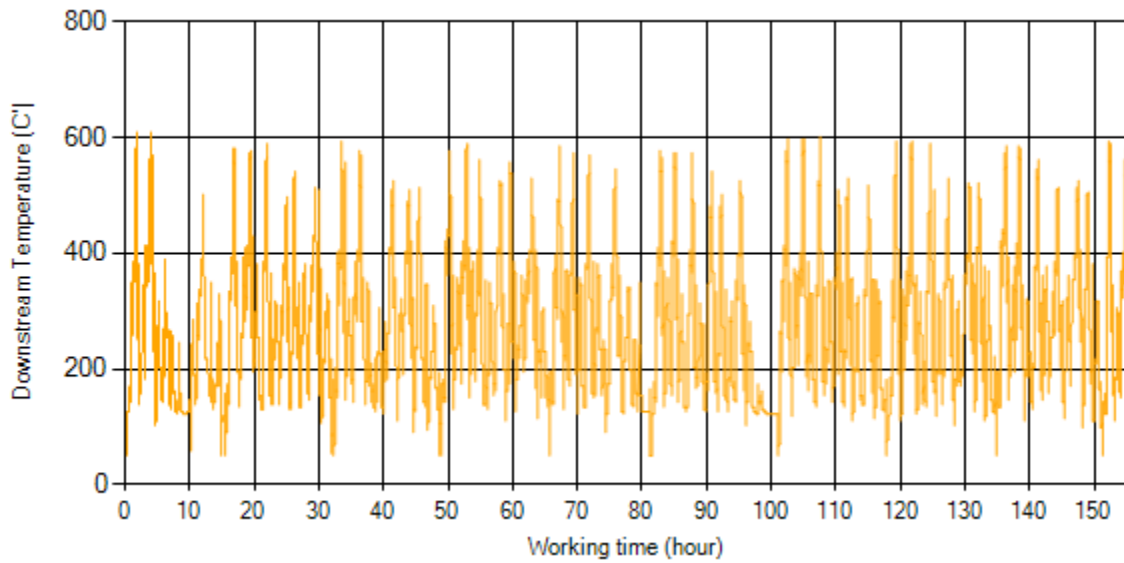


Figure 9- Temperature vs. working hours

Engine Speed Diagrams

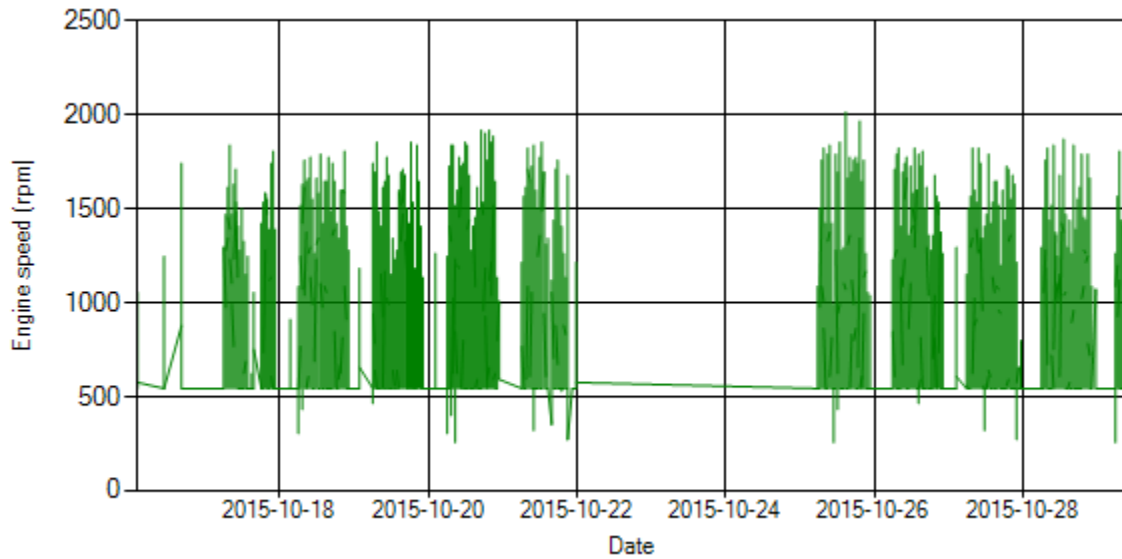


Figure 10- Engine speed distribution over the period

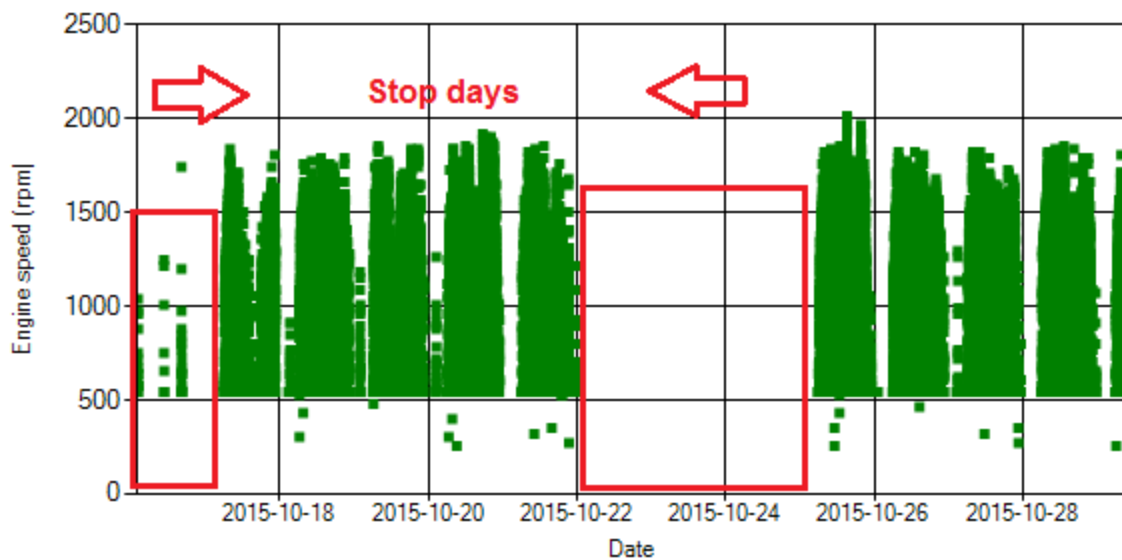


Figure 11- Engine speed diagram for calculating CPK's working days

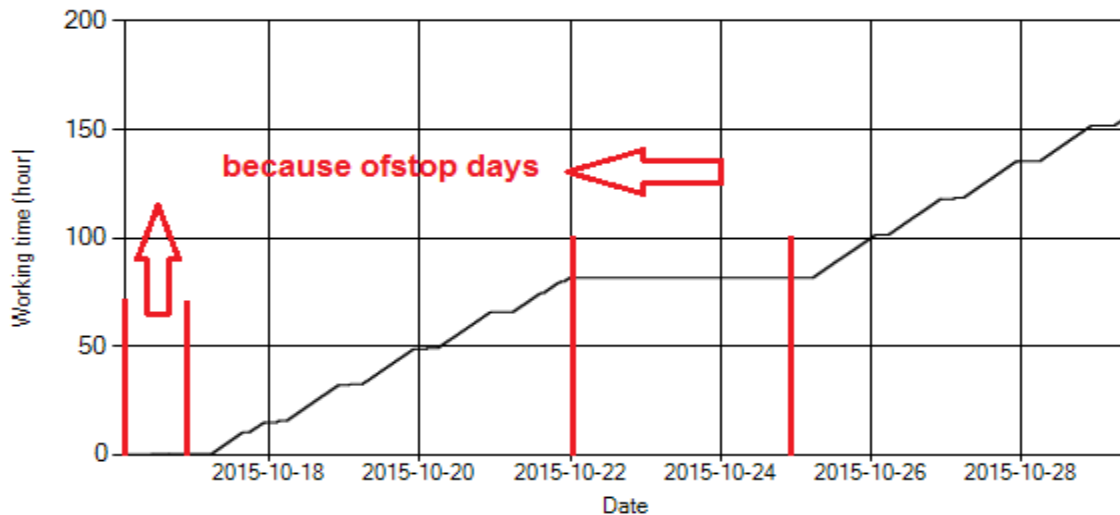


Figure 12- Time diagram for calculating CPK's working days

Notice: Data logger sampling time can be calculated from Figure 12. The lines parallel with Date axis show days without data logger data.

Pressure-Engine Speed diagrams

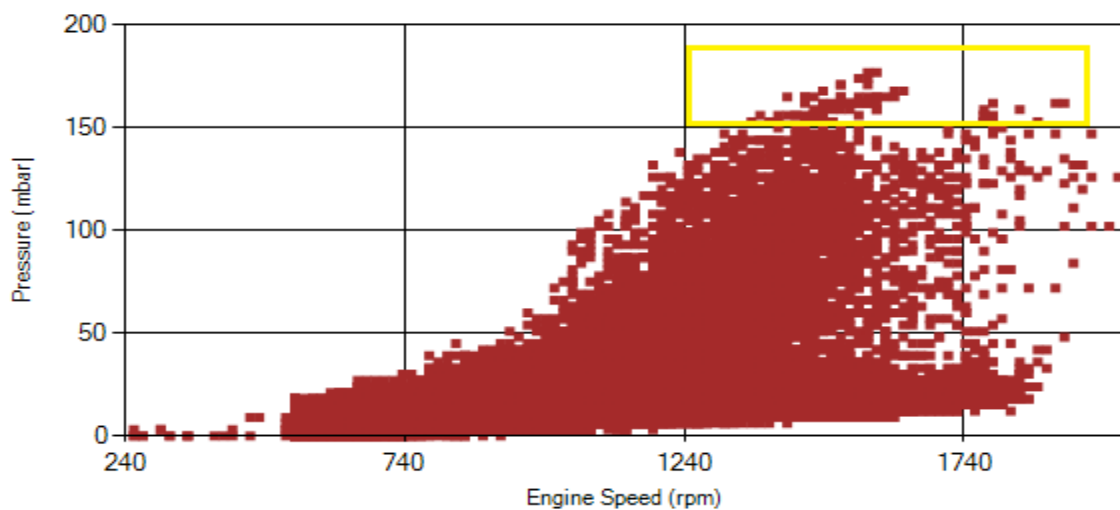


Figure 13- Pressure against engine speed

Notice: Yellow alarm (200>pressure>150) range was indicated in figure 13.

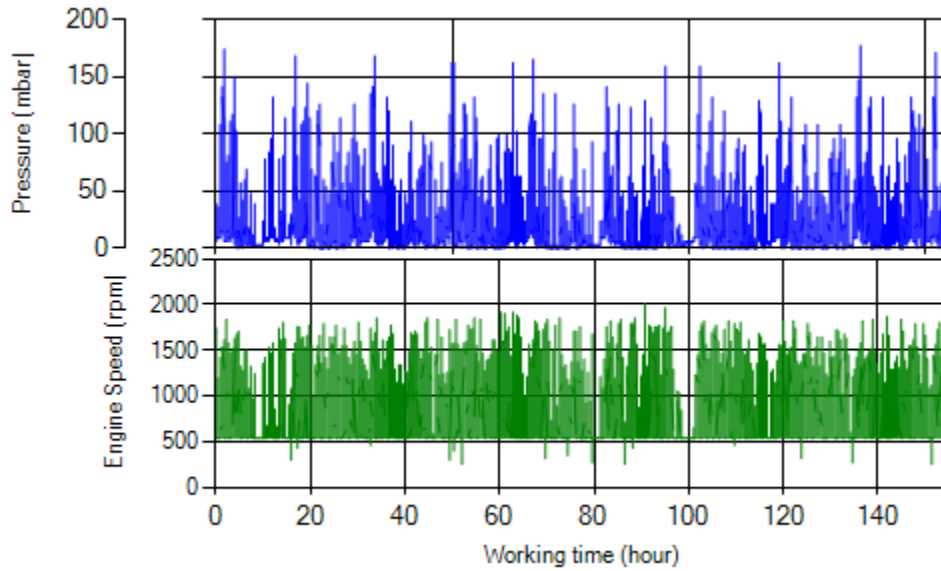


Figure 14- P, N distribution vs. working hours

Temperature-Engine Speed diagrams

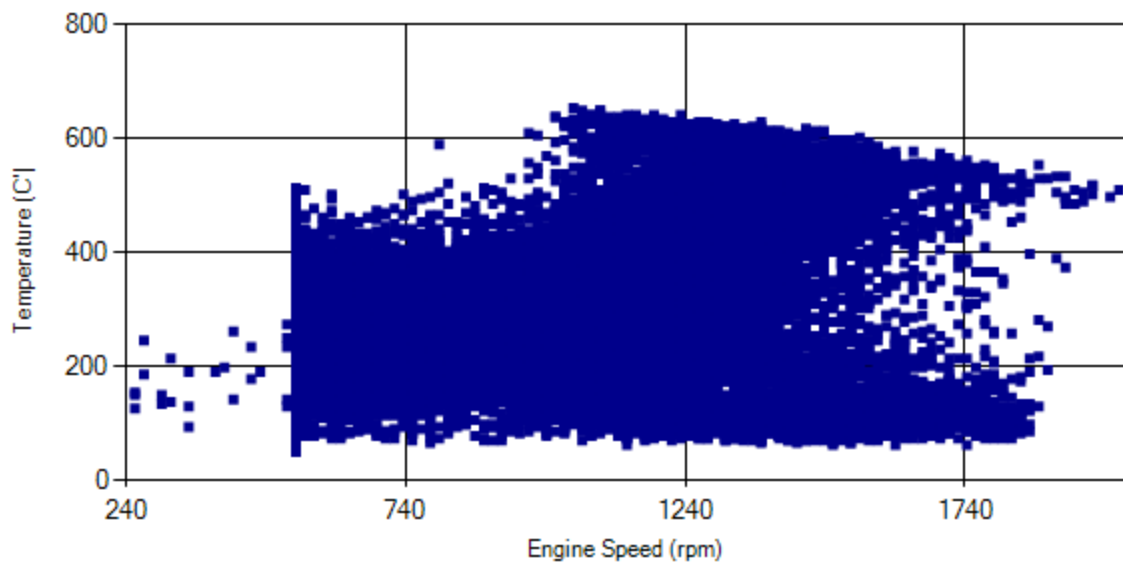


Figure 15- Temperature against engine speed

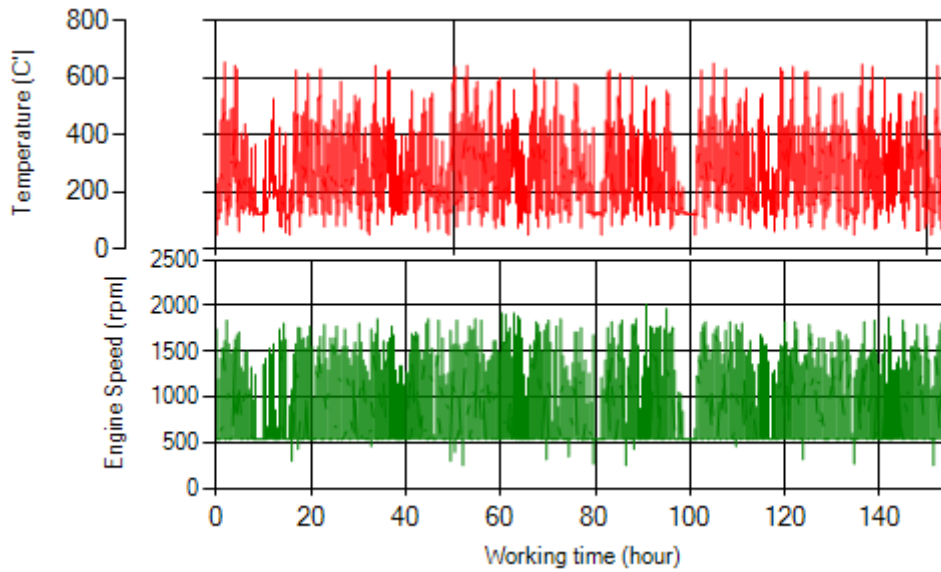


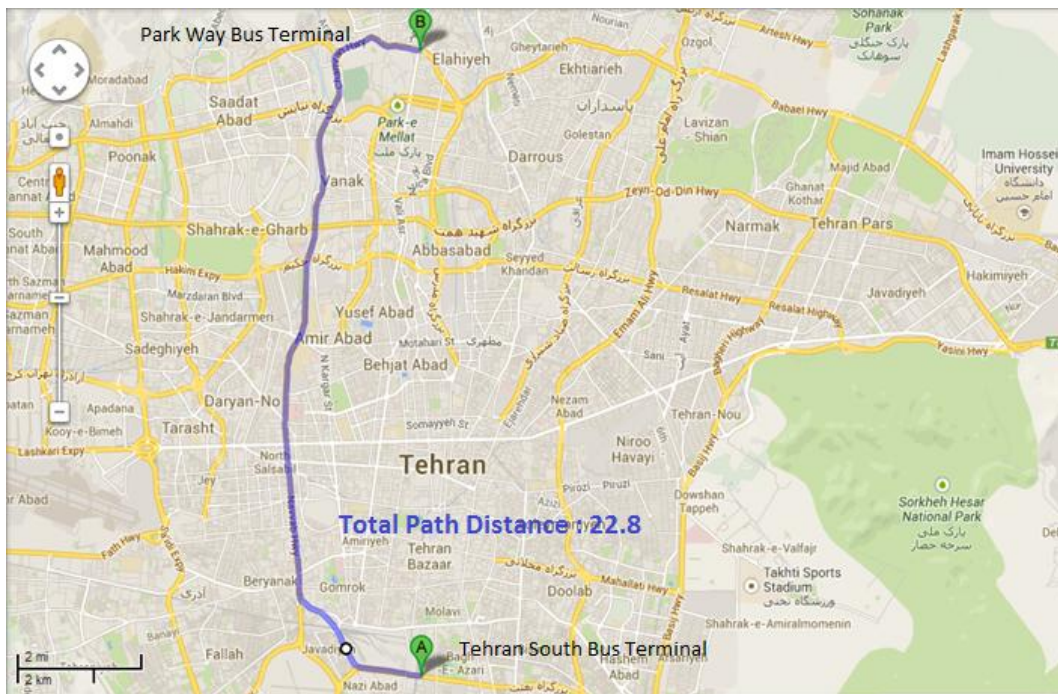
Figure 16- T, N distribution vs. working hours

Filter Operation Analysis

- As depicted in figure 1, only 0.18% of time pressure was above 150 mbar and pressure above 200 can't be seen.
- Figure 2 displays flow temperature distribution for DPF's upstream. It can be obviously observed that 12% of total working-time temperature is above 400 °C and 19% above 350°C.

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

Vehicle plate number	78515
Bus line	Number 4 (south to north bus line)
DPF producer company	Dinex_01 (Passive system with FBC)



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Overall Information

Table1- Overall Information

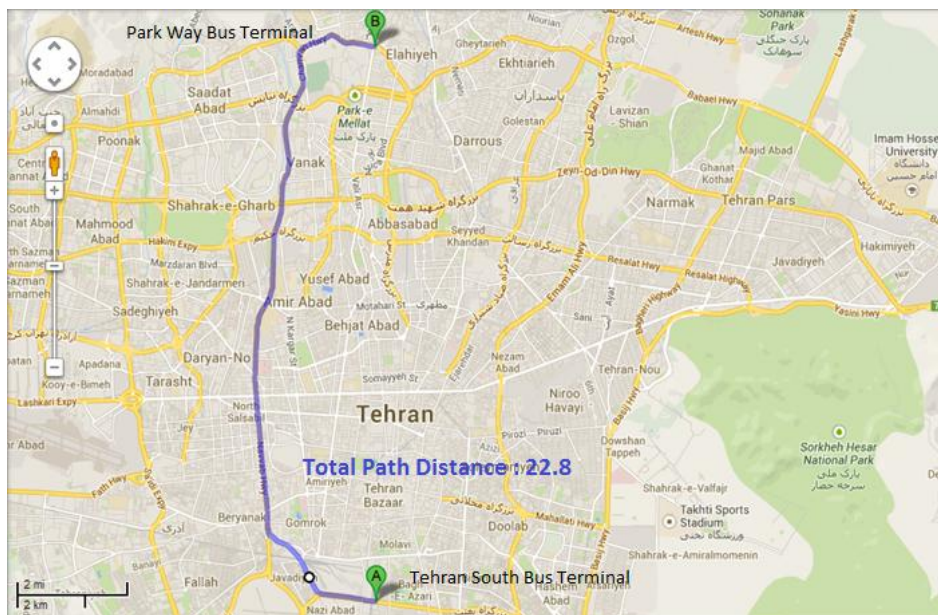
Vehicle plate number	78515
CPK data logger number	LN: 001490, DN: 1954, Sim Number +98000000000
Bus line	Number 4 (south to north bus line)
Bus Terminals	Tehran South Bus Terminal - Park Way Bus Terminal
Total path distance	22.8 km
DPF producer company	Dinex_01 (passive system with FBC)
Installation date	22/Oct/2014
Report period	01/Oct/2015 – 31/Sep/2015 (thirty one days)
K value - DPF upstream	- [1/m]
K value – DPF downstream	- [1/m]

Table 2- DPF Maintenance History

Filter maintenance date	Filter core was changed on 15/Feb/2015.
Dosing status	Dosing value was reduced by 70% on March February 15 th . (Secondary value/Initial value=0.3)

Notice: Bus has been stopped from Sep 18th until now due to technical problems (related to Bus Company). So there is no data to providing October's report.

Vehicle plate number	78524
Bus line	Number 4 (south to north Bus line)
DPF producer company	PURltech (Passive system with FBC)



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Notice: System was working without DPF during this period.

Overall Information

Table1- Overall Information

Vehicle plate number	78524
CPK data logger number	LN: 001443, DN: 1930, Sim +989218786219
Bus line	Number 4 (south to north Bus line)
Bus Terminals	Tehran South Bus Terminal - Park Way Bus Terminal
Total path distance	22.8 km
DPF producer company	PURltech (Passive system with FBC)
Installation date	28/Jan/2015
Report period	01/Oct/2015 – 15/Oct/2015 (fifteen days)
K value – DPF upstream	1.85 [1/m]
K value – DPF downstream	0.02 [1/m]

Table 2- DPF Maintenance History

Filter maintenance date	<p>DPF core was removed on Jul 22nd and was cleaned on Aug 12th for the first time.</p> <p>Considering system relatively high backpressure, filter isolation defect and air filter's deformation, DPF core was removed on Sep 16th and will be installed on system after cleaning and improving isolation system.</p>
Dosing status	Dosing value has been kept constant from installation date until now.

Table 3- Fuel and Additive Consumption Information

Bus mileage (from DPF installation date)	39203 km
Bus mileage over the period	3475 km
Working days over the period	15 days
Stop days	0 day
Data logger working days	15 days
Working hours over the period	236 hours 39 minutes
Average working hours per day (including stop days)	15 hours 46 minutes
Bus average speed	14.68 km/hr
idle speed time to all working time ration	-%
Total Bus fuel consumption over the period	2253 lit
Fuel consumption per hour	9.52 lit/hr
Average fuel consumption	0.65 lit/km
Total Bus additive consumption over the period	- lit
Average additive consumption	- cc/km
Additive consumption to fuel ration	- cc/1000lit

Notice: Due to some technical problem related to data logger, rpm data were missing. So related parameters like idling speed were left blank.

Notice: DPF core was removed on Sep 16th and additive system was disconnected, so additive consumption during this period was zero.

Temperature, Pressure and Engine Speed Overview

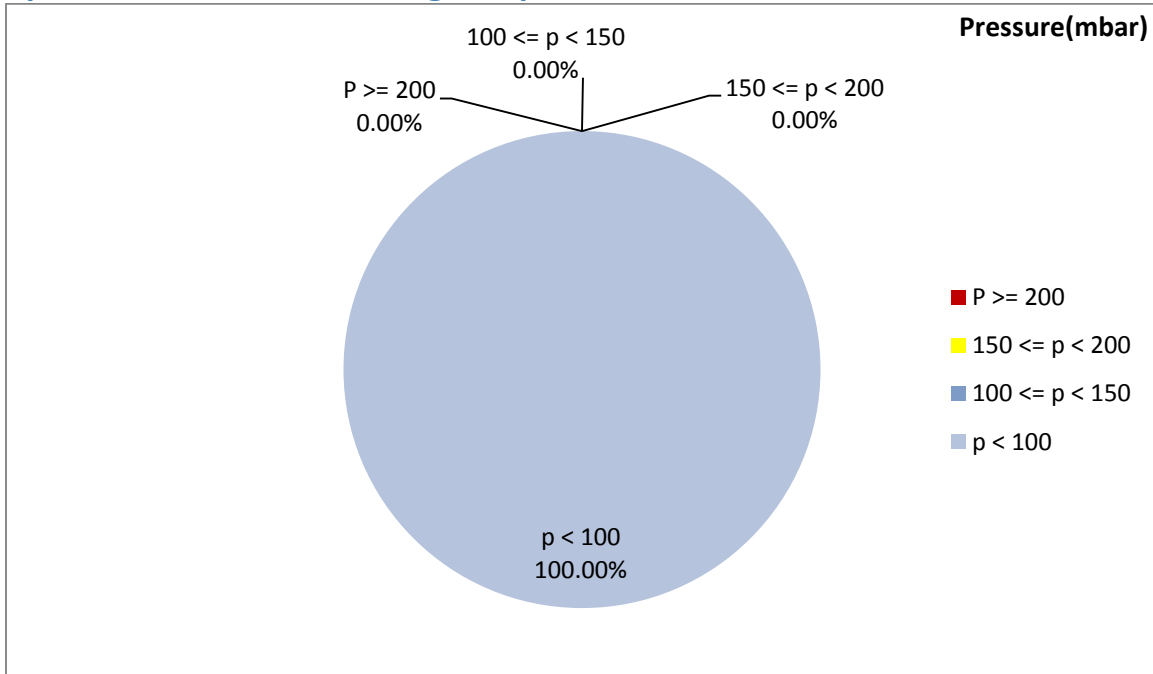


Figure 1- Pressure distribution over the working hours

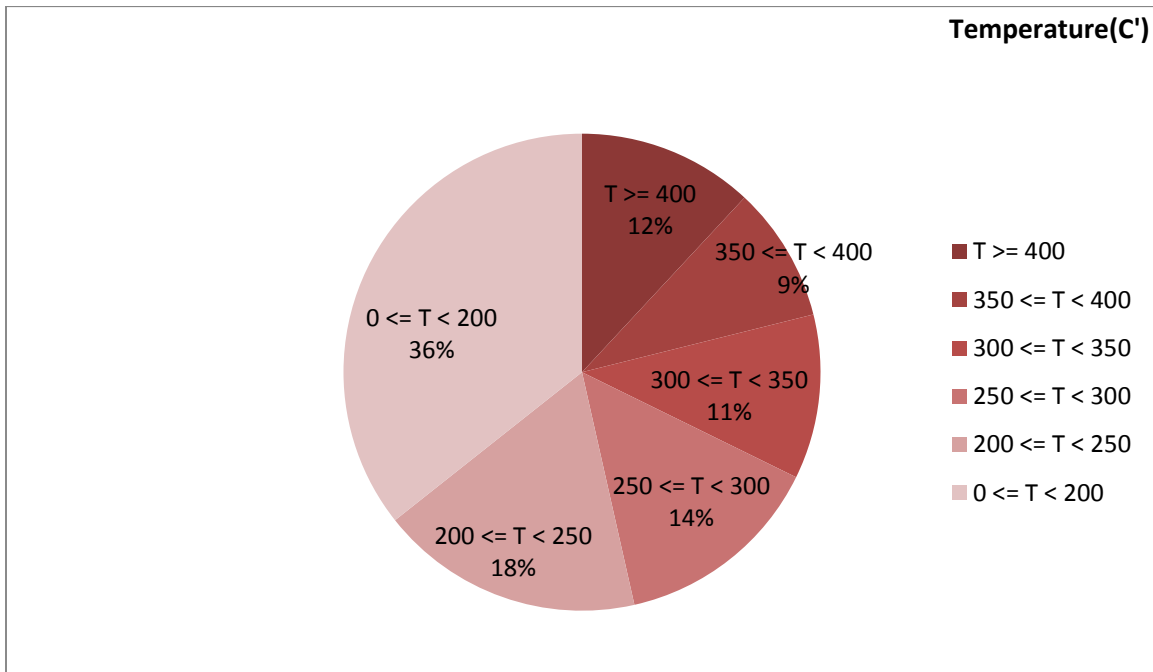


Figure 2-Temperature distribution over the working hours

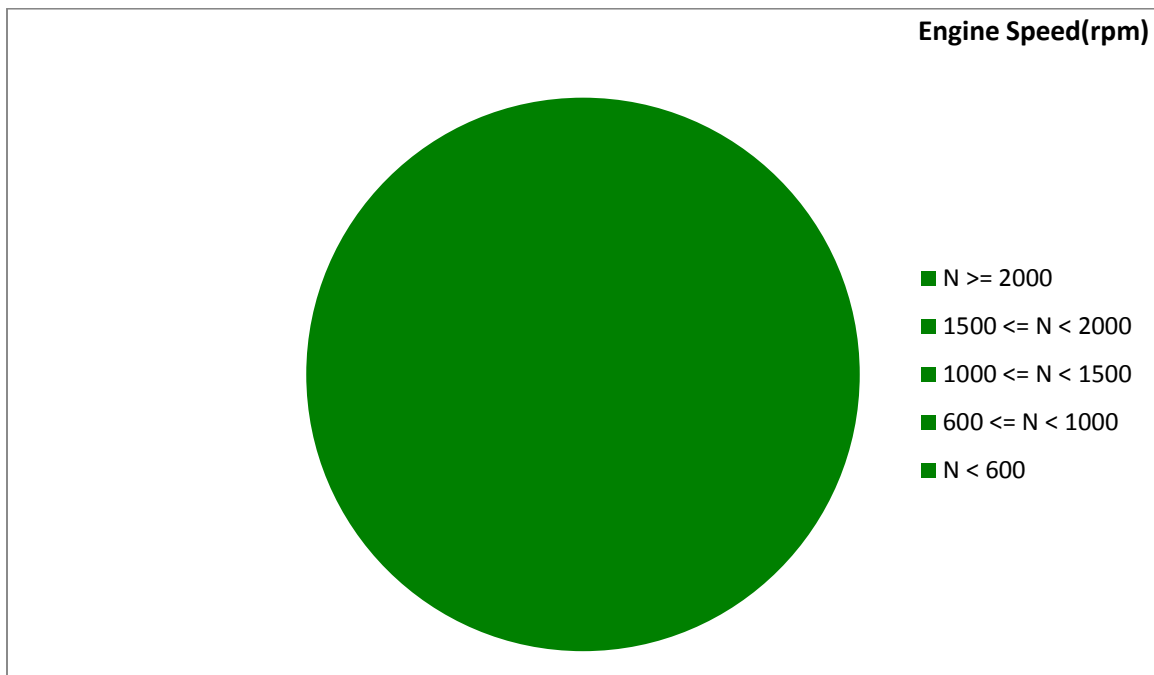


Figure 3- Engine speed distribution over the working hours

Table 4- Mean values

Mean temperature (C)	Mean pressure(mbar)	Mean engine speed(rpm)
259.04	5.05	-

Table 5- Mean values without idling

Mean temperature (C)	Mean pressure(mbar)	Mean engine speed(rpm)
-	-	-

Table 6- Max-min values

Max-min temperature(C)	Max-min pressure(mbar)	Max-min engine speed(rpm)
582-50	96-0	-

Notice: Due to data logger technical problem, rpm sensor data were missing. So engine speed's related parameters were left blank.

Detailed Pressure Analysis

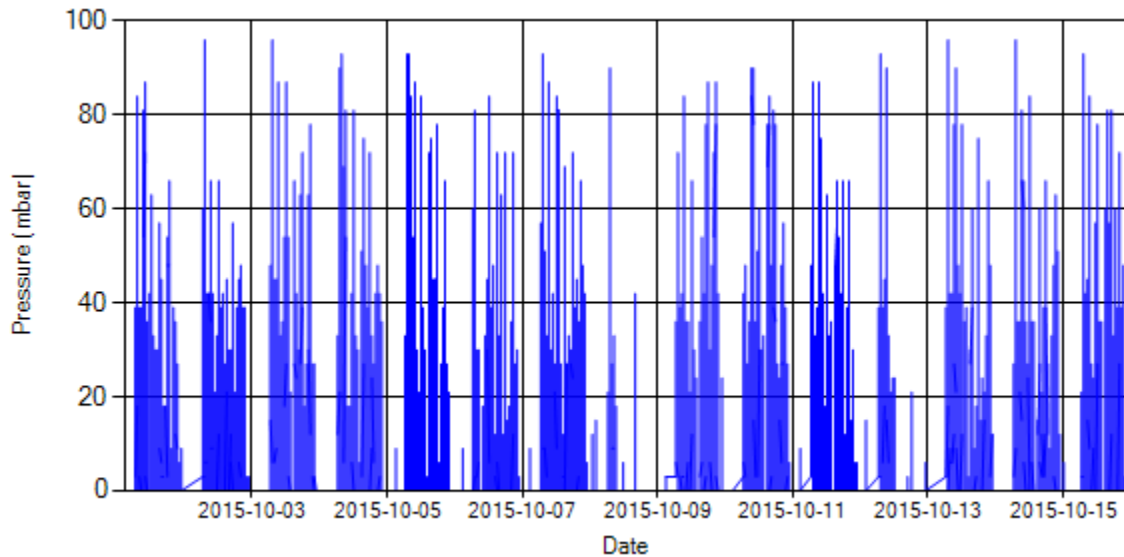


Figure 4- Pressure distribution over the period

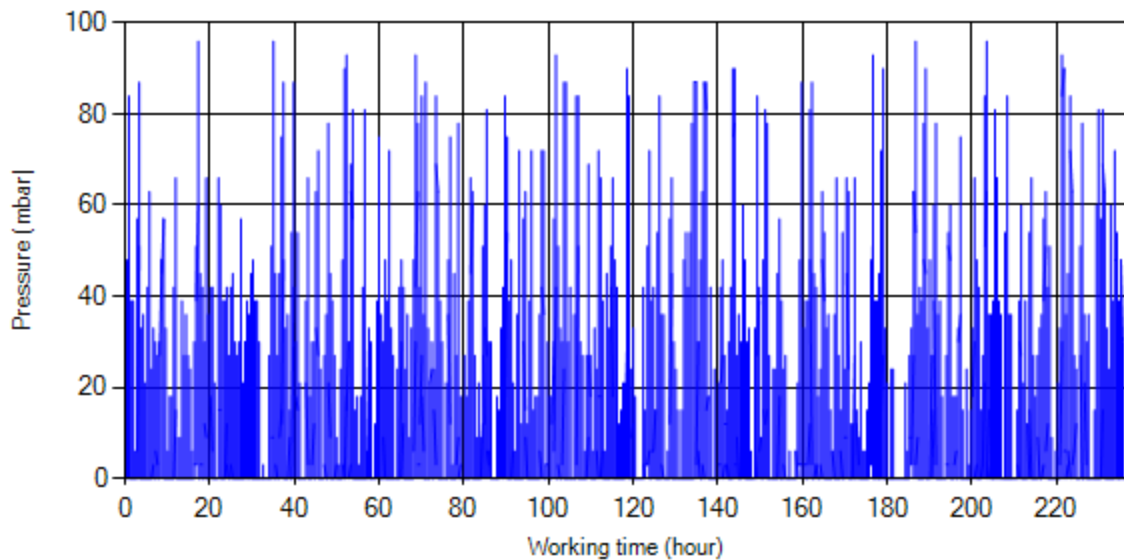


Figure 5- Pressure vs. working hours

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.

Detailed Temperature Analysis

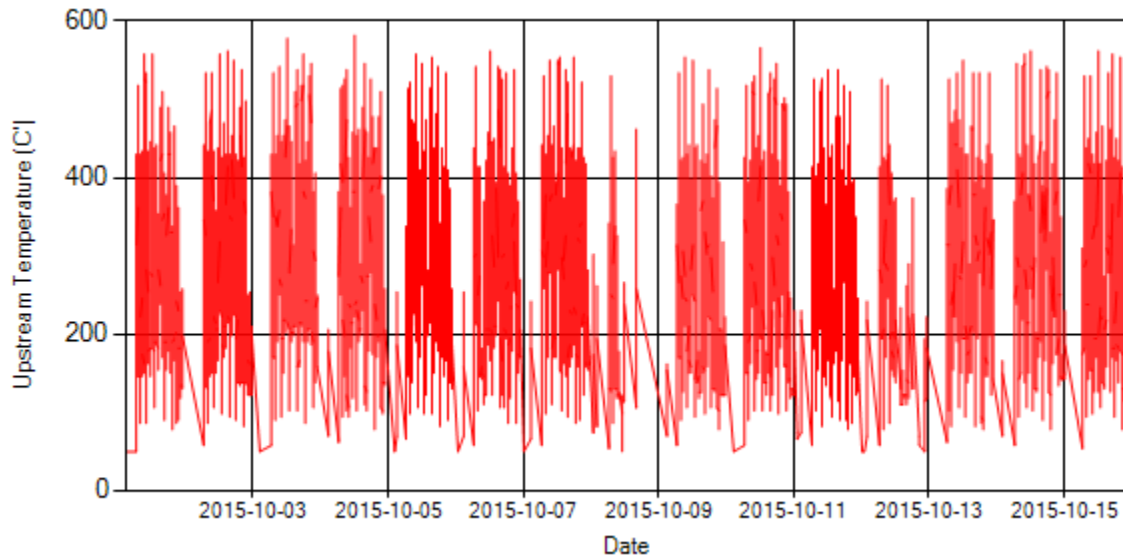


Figure 6- Temperature distribution over the period

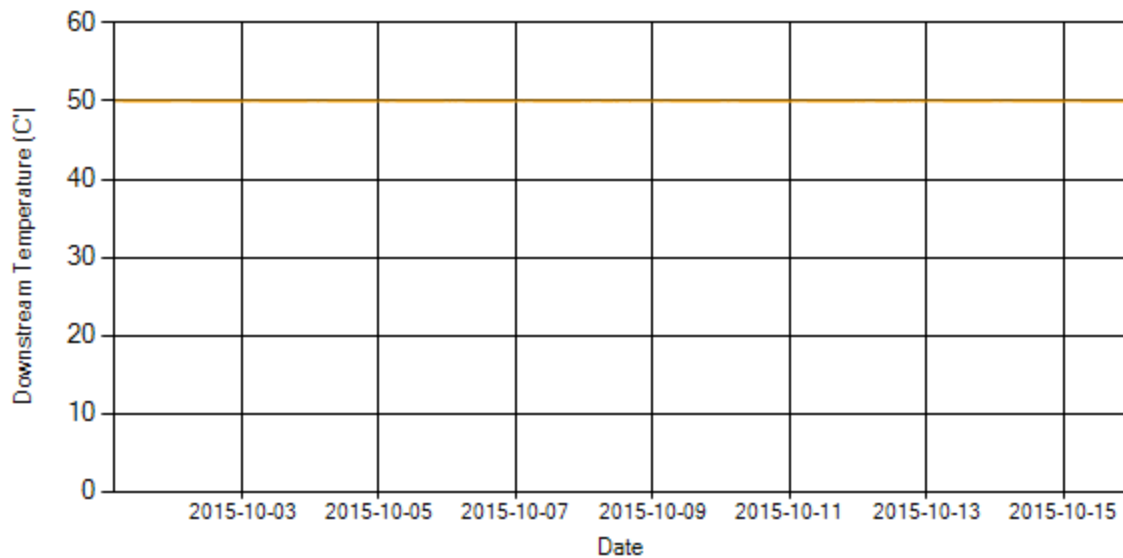


Figure 7- Temperature distribution over the period

Notice: Temperature 2 sensor was showing constant value due to data logger problem.

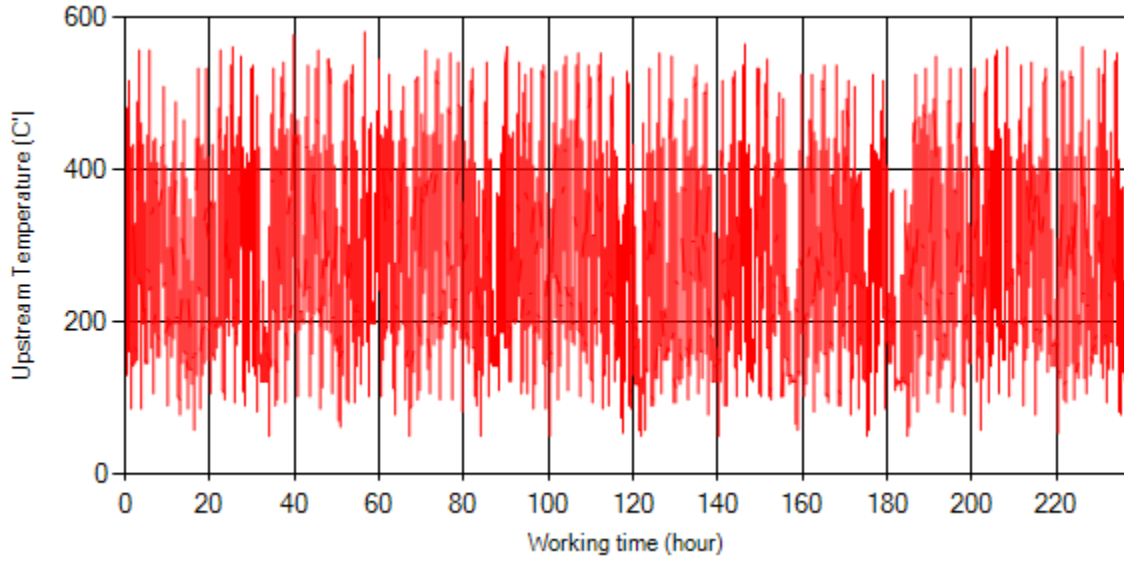


Figure 8- Temperature vs. working hours

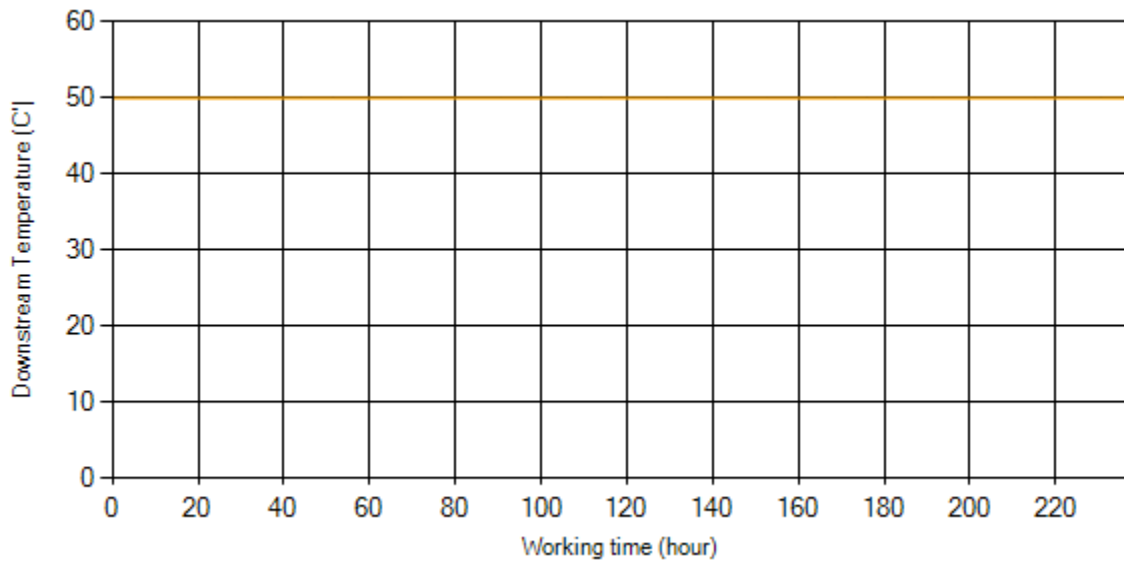


Figure 9- Temperature vs. working hours

Engine Speed Diagrams

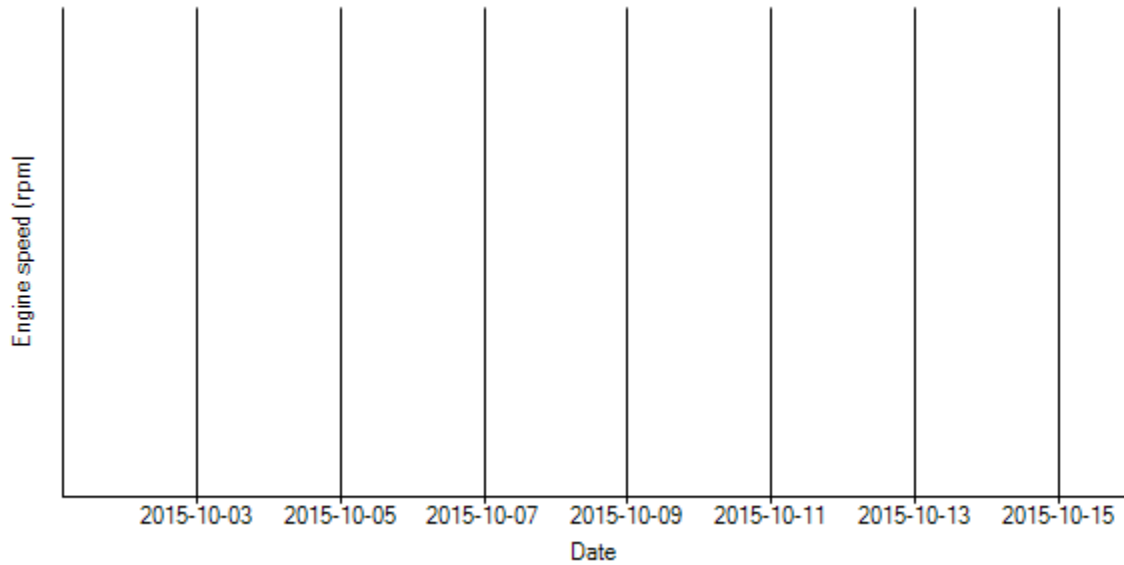


Figure 10- Engine speed distribution over the period

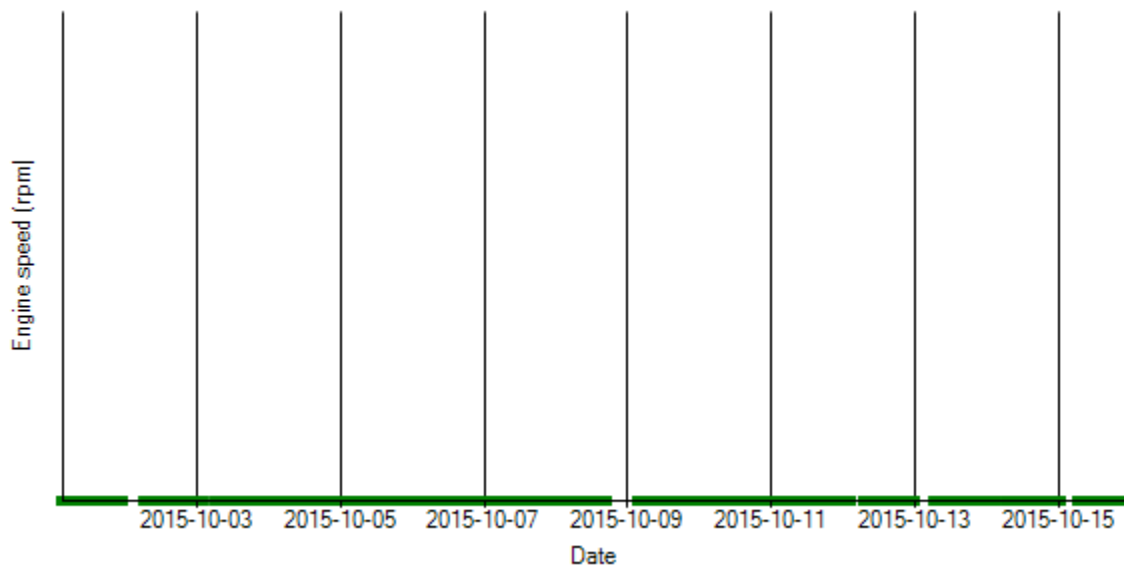


Figure 11- Engine speed diagram for calculating CPK's working days

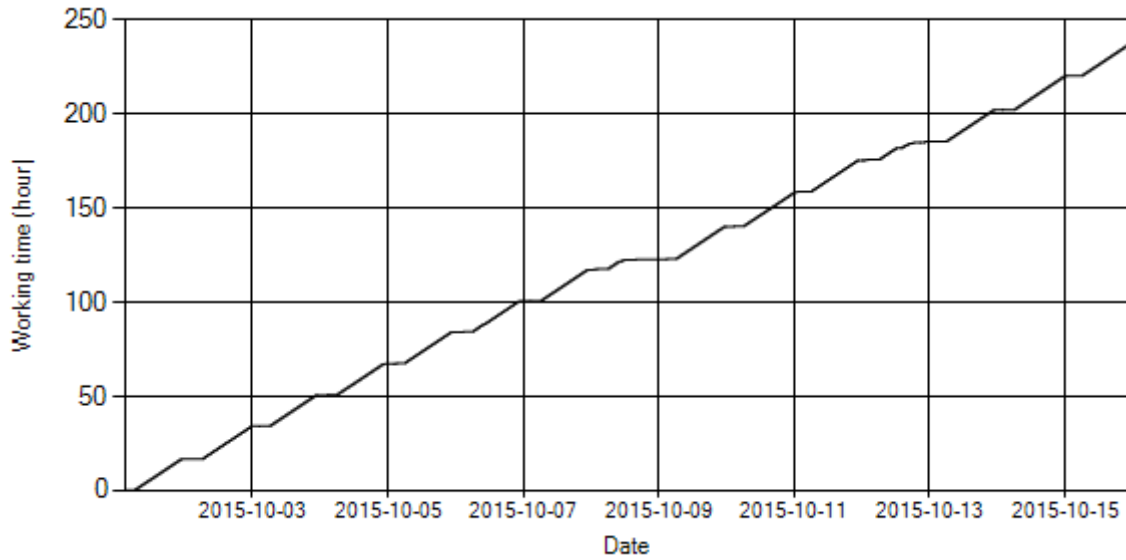


Figure 12- Time diagram for calculating CPK's working days

Notice: Data logger sampling time can be calculated from Figure 12. The lines parallel with Date axis show days without data logger data.

Pressure-Engine Speed diagrams

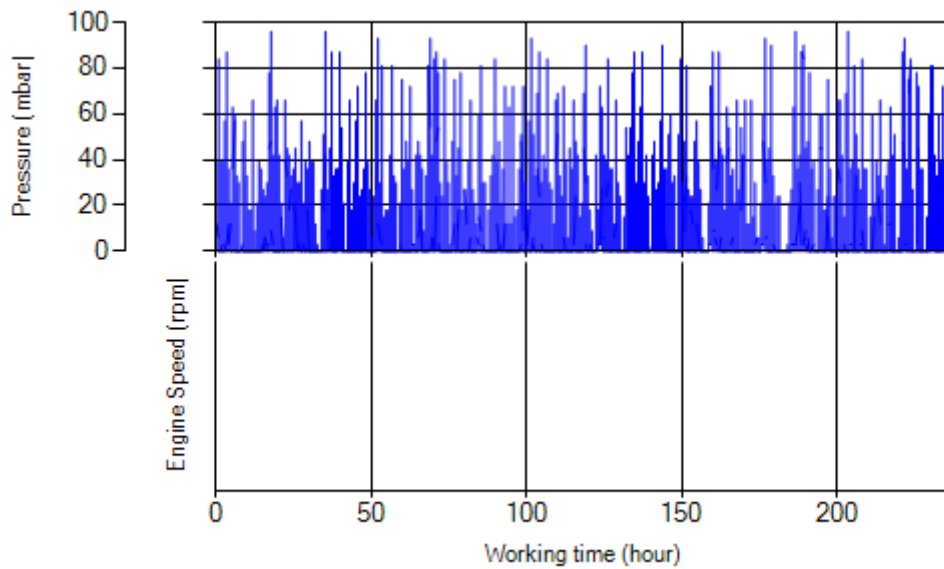


Figure 13- P, N distribution vs. working hours

Temperature-Engine Speed diagrams

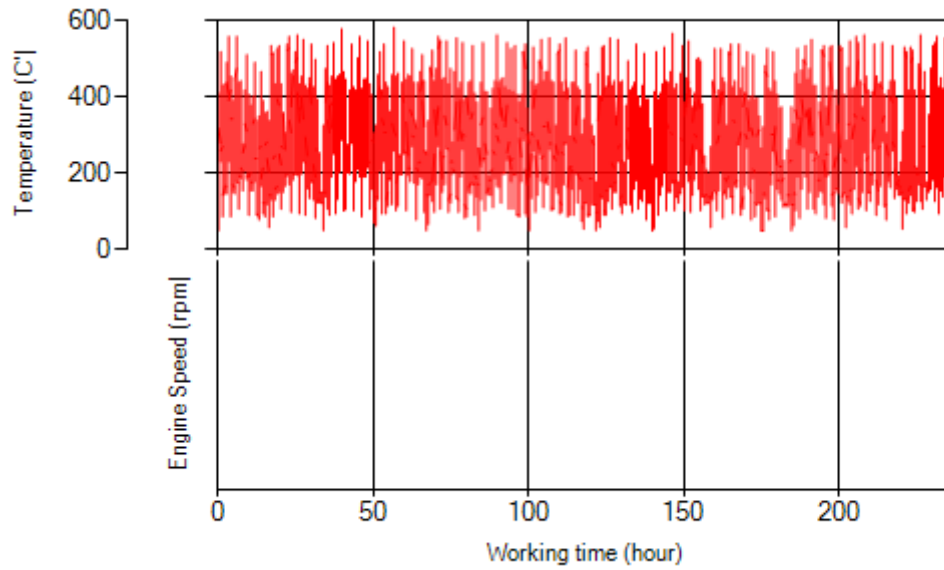


Figure 14- T, N distribution vs. working hours

Filter Operation Analysis

Notice: System was working without DPF during this period.

Notice: System was working without DPF during this period

Overall Information

Table1- Overall Information

Vehicle plate number	78524
CPK data logger number	LN: 001443, DN: 1930, Sim +989218786219
Bus line	Number 4 (south to north Bus line)
Bus Terminals	Tehran South Bus Terminal - Park Way Bus Terminal
Total path distance	22.8 km
DPF producer company	PURltech (Passive system with FBC)
Installation date	28/Jan/2015
Report period	16/Oct/2015 – 31/Oct/2015 (sixteen days)
K value – DPF upstream	1.85 [1/m]
K value – DPF downstream	0.02 [1/m]

Table 2- DPF Maintenance History

Filter maintenance date	<p>DPF core was removed on Jul 22nd and was cleaned on Aug 12th for the first time.</p> <p>Considering system relatively high backpressure, filter isolation defect and air filter's deformation, DPF core was removed on Sep 16th and will be installed on system after cleaning and improving isolation system.</p>
Dosing status	Dosing value has been kept constant from installation date until now.

Table 3- Fuel and Additive Consumption Information

Bus mileage (from DPF installation date)	41660 km
Bus mileage over the period	2457 km
Working days over the period	10 days
Stop days	5 days
Data logger working days	10 days
Working hours over the period	204 hours 43 minutes
Average working hours per day (including stop days)	12 hours 2 minutes
Bus average speed	12 km/hr
idle speed time to all working time ration	- %
Total Bus fuel consumption over the period	1537 lit
Fuel consumption per hour	7.51 lit/hr
Average fuel consumption	0.63 lit/km
Total Bus additive consumption over the period	- lit
Average additive consumption	- cc/km
Additive consumption to fuel ration	- cc/1000lit

Notice: Due to some technical problem related to data logger, rpm data were missing. So related parameters like idling speed were left blank.

Notice: DPF core was removed on Sep 16th and additive system was disconnected, so additive consumption during this period was zero.

Notice: Considering data logger problem and stop days with switch on, working hours and its related parameters were unreliable.

Temperature, Pressure and Engine Speed Overview

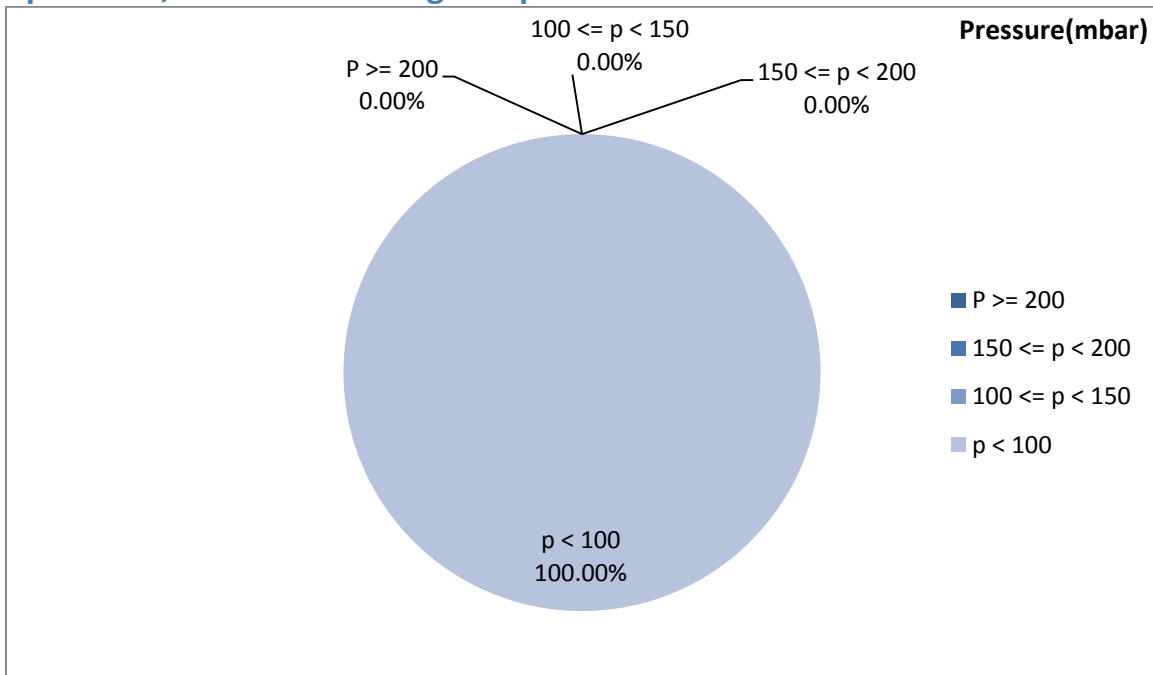


Figure 1- Pressure distribution over the working hours

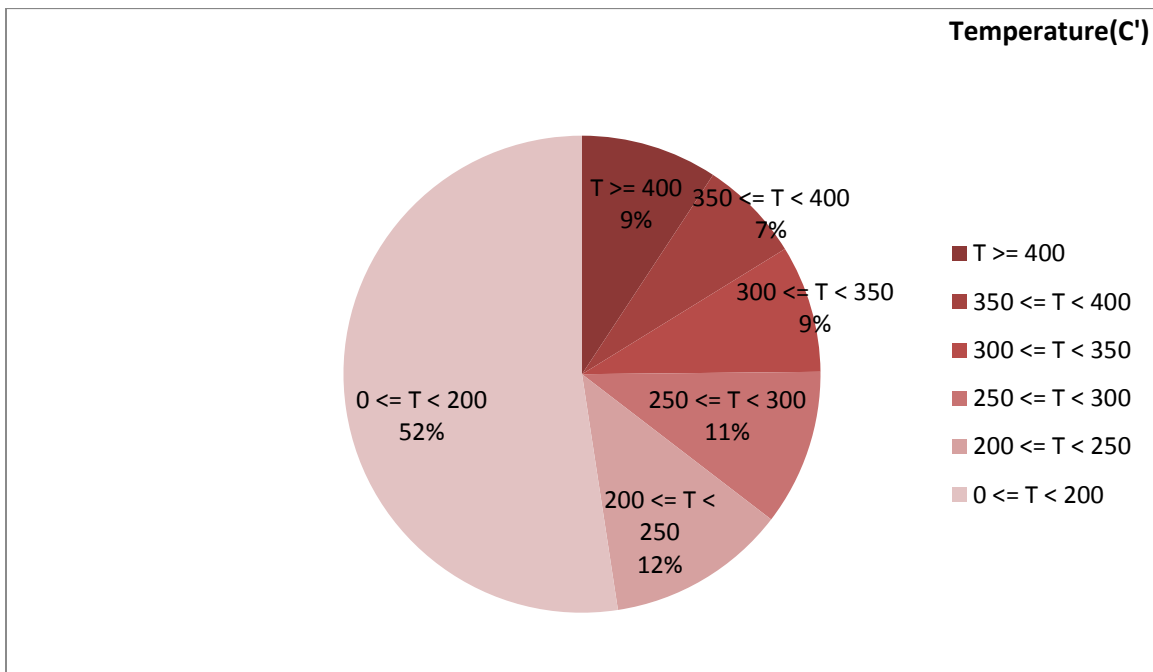


Figure 2-Temperature distribution over the working hours

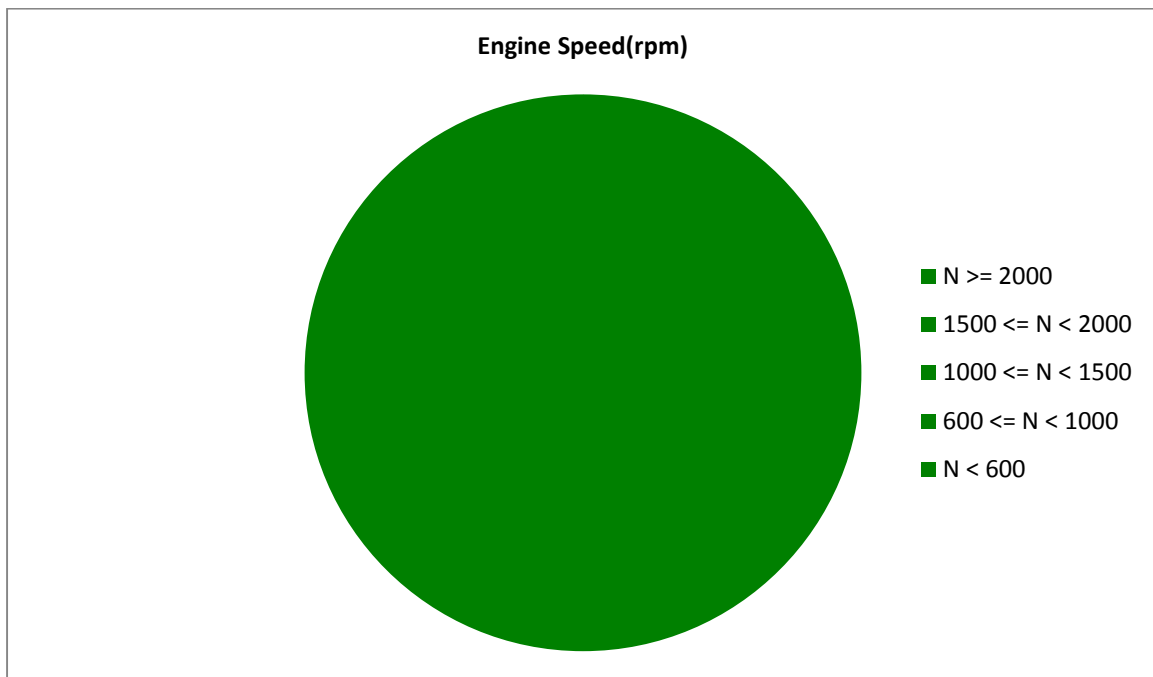


Figure 3- Engine speed distribution over the working hours

Table 4- Mean values

Mean temperature (C)	Mean pressure(mbar)	Mean engine speed(rpm)
217.95	4.01	-

Table 5- Mean values without idling

Mean temperature (C)	Mean pressure(mbar)	Mean engine speed(rpm)
-	-	-

Table 6- Max-min values

Max-min temperature(C)	Max-min pressure(mbar)	Max-min engine speed(rpm)
562-50	96-0	0-0

Notice: Due to data logger technical problem, rpm sensor data missed. So engine speed's related parameters were left blank.

Detailed Pressure Analysis

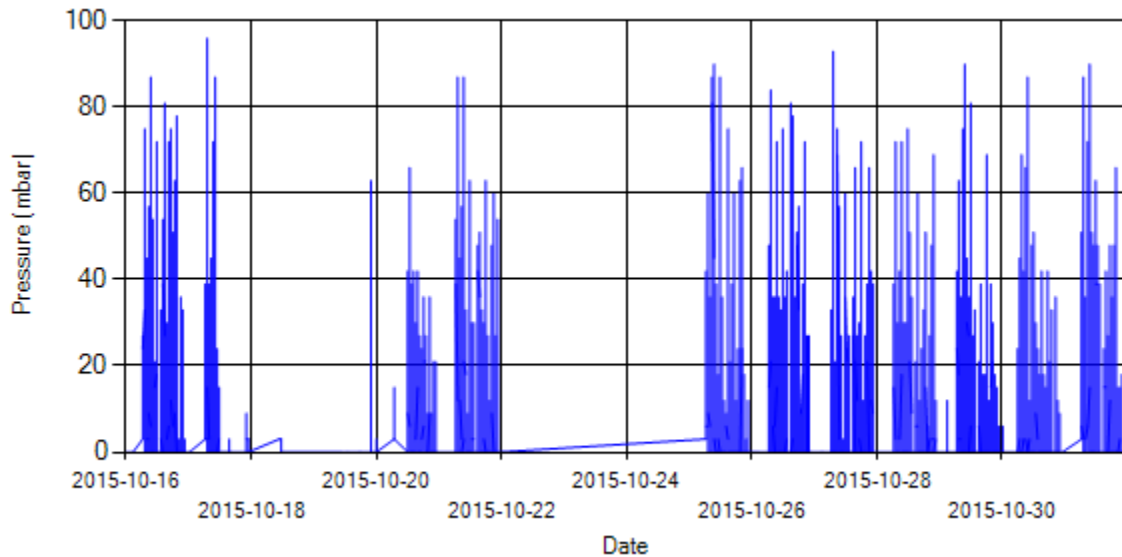


Figure 4- Pressure distribution over the period

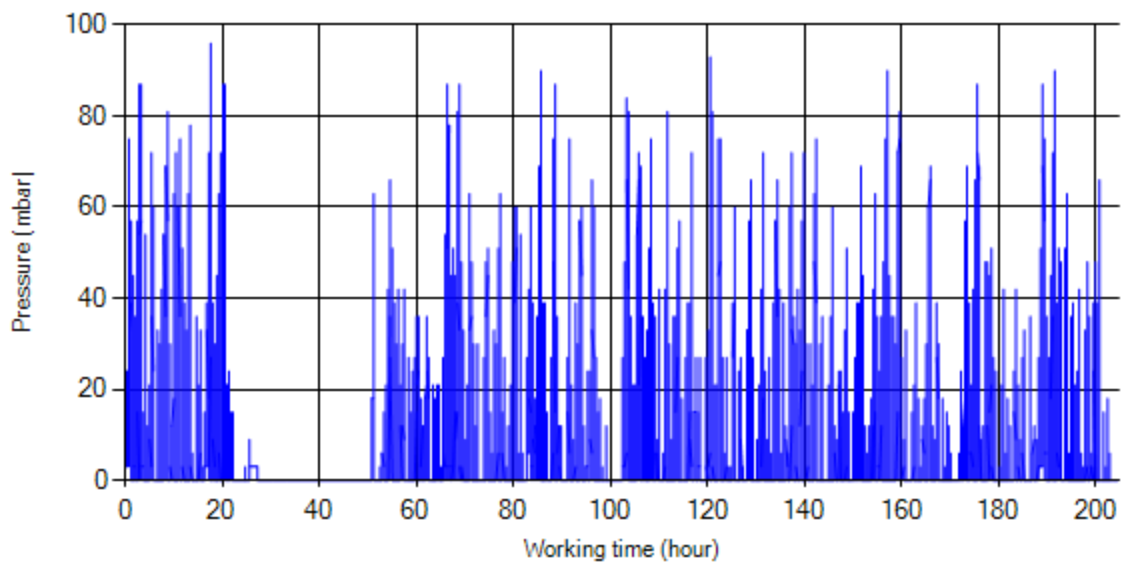


Figure 5- Pressure vs. working hours

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.

Detailed Temperature Analysis

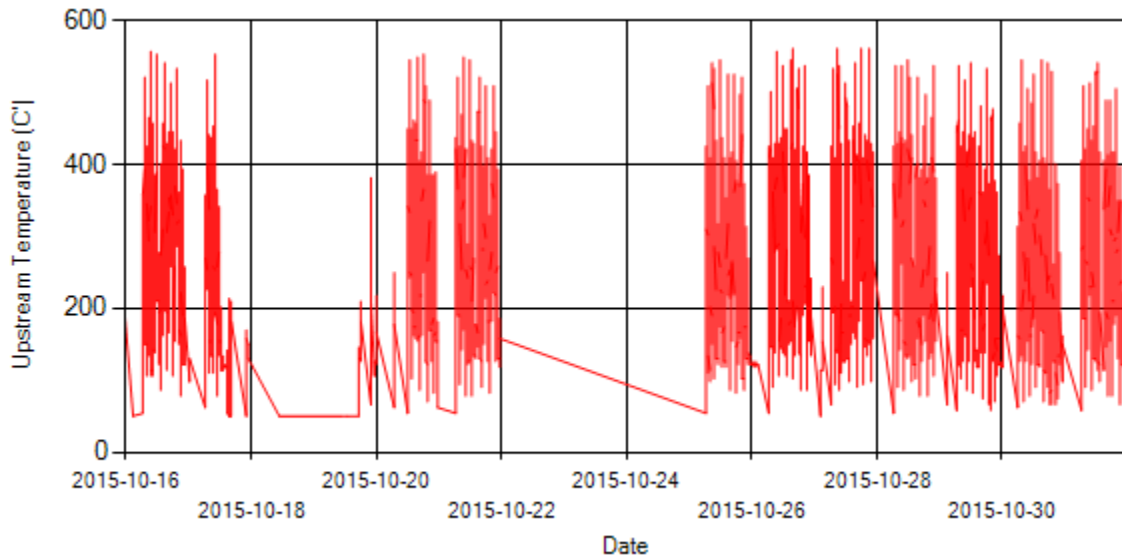


Figure 6- Temperature distribution over the period

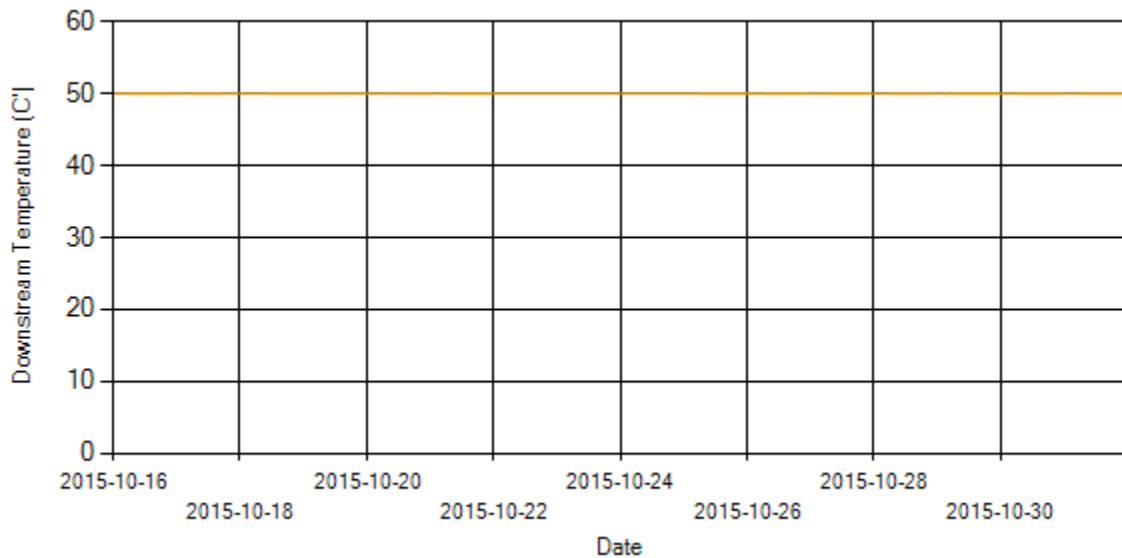


Figure 7- Temperature distribution over the period

Notice: Temperature 2 sensor was showing constant value due to data logger problem.

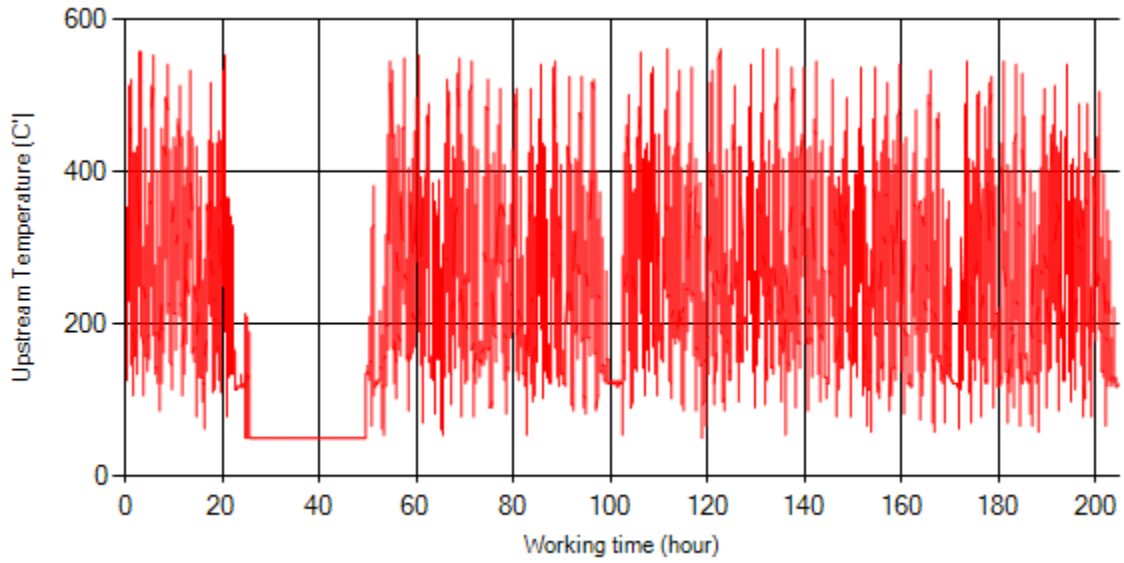


Figure 8- Temperature vs. working hours

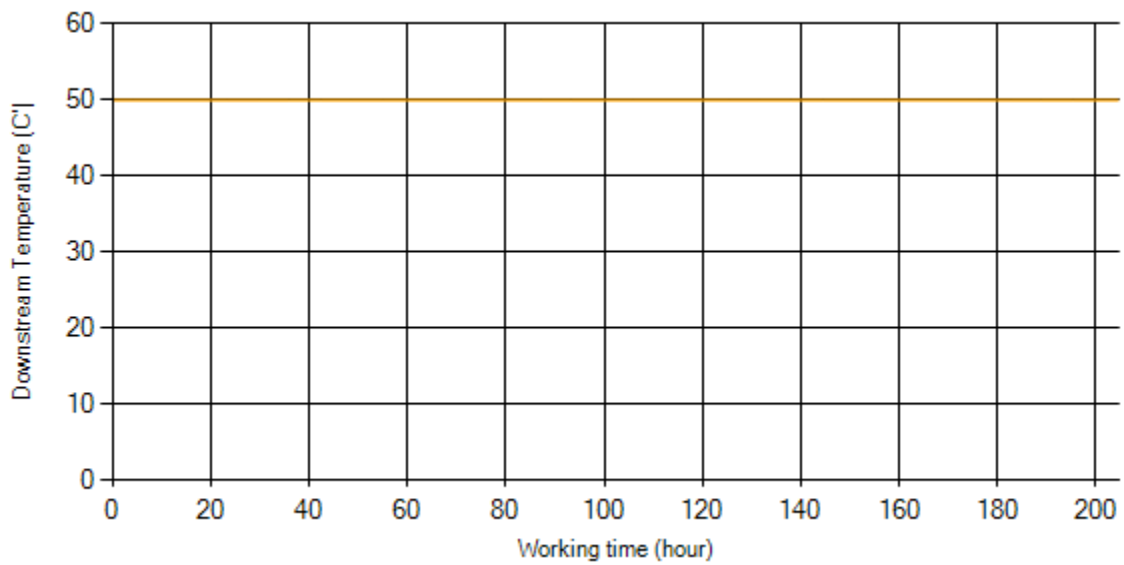


Figure 9- Temperature vs. working hours

Engine Speed Diagrams

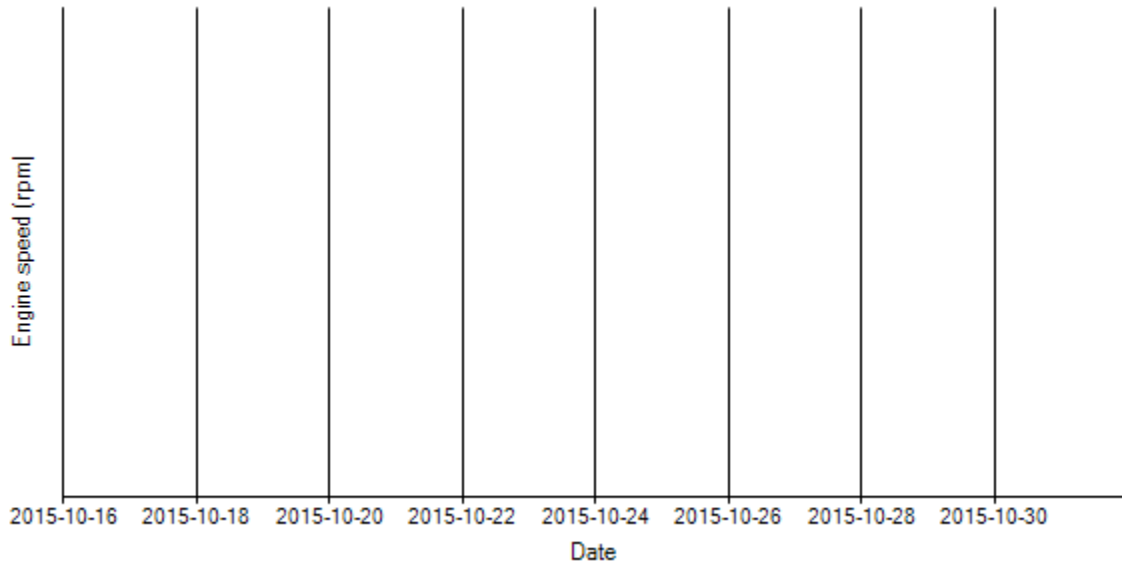


Figure 10- Engine speed distribution over the period

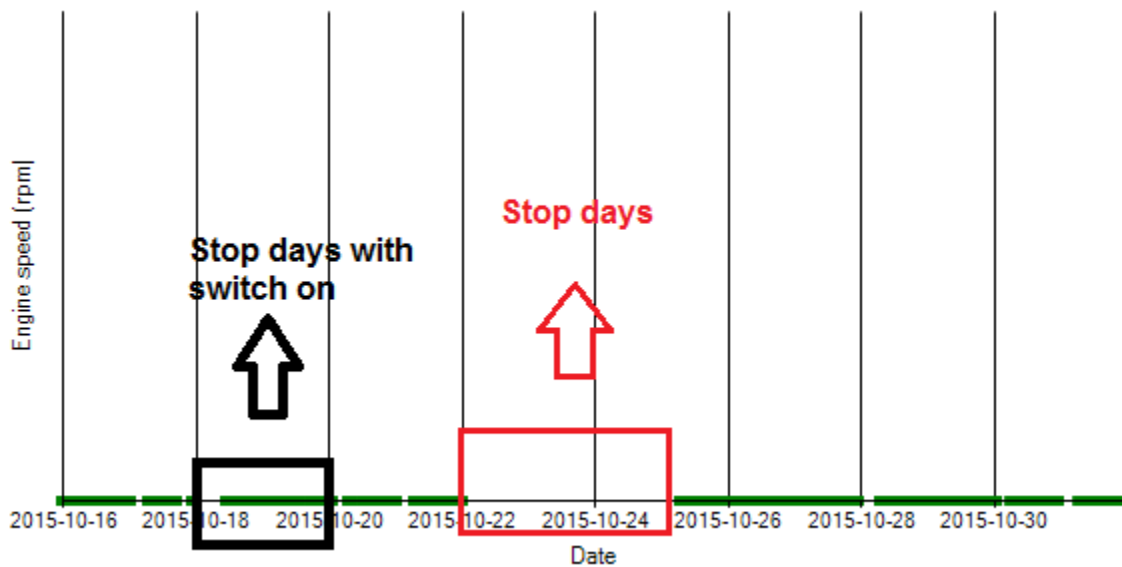


Figure 11- Engine speed diagram for calculating CPK's working days

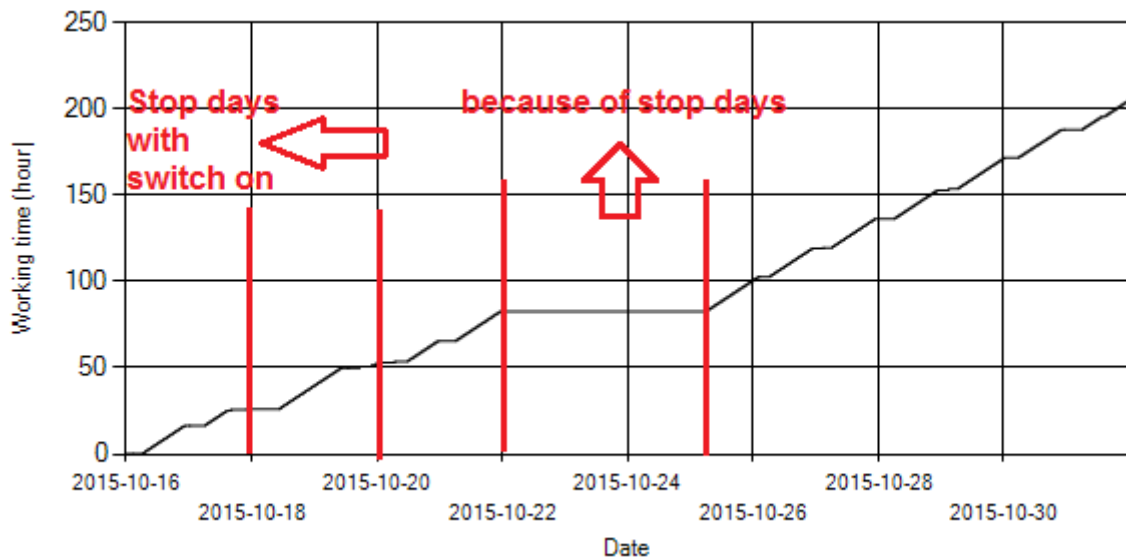


Figure 12- Time diagram for calculating CPK's working days

Notice: Data logger sampling time can be calculated from Figure 12. The lines parallel with Date axis show days without data logger data. Considering figures 4 and 6 beside bus company report, Oct 18th and 19th were stop days with switch on (RPM=0). But due to data logger problem, it can't be distinguished from working days.

Pressure-Engine Speed diagrams

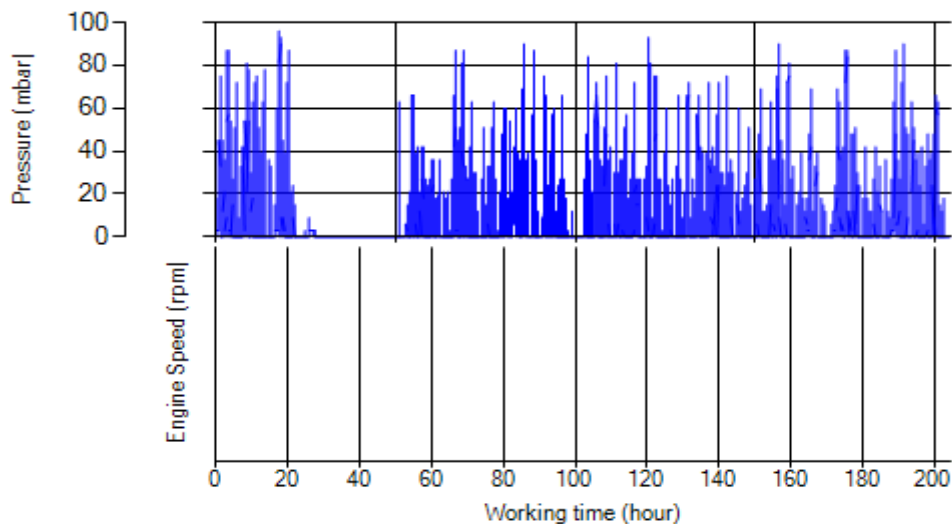


Figure 13- P, N distribution vs. working hours

Temperature-Engine Speed diagrams

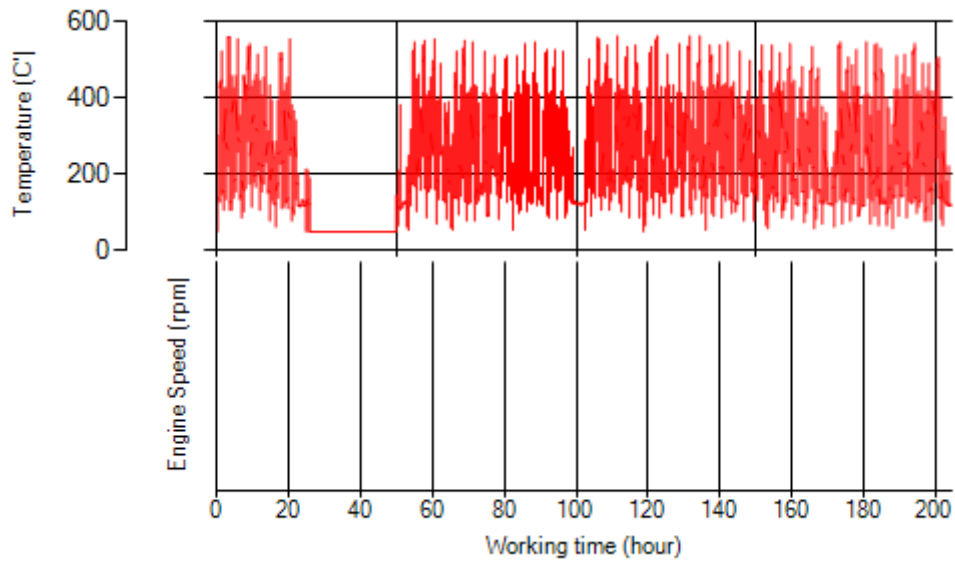


Figure 14- T, N distribution vs. working hours

Filter Operation Analysis

Notice: System was working without DPF during this period.

Vehicle plate number	33572 (28958)
Bus line	Number 2 (west to east bus line)
DPF producer company	HJS_03 (active system with FBC – electrical heater)



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Overall Information

Table1- Overall Information

Vehicle plate number	33572 (28958)
CPK data logger number	LN: 001521, DN: 1995, Sim Number +989218469643
Bus line	Number 2 (west to east bus line)
Bus Terminals	Khavaran Bus Terminal - Western Bus Terminal
Total path distance	19 km
DPF producer company	HJS_03 (active system with FBC – electrical heater)
Installation date	19/Feb/2015
Report period	01/Oct/2015 – 15/Oct/2015 (fifteen days)
K value - DPF upstream	1.70 [1/m]
K value – DPF downstream	0.02 [1/m]

Table 2- DPF Maintenance History

Filter maintenance date	DPF was cleaned on Oct 5 th for the first time.
Dosing status	Dosing value has been kept constant from installation date until now.

Table 3- Fuel and Additive Consumption Information

Bus mileage (from DPF installation date)	32741 km
Bus mileage over the period	1914 km
Working days over the period	14 days
Stop days	1 days
Data logger working days	14 days
Working hours over the period	167 hours 58 minutes
Average working hours per day (including stop days)	11 hours 11 minutes
Bus average speed	11.39 km/hr
idle speed time to all working time ration	51.15 %
Total Bus fuel consumption over the period	1244 lit
Fuel consumption per hour	7.40 lit/hr
Average fuel consumption	0.65 lit/km
Total Bus additive consumption over the period	0.540 lit
Average additive consumption	283 cc/km
Additive consumption to fuel ration	435 cc per 1000 lit (batch dosing with tank level)

Notice: RPM sensor had problem from Oct 1st until Oct 6th. So engine speed related parameters were calculated from available data (Oct 7th – Oct 15th)

Temperature, Pressure and Engine Speed Overview

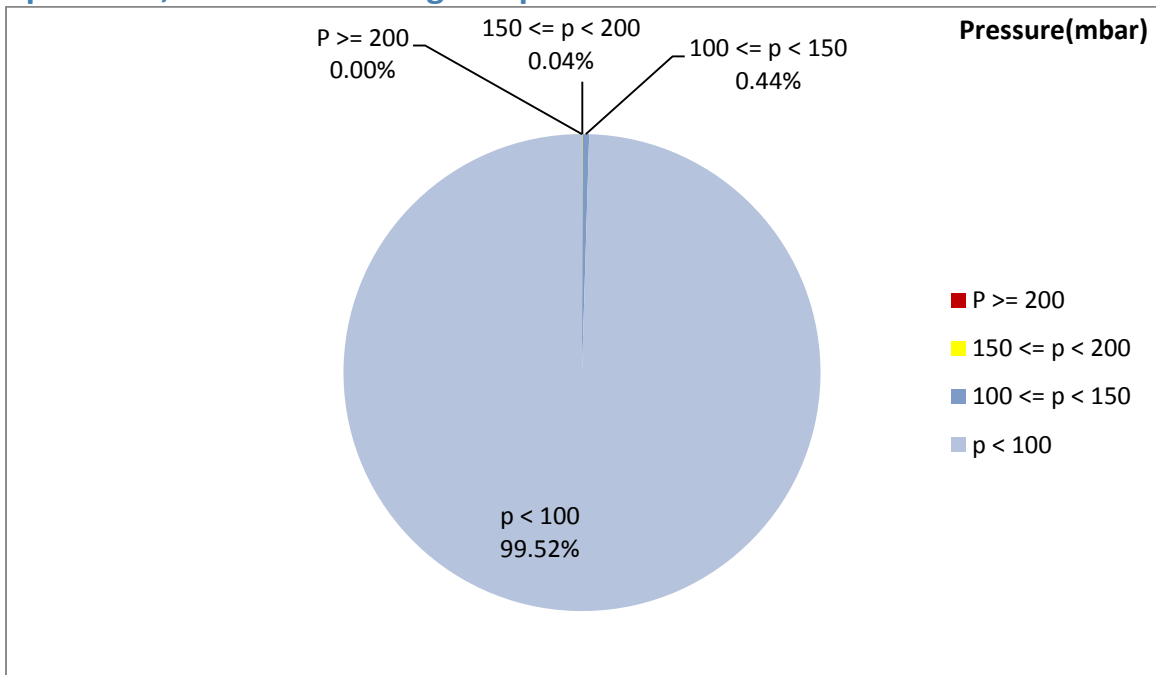


Figure 1- Pressure distribution over the working hours

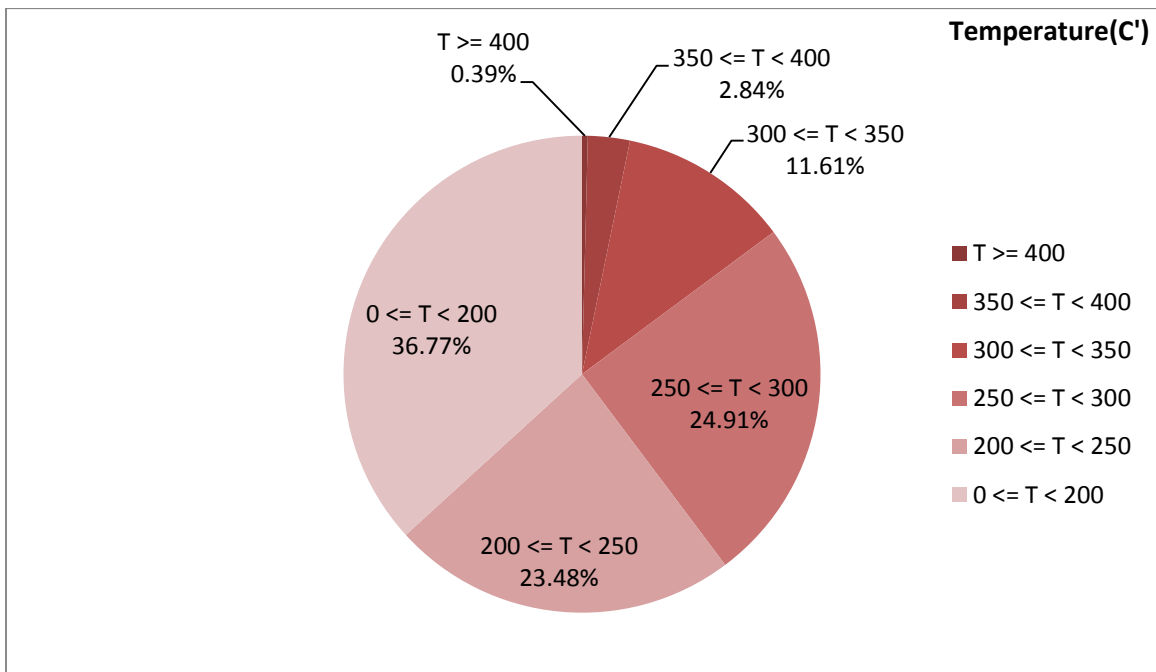


Figure 2-Temperature distribution over the working hours

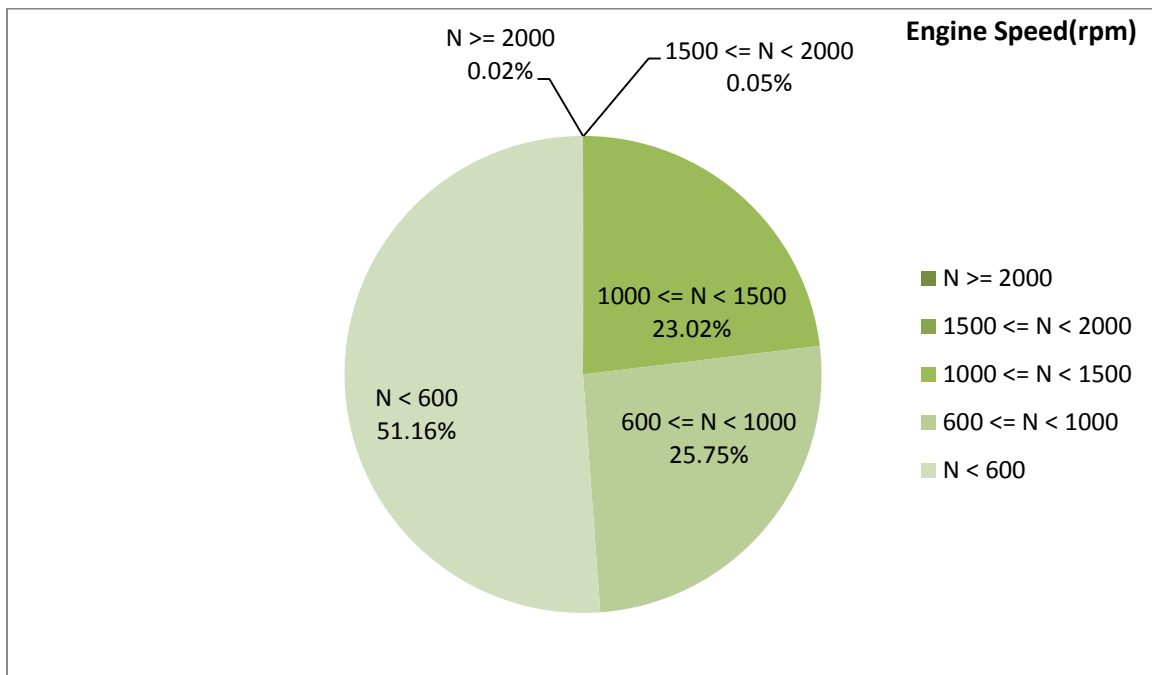


Figure 3- Engine speed distribution over the working hours

Notice: RPM sensor had problem from Oct 1st until Oct 6th. So engine speed related parameters were calculated from available data (Oct 7th – Oct 15th).

Table 4- Mean values

Mean temperature (C)	Mean pressure(mbar)	Mean engine speed(rpm)
224.11	14.56	748

Table 5- Mean values without idling

Mean temperature (C)	Mean pressure(mbar)	Mean engine speed(rpm)
274.57	23.54	959

Table 6- Max-min values

Max-min temperature(C)	Max-min pressure(mbar)	Max-min engine speed(rpm)
470-50	195-0	2144-336

Notice: RPM sensor had problem from Oct 1st until Oct 6th. So engine speed related parameters were calculated from available data (Oct 7th – Oct 15th).

Detailed Pressure Analysis

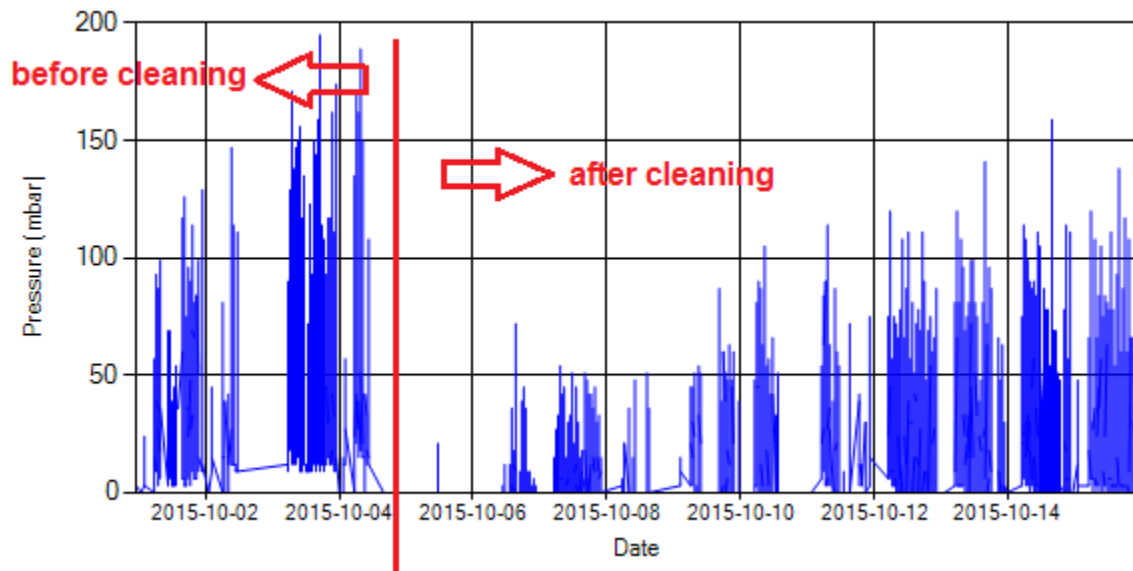


Figure 4- Pressure distribution over the period

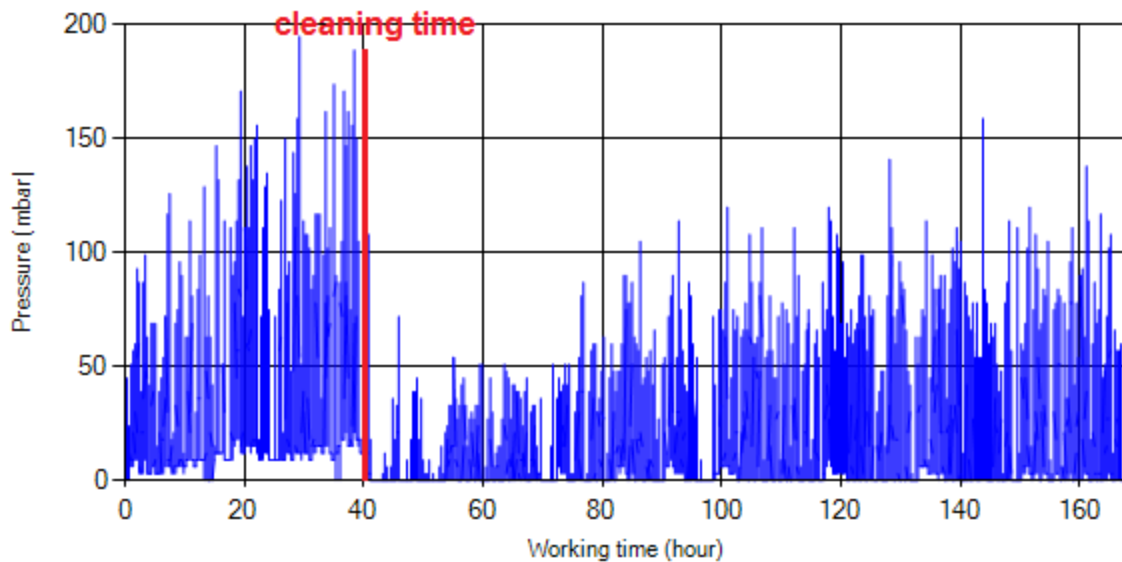


Figure 5- Pressure vs. working hours

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.

Detailed Temperature Analysis

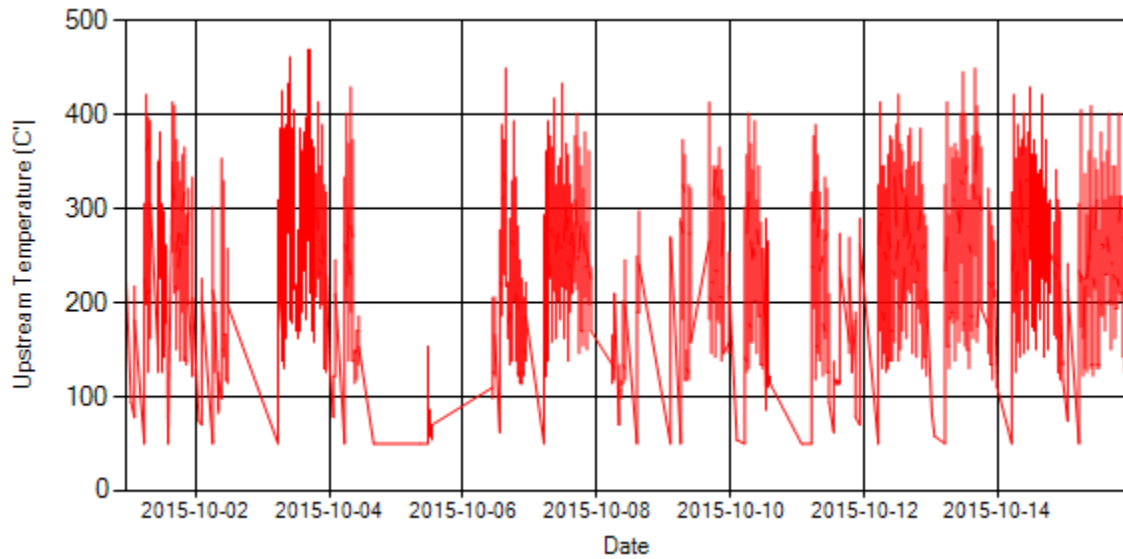


Figure 6- Temperature distribution over the period

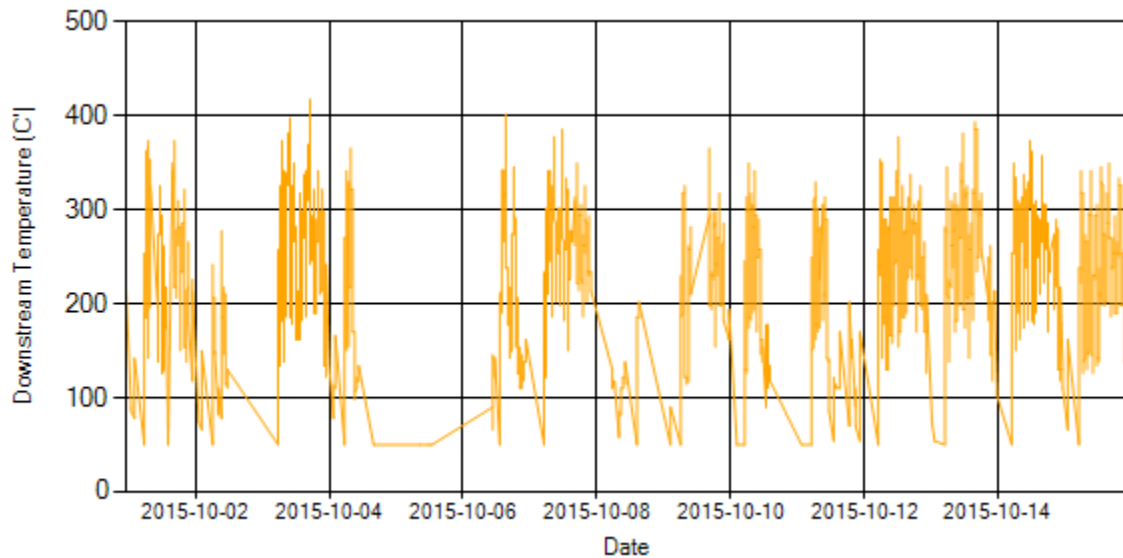


Figure 7- Temperature distribution over the period

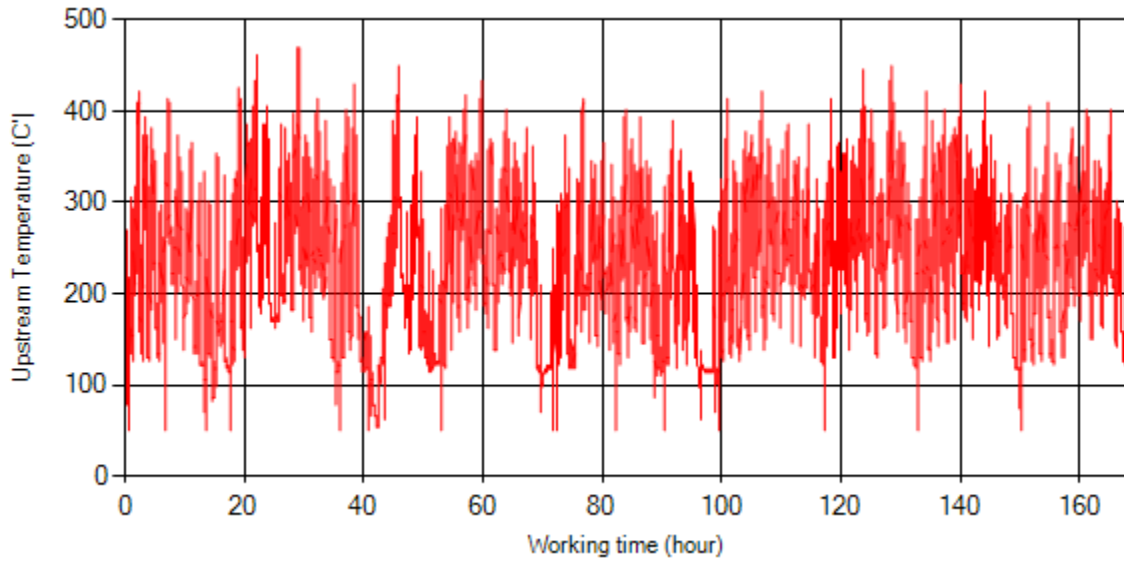


Figure 8- Temperature vs. working hours

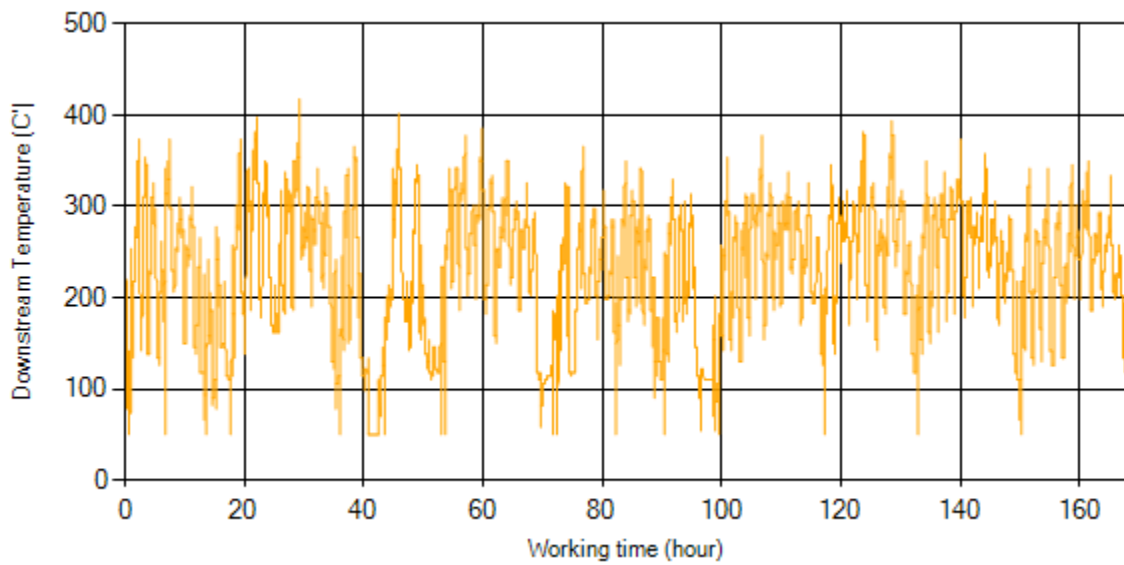


Figure 9- Temperature vs. working hours

Engine Speed Diagrams

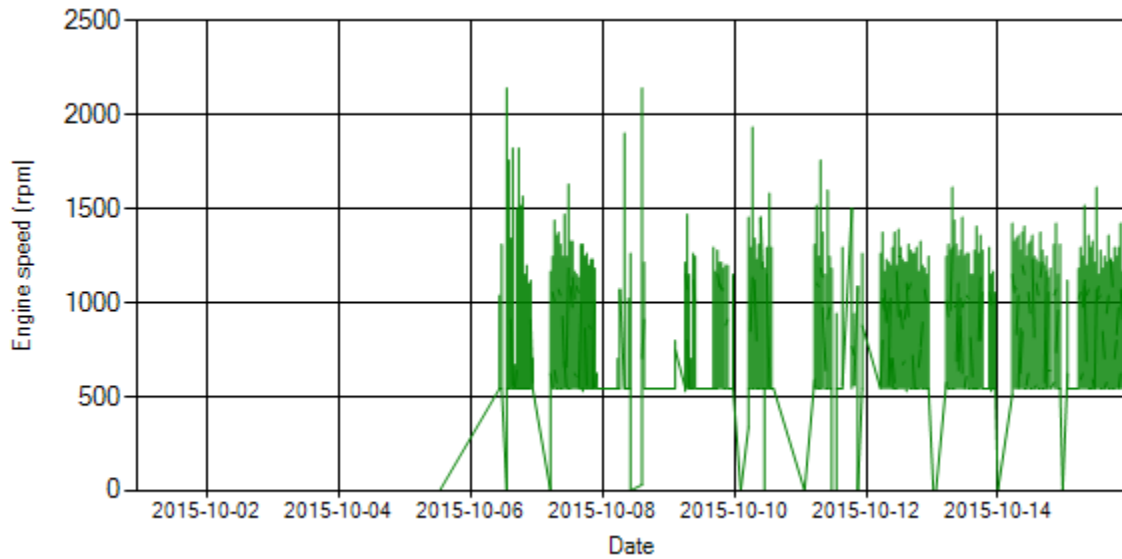


Figure 10- Engine speed distribution over the period

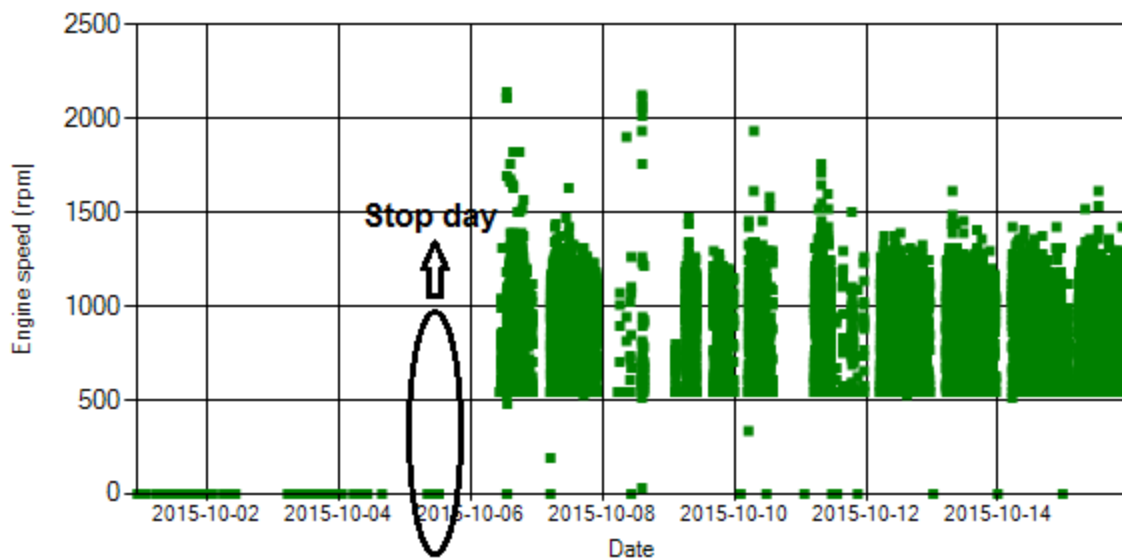


Figure 11- Engine speed diagram for calculating CPK's working days

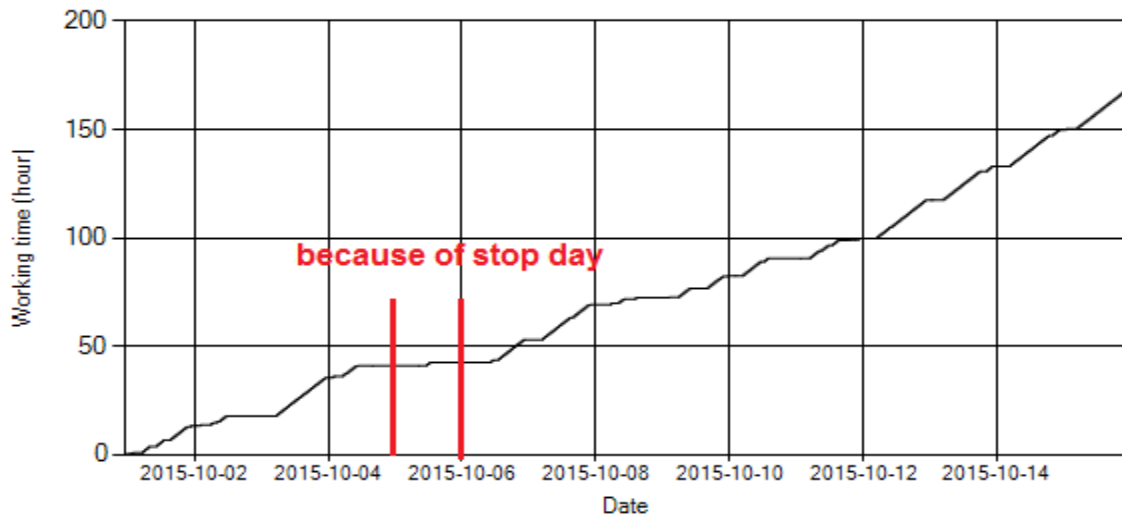


Figure 12- Time diagram for calculating CPK's working days

Notice: Data logger sampling time can be calculated from Figure 12. The lines parallel with Date axis show days without data logger data.

Pressure-Engine Speed diagrams

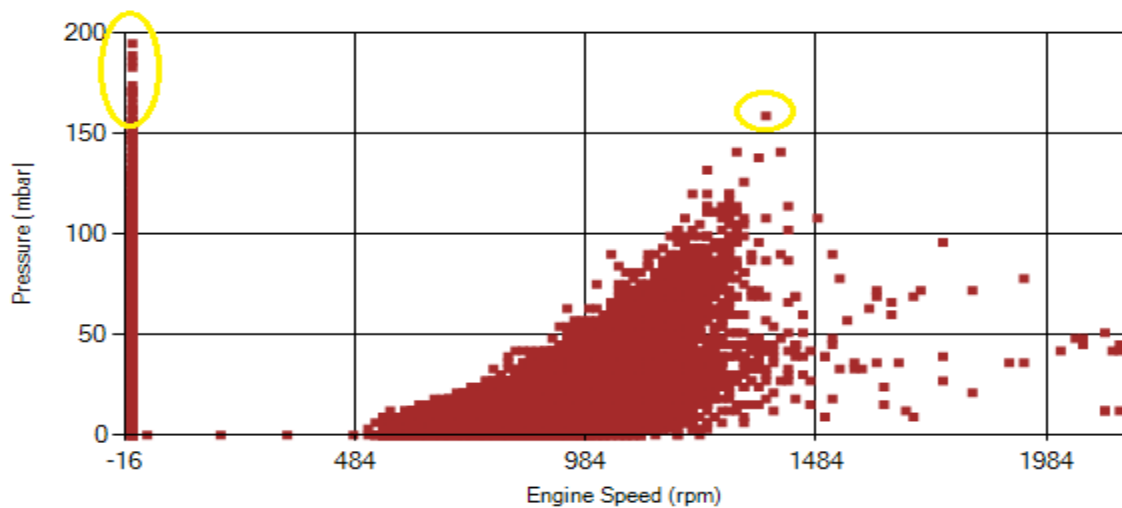


Figure 13- Pressure against engine speed

Notice: Yellow alarm (200>pressure>150) range was indicated in figure 13.

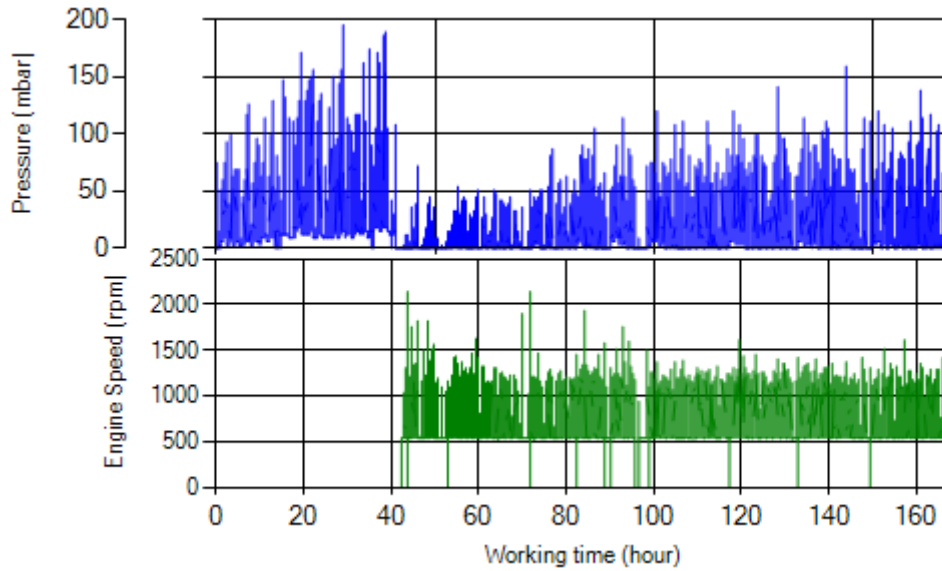


Figure 14- P, N distribution vs. working hours

Temperature-Engine Speed diagrams

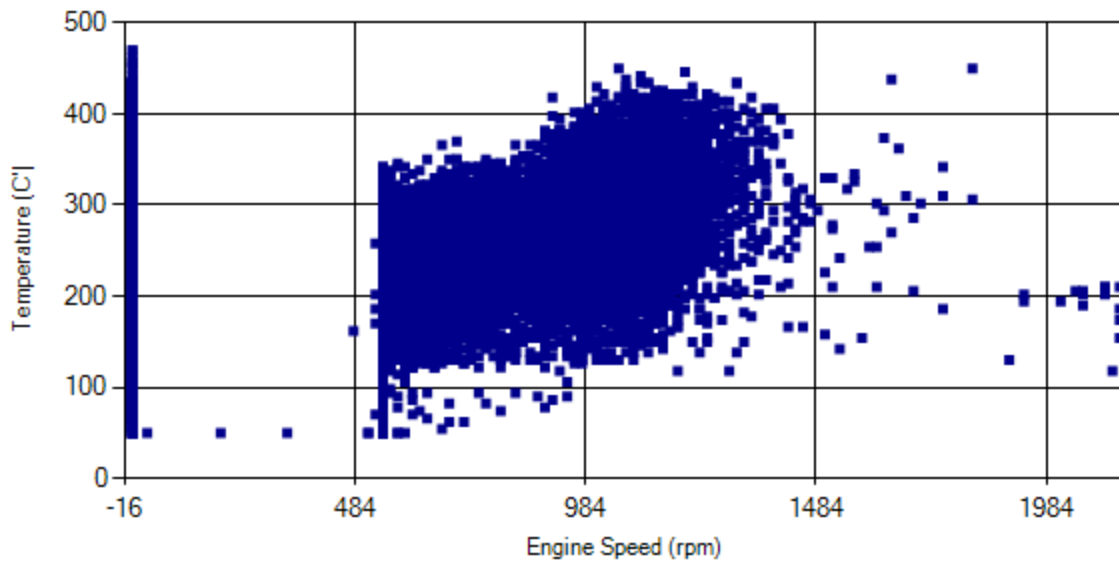


Figure 15- Temperature against engine speed

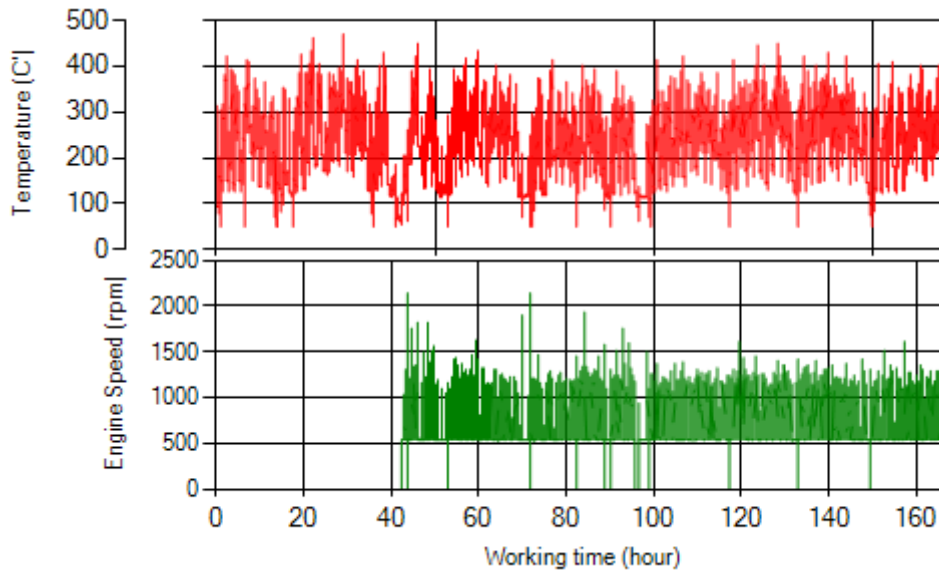


Figure 16- T, N distribution vs. working hours

Filter Operation Analysis

- As depicted in figure 1, only 0.04% of total working time pressure was above 150 mbar during this period. This low pressure distribution was due to filter cleaning on Oct 5th.
- Figure 2 displays flow temperature distribution for DPF's upstream. It can be obviously observed that 0.39% of total working time temperature is above 400°C. And 3.23% above 350°C.

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

Overall Information

Table1- Overall Information

Vehicle plate number	33572 (28958)
CPK data logger number	LN: 001521, DN: 1995, Sim Number +989218469643
Bus line	Number 2 (west to east bus line)
Bus Terminals	Khavaran Bus Terminal - Western Bus Terminal
Total path distance	19 km
DPF producer company	HJS_03 (active system with FBC – electrical heater)
Installation date	19/Feb/2015
Report period	16/Oct/2015 – 31/Oct/2015 (sixteen days)
K value - DPF upstream	1.70 [1/m]
K value – DPF downstream	0.02 [1/m]

Table 2- DPF Maintenance History

Filter maintenance date	DPF was cleaned on Oct 5 th for the first time.
Dosing status	Dosing value has been kept constant from installation date until now.

Table 3- Fuel and Additive Consumption Information

Bus mileage (from DPF installation date)	34825 km
Bus mileage over the period	2084 km
Working days over the period	14 days
Stop days	2 days
Data logger working days	10 days
Working hours over the period	-
Average working hours per day (including stop days)	-
Bus average speed	16.8 km/hr
idle speed time to all working time ration	53.98 %
Total Bus fuel consumption over the period	1354 lit
Fuel consumption per hour	- lit/hr
Average fuel consumption	0.65 lit/km
Total Bus additive consumption over the period	0.562 lit
Average additive consumption	270 cc/km
Additive consumption to fuel ration	415 cc per 1000 lit (batch dosing with tank level)

Notice: data logger had fuse problem during this period, so some information was missing.

Temperature, Pressure and Engine Speed Overview

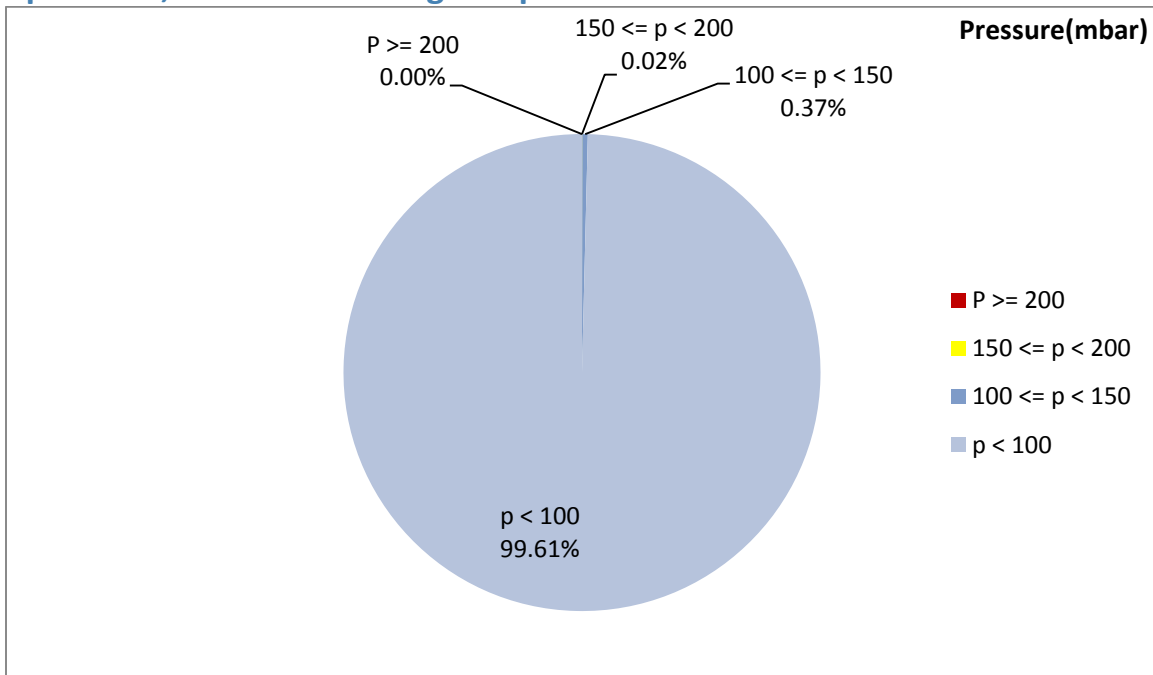


Figure 1- Pressure distribution over the working hours

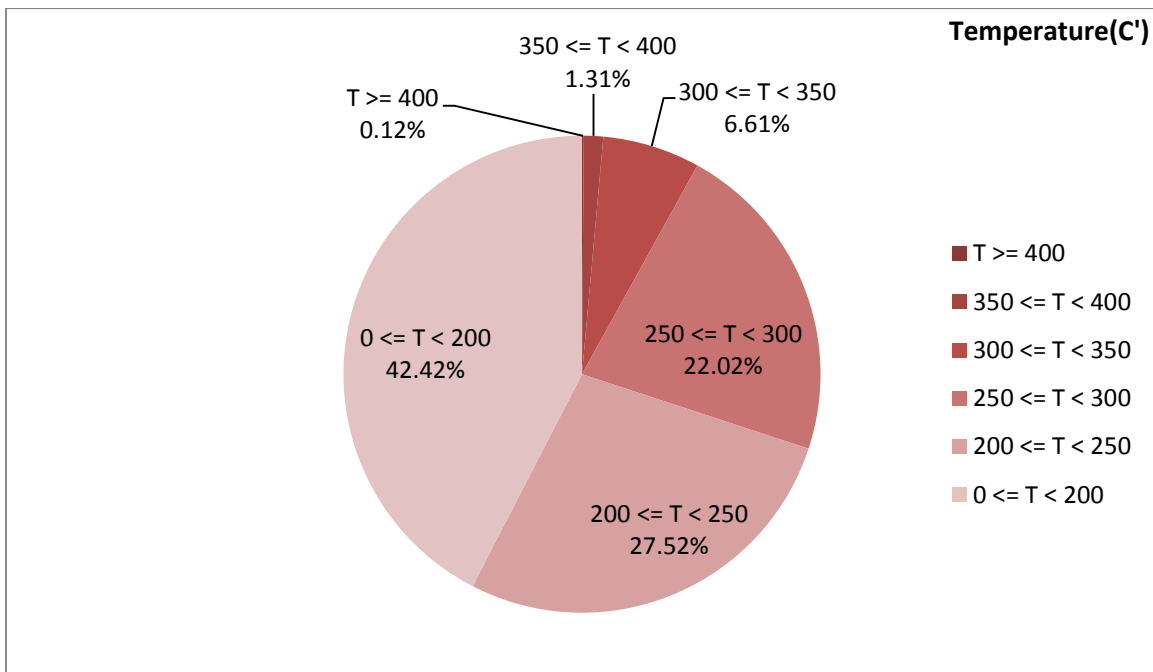


Figure 2-Temperature distribution over the working hours

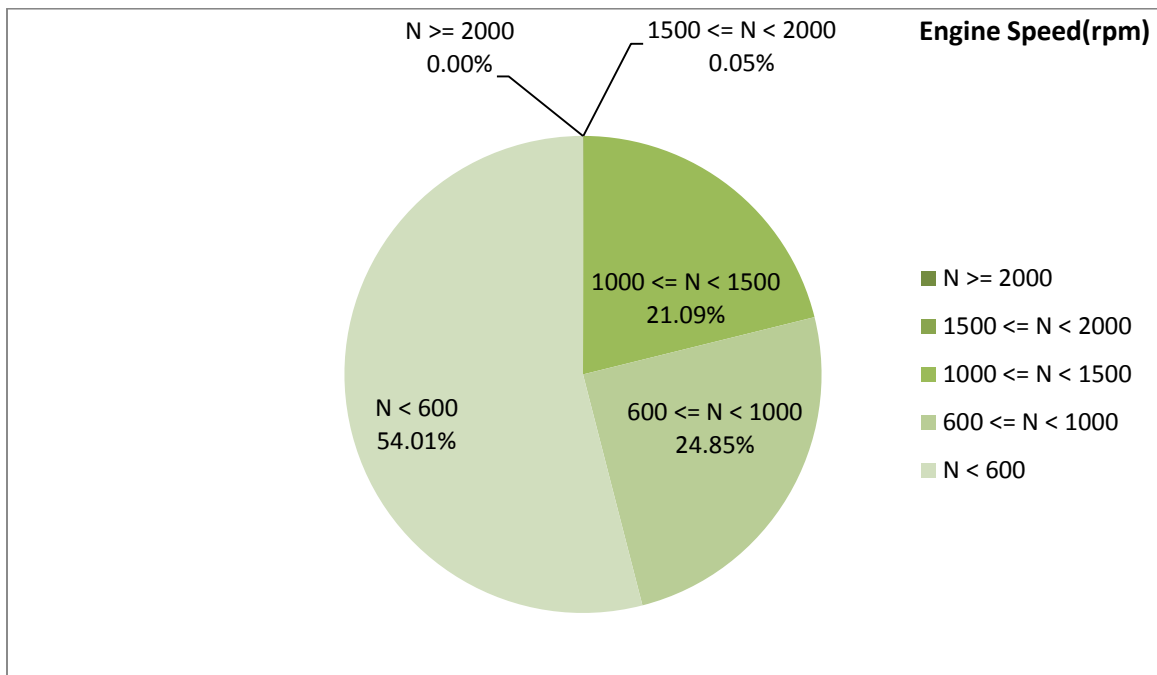


Figure 3- Engine speed distribution over the working hours

Table 4- Mean values

Mean temperature (C)	Mean pressure(mbar)	Mean engine speed(rpm)
209.85	17.25	733

Table 5- Mean values without idling

Mean temperature (C)	Mean pressure(mbar)	Mean engine speed(rpm)
259.01	33.12	953

Table 6- Max-min values

Max-min temperature(C)	Max-min pressure(mbar)	Max-min engine speed(rpm)
434-50	201-0	1904-304

Detailed Pressure Analysis

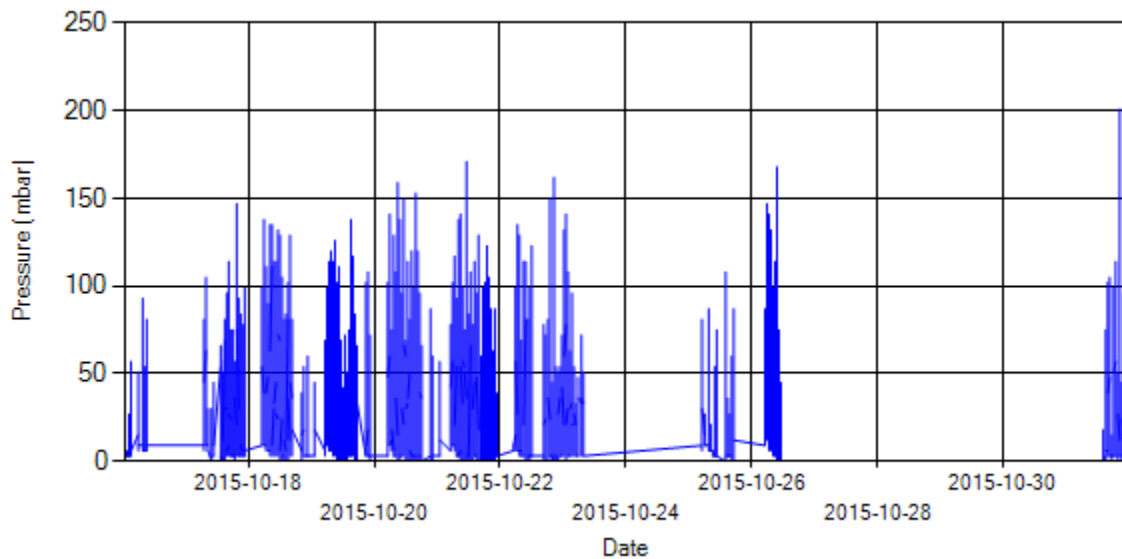


Figure 4- Pressure distribution over the period

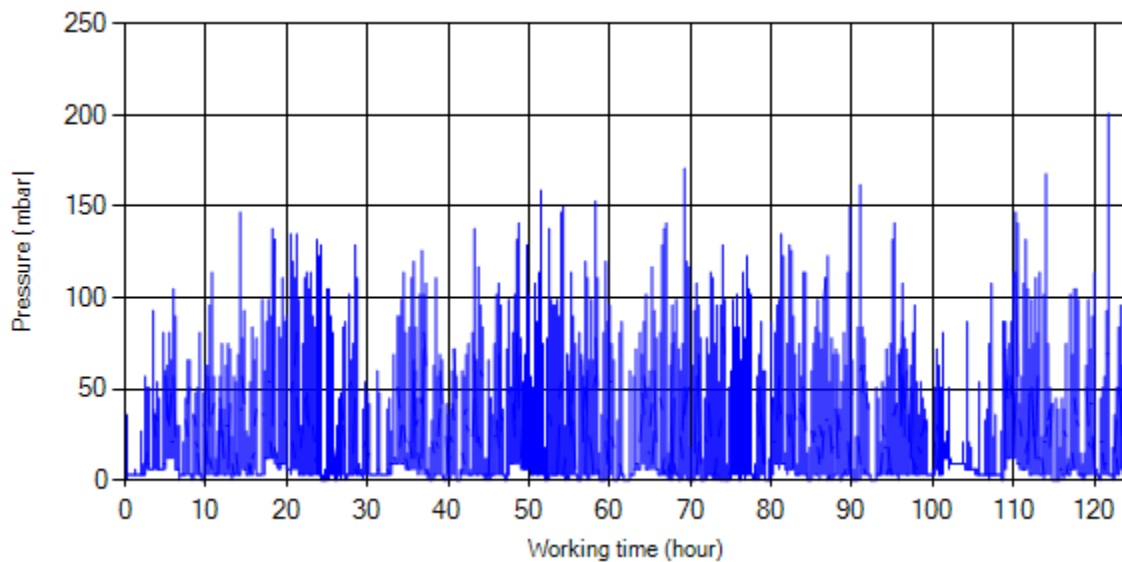


Figure 5- Pressure vs. working hours

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.

Detailed Temperature Analysis

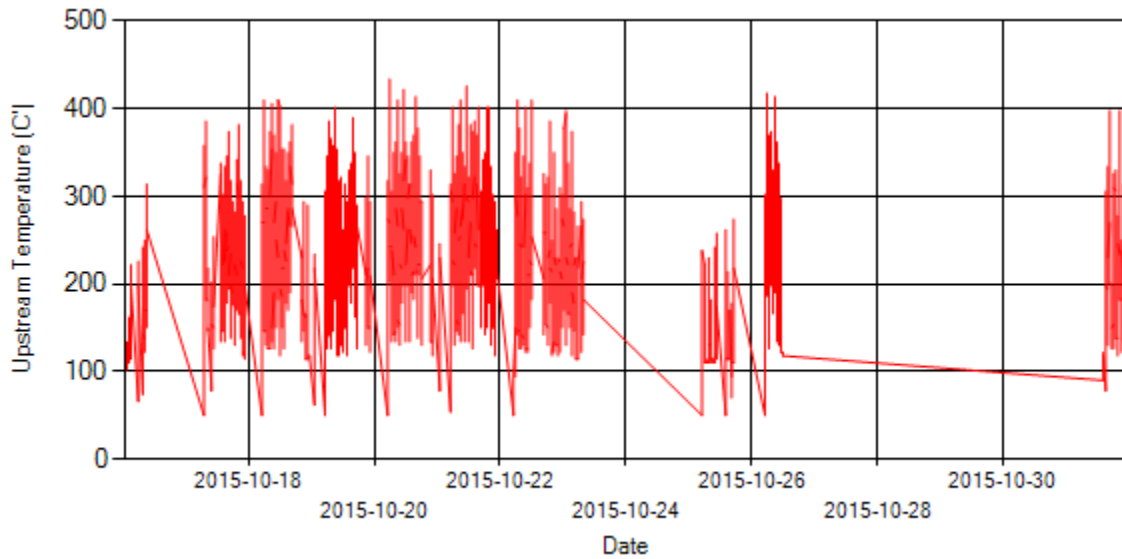


Figure 6- Temperature distribution over the period

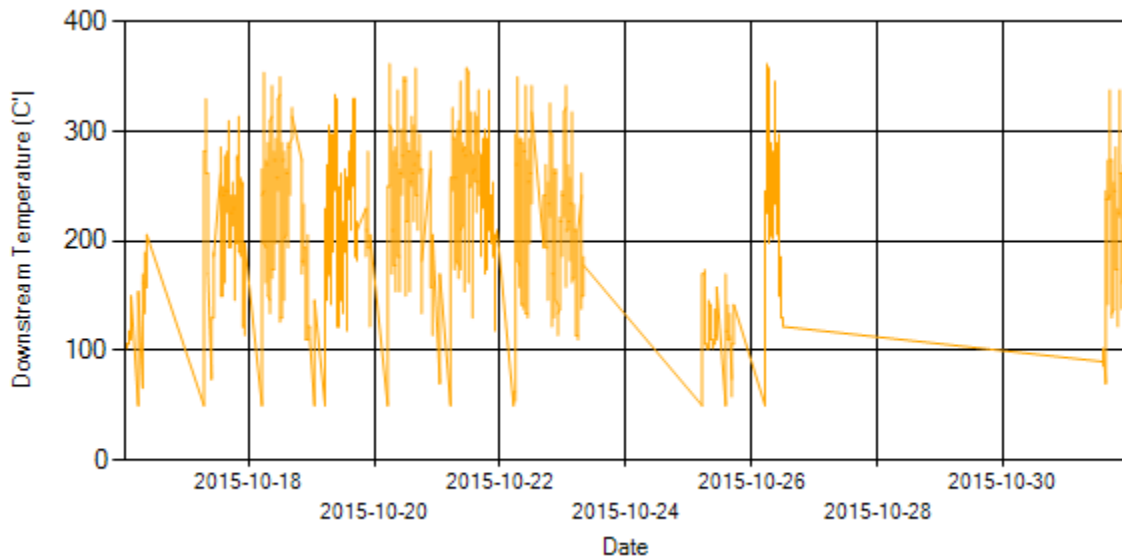


Figure 7- Temperature distribution over the period

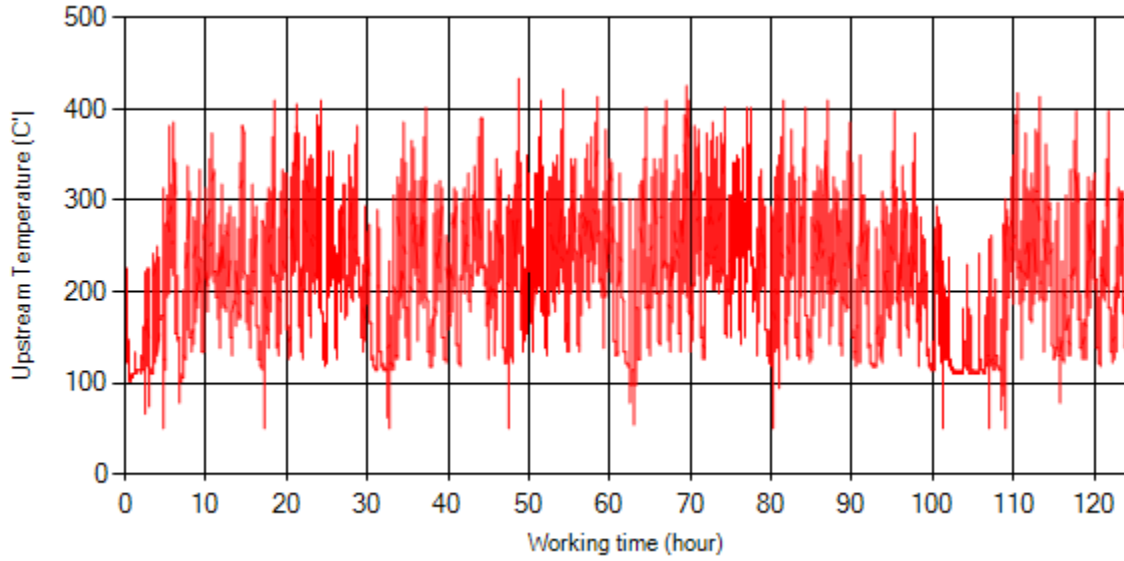


Figure 8- Temperature vs. working hours

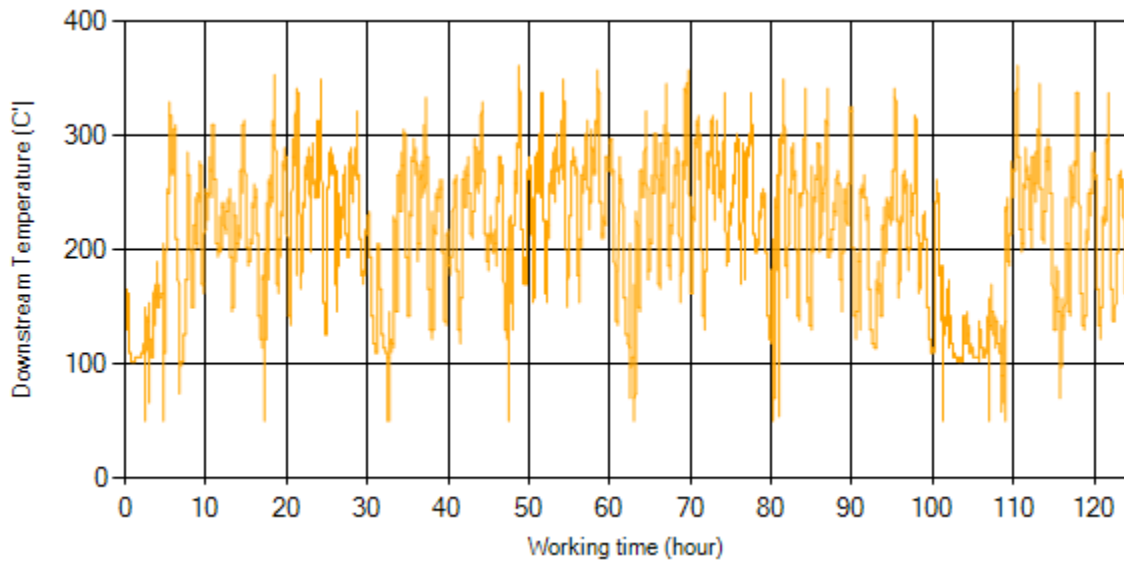


Figure 9- Temperature vs. working hours

Engine Speed Diagrams

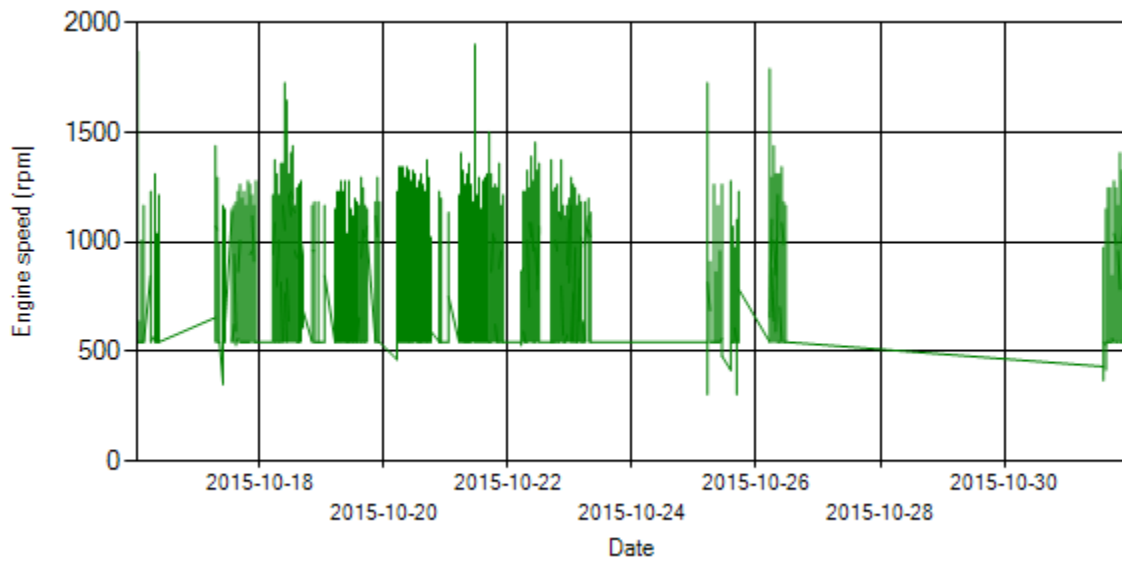


Figure 10- Engine speed distribution over the period

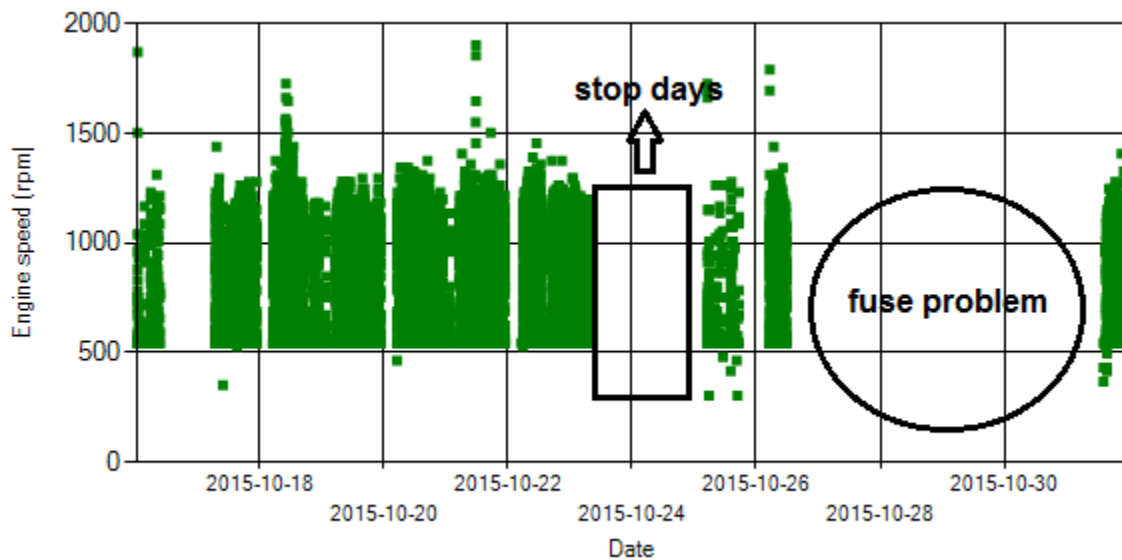


Figure 11- Engine speed diagram for calculating CPK's working days

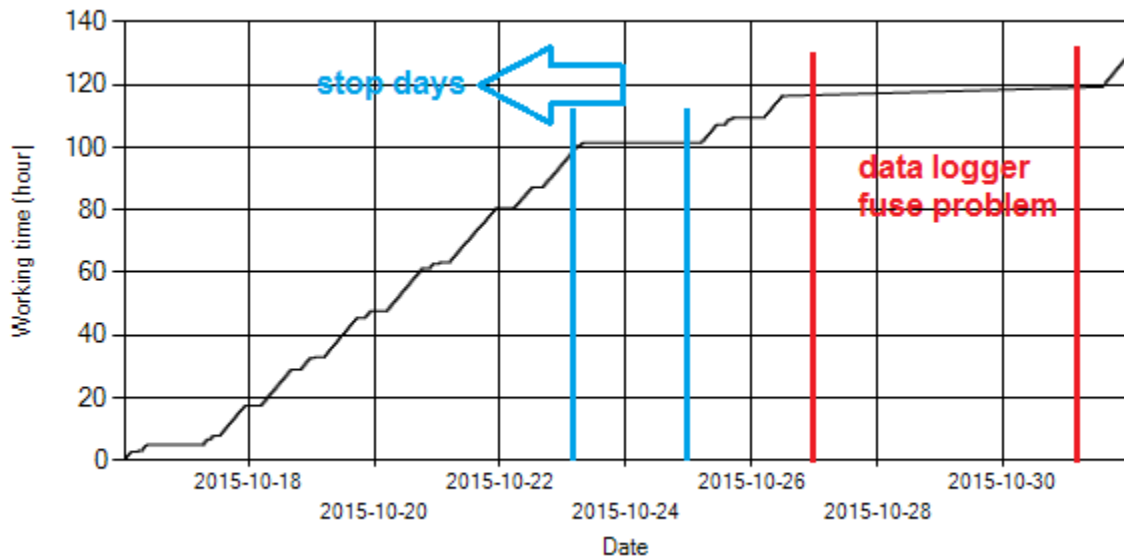


Figure 12- Time diagram for calculating CPK's working days

Notice: Data logger sampling time can be calculated from Figure 12. The lines parallel with Date axis show days without data logger data.

Pressure-Engine Speed diagrams

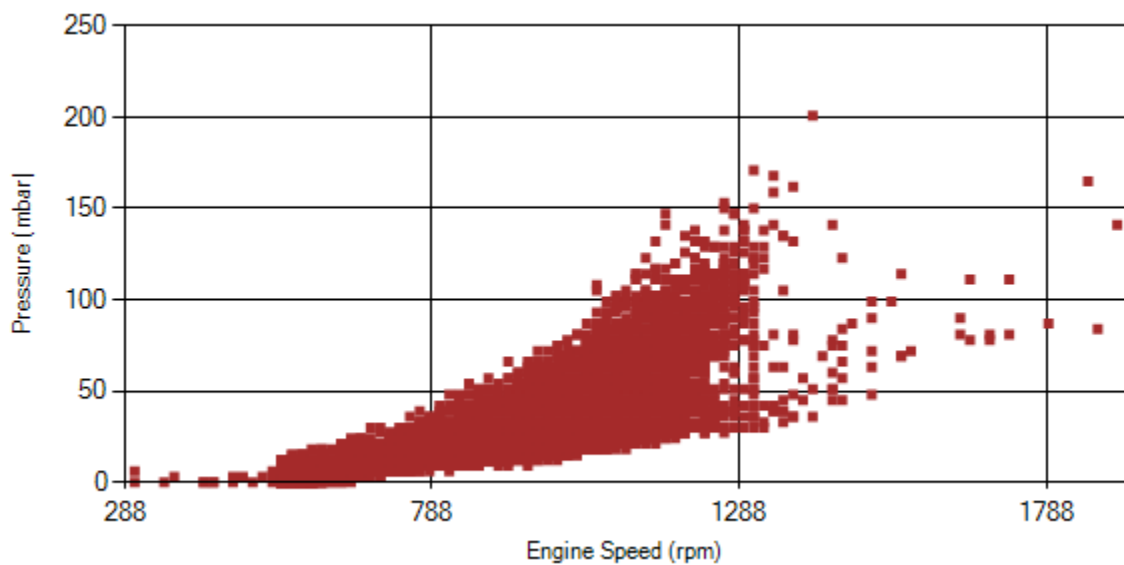


Figure 13- Pressure against engine speed

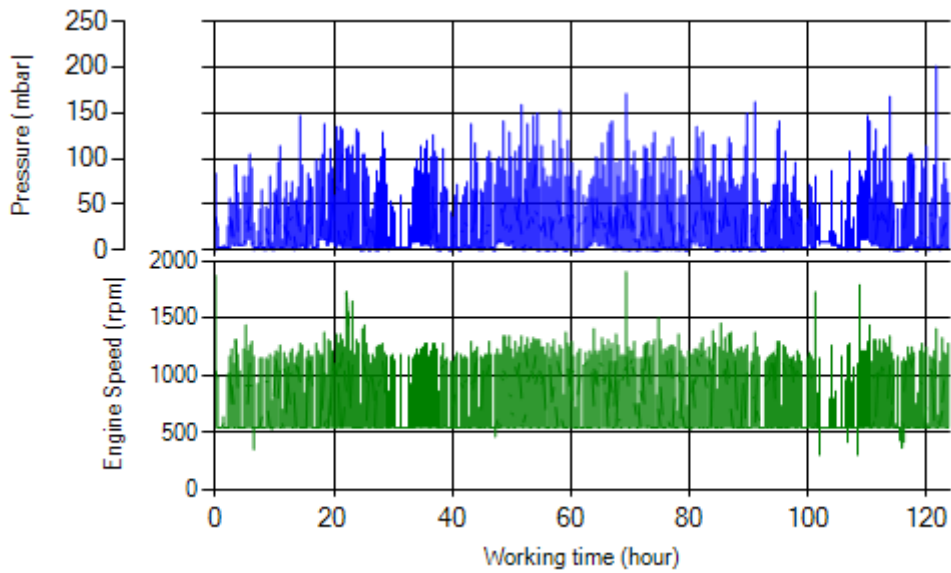


Figure 14- P, N distribution vs. working hours

Temperature-Engine Speed diagrams

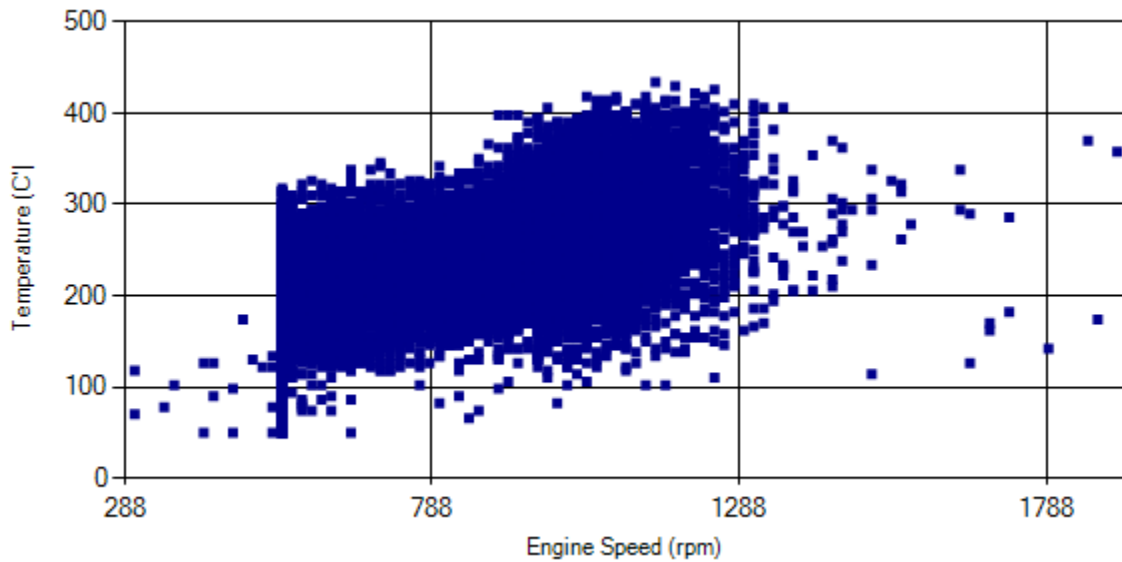


Figure 15- Temperature against engine speed

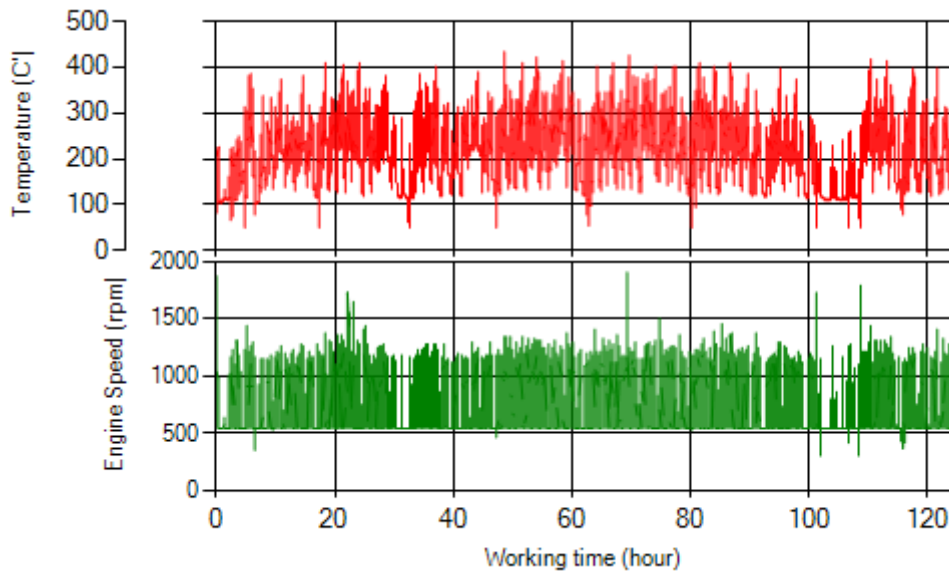


Figure 16- T, N distribution vs. working hours

Filter Operation Analysis

- As depicted in figure 1, only 0.02% of total working time pressure was above 150 mbar during this period. This low pressure distribution was due to filter cleaning on Oct 5th.
- Figure 2 displays flow temperature distribution for DPF's upstream. It can be obviously observed that 0.12% of total working time temperature is above 400°C. And 1.43% above 350°C.

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

Vehicle plate number	33637 (34119)
Bus line	Number 2 (west to east bus line)
DPF producer company	Dinex_02 (Passive system with FBC)



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Notice: System was working over this period without DPF.

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	01/Oct/2015 – 15/Oct/2015 (fifteen 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 th . After receiving cleaning machine DPF was cleaned on Aug 10 th and was installed on Aug 22 nd but worked only for ten days. The last cleaning was done on Sep 24 th but cleaning issue was unavoidable after only three days working. Finally DPF was replaced by muffler on Sep 8 th and system have been working from that date without DPF.
Dosing status	Additive dosing was increased 60% of its initial value for tests two and three.

Table 3- Fuel and Additive Consumption Information

Bus mileage over the period	2495 km
Working days over the period	15 days
Stop days	0 day
Data logger working days	15 days
Working hours over the period	246 hours 41 minutes
Average working hours per day (including stop days)	16 hours 26 minutes
Bus average speed	10.10 km/hr
idle speed time to all working time ration	42.16 %
Total Bus fuel consumption over the period	1597 lit
Fuel consumption per hour	5.95 lit/hr
Average fuel consumption	0.64 lit/km

Temperature, Pressure and Engine Speed Overview

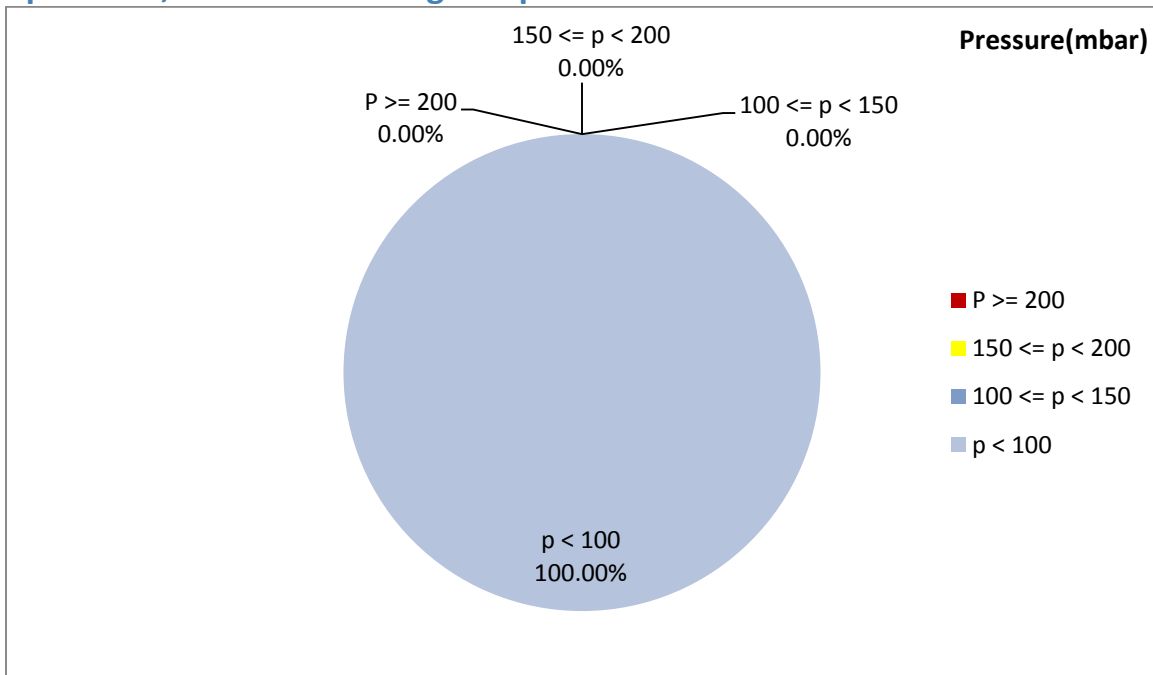


Figure 1- Pressure distribution over the working hours

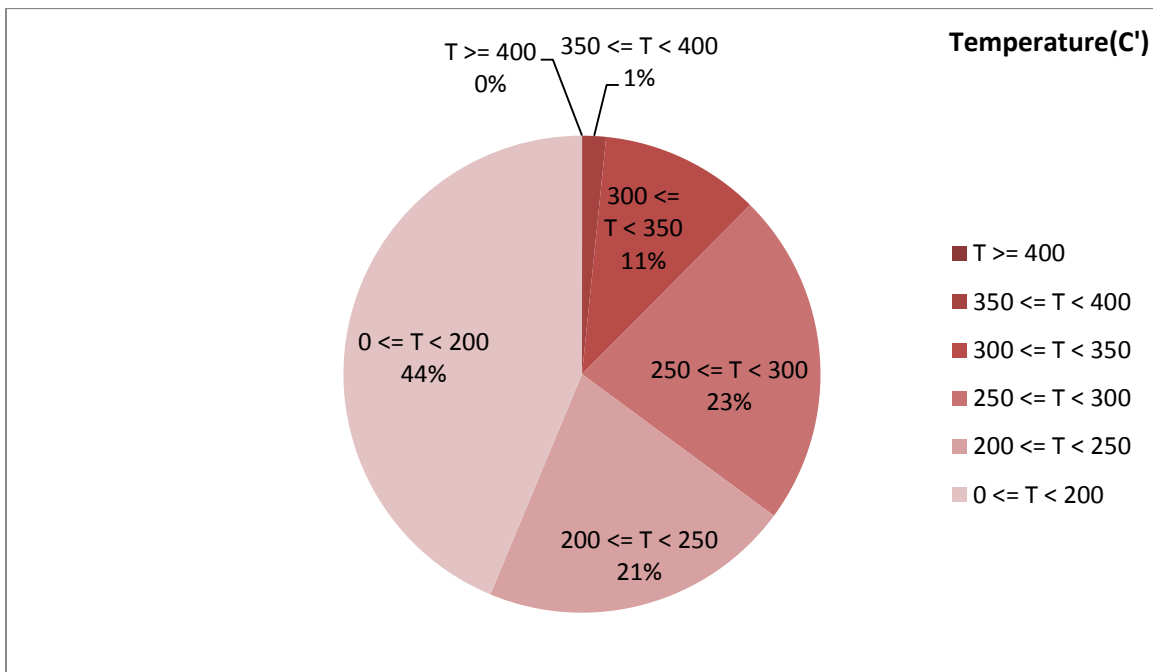


Figure 2-Temperature distribution over the working hours

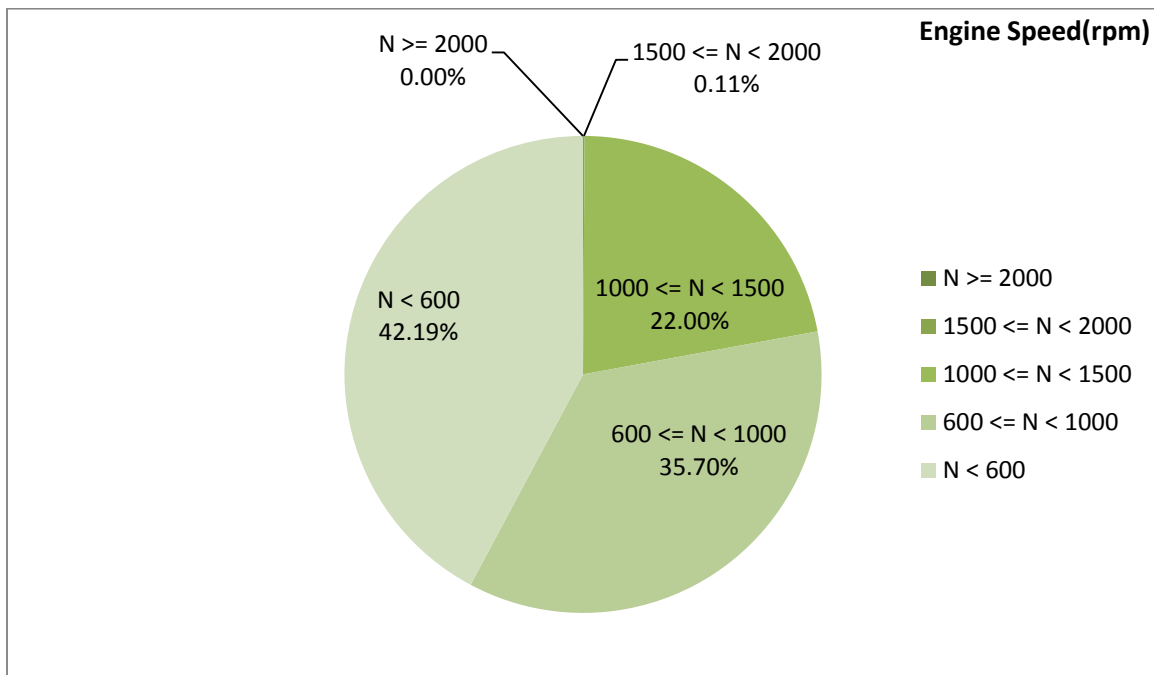


Figure 3- Engine speed distribution over the working hours

Table 4- Mean values

Mean temperature (C)	Mean pressure(mbar)	Mean engine speed(rpm)
218.23	1.48	765

Table 5- Mean values without idling

Mean temperature (C)	Mean pressure(mbar)	Mean engine speed(rpm)
249.44	2.56	924

Table 6- Max-min values

Max-min temperature(C)	Max-min pressure(mbar)	Max-min engine speed(rpm)
434-50	78-0	1888-272

Detailed Pressure Analysis

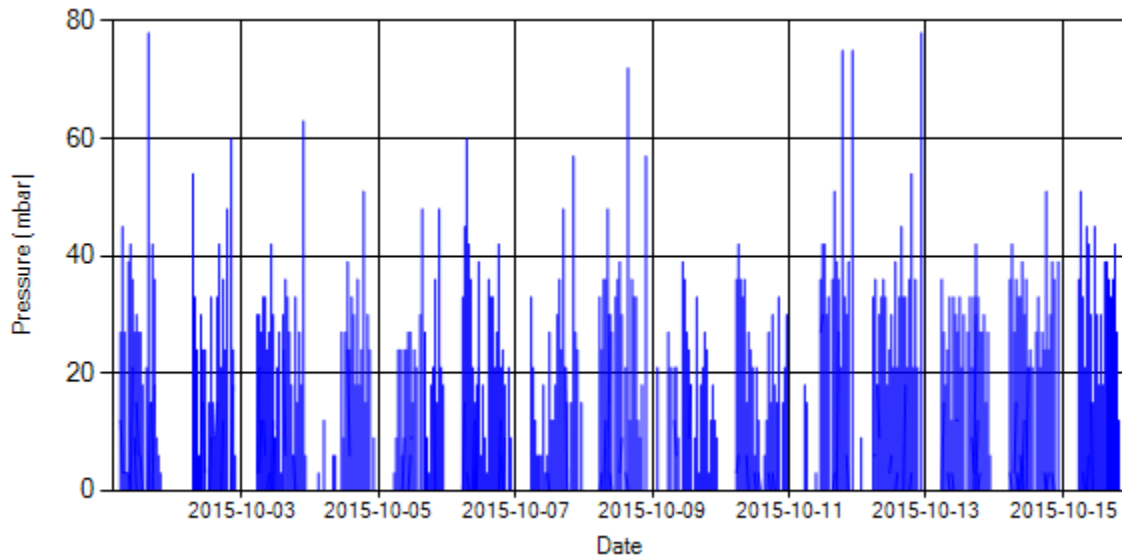


Figure 4- Pressure distribution over the period

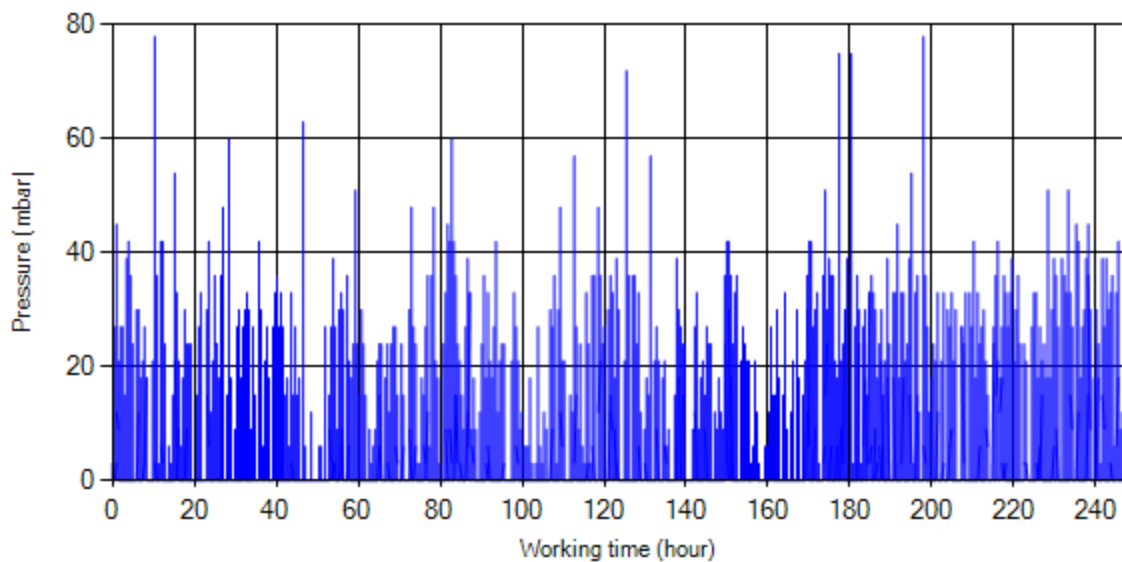


Figure 5- Pressure vs. working hours

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.

Detailed Temperature Analysis

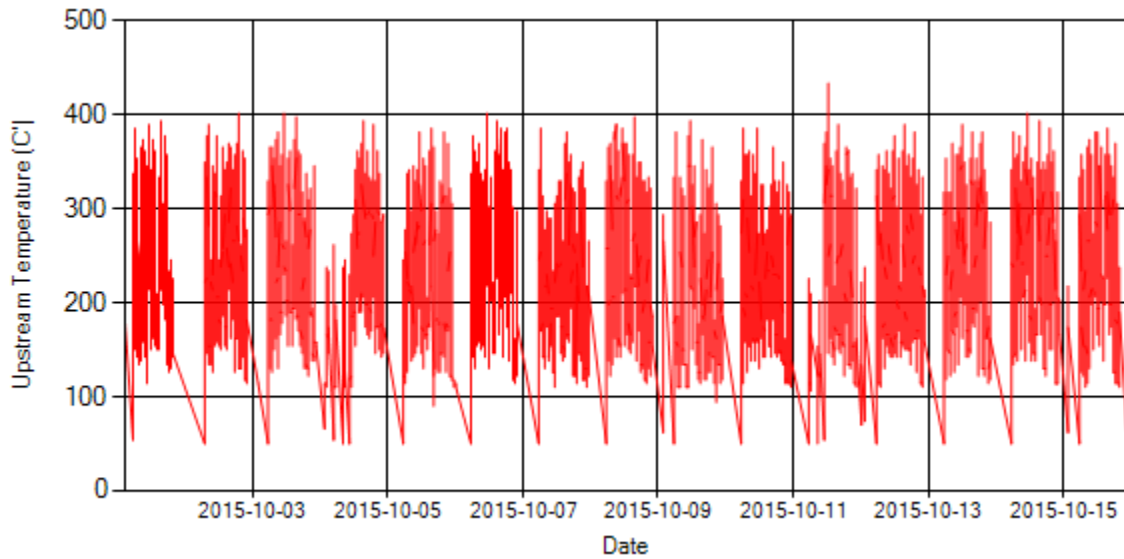


Figure 6- Temperature distribution over the period

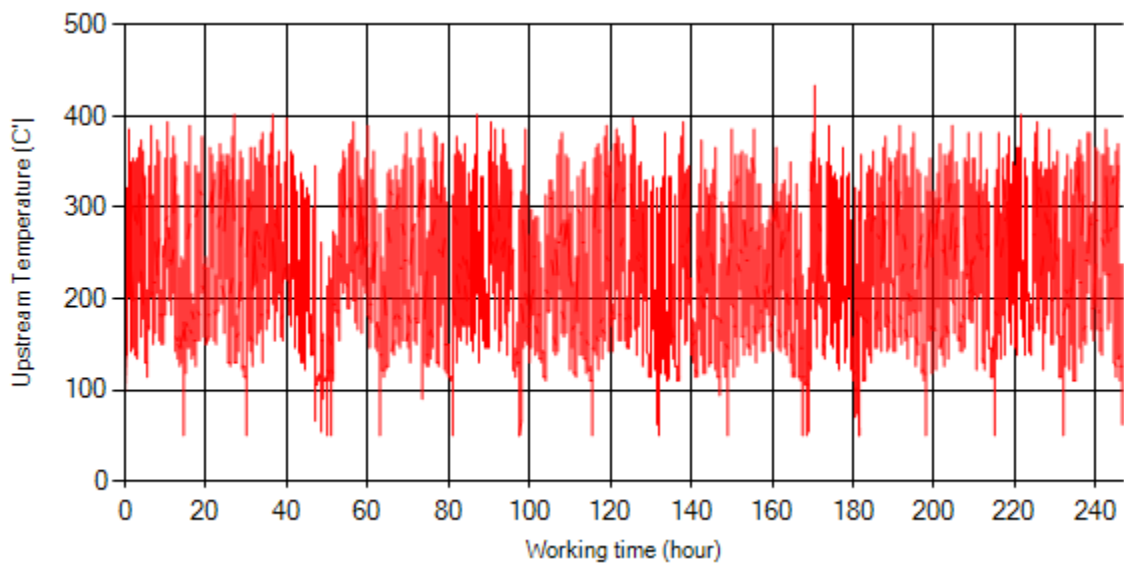


Figure 7- Temperature vs. working hours

Engine Speed Diagrams

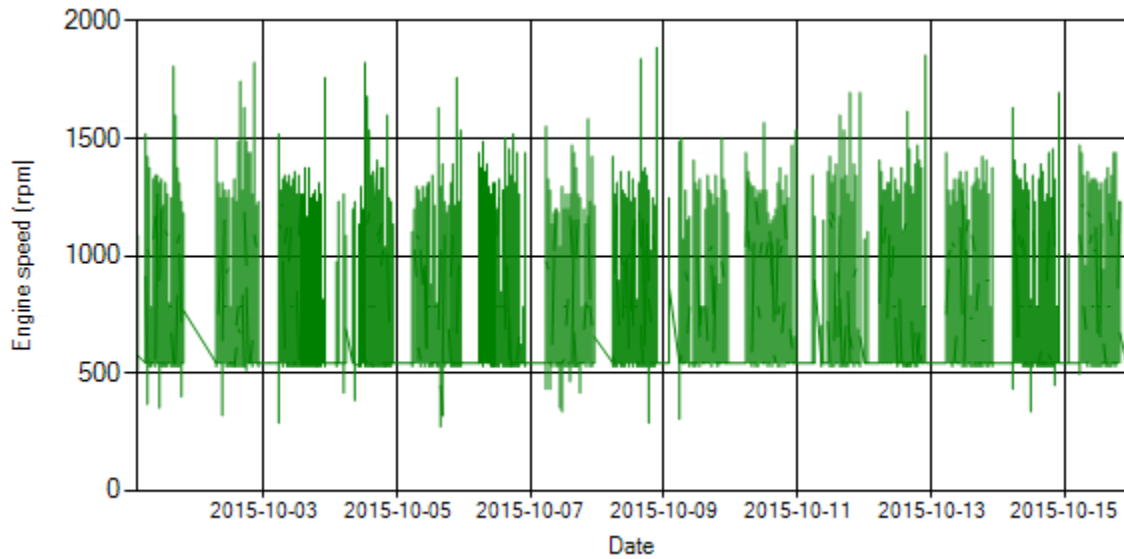


Figure 8- Engine speed distribution over the period

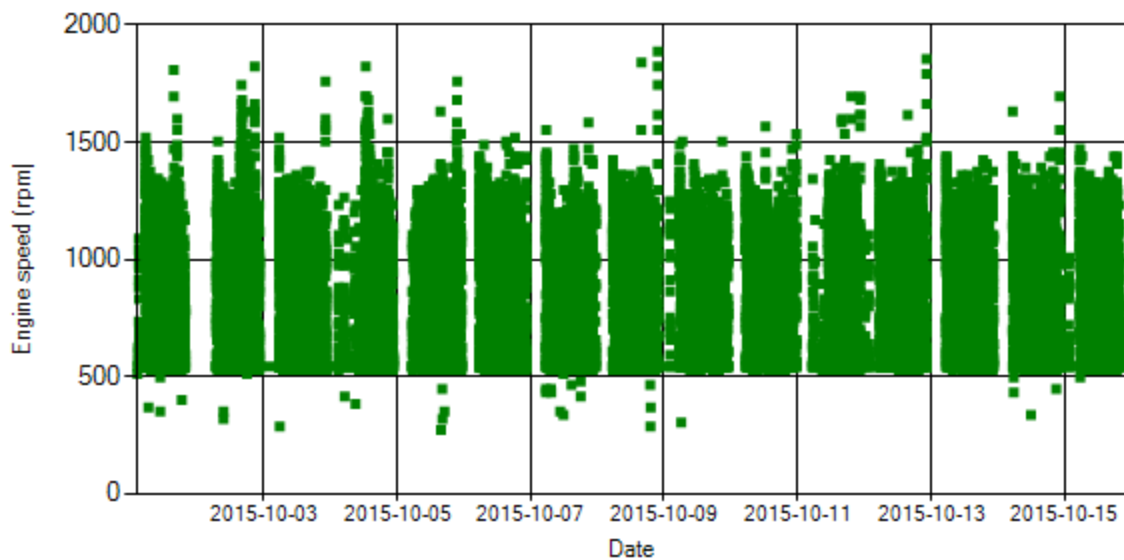


Figure 9- Engine speed diagram for calculating CPK's working days

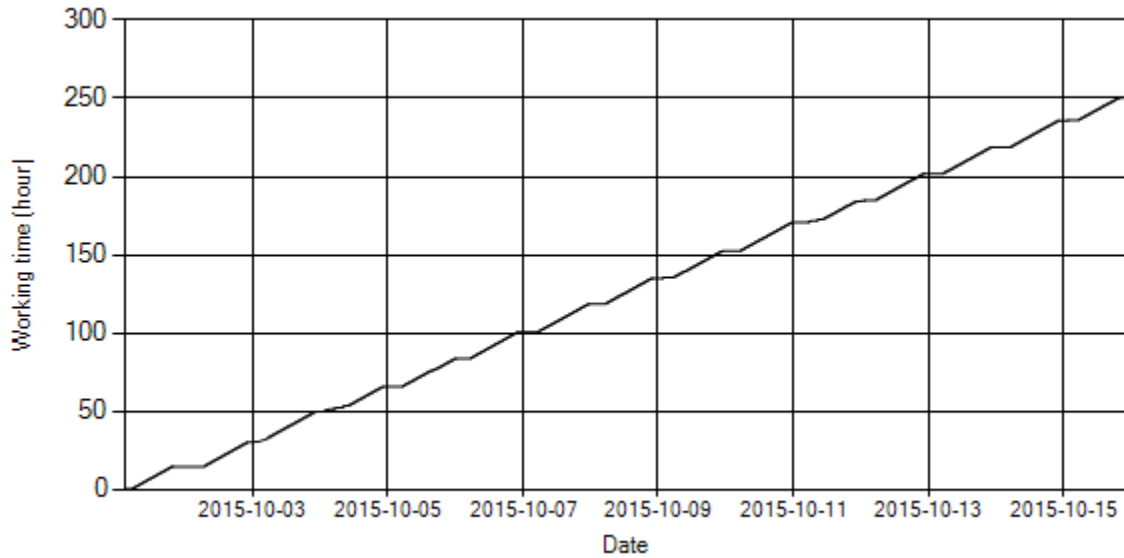


Figure 10- Time diagram for calculating CPK's working days

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 Figure 12, stop days could not be observed during this period.

Pressure-Engine Speed diagrams

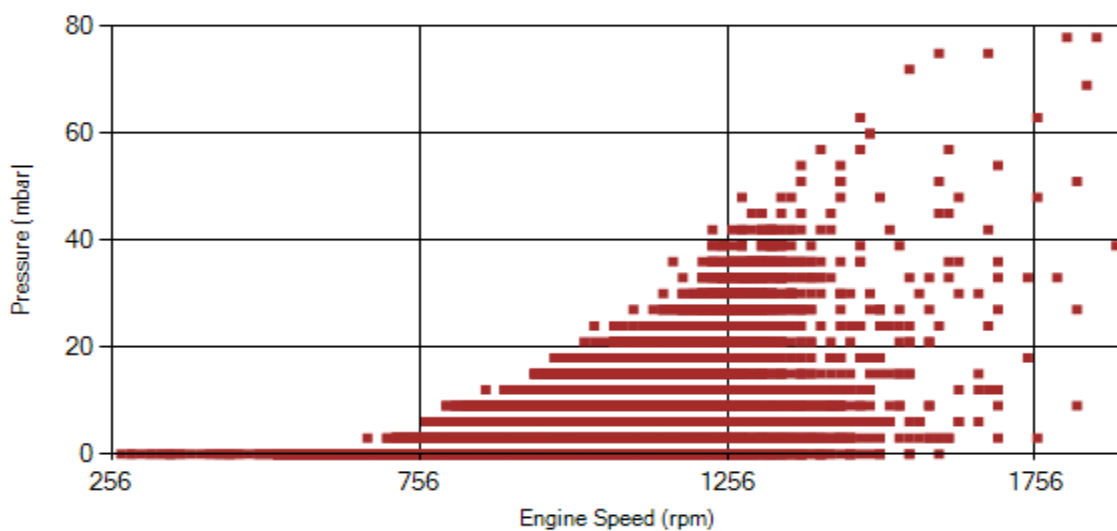


Figure 11- Pressure against engine speed

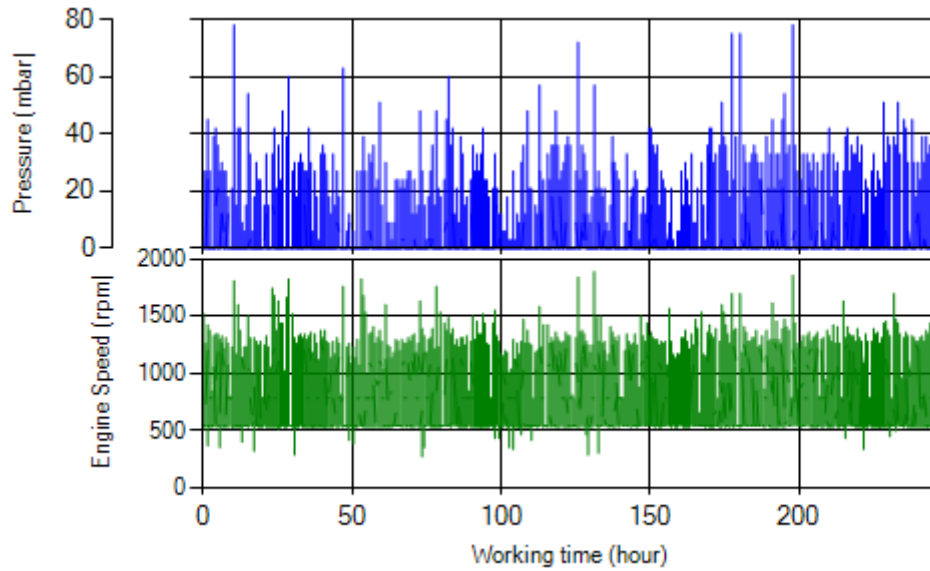


Figure 12- P, N distribution vs. working hours

Temperature-Engine Speed diagrams

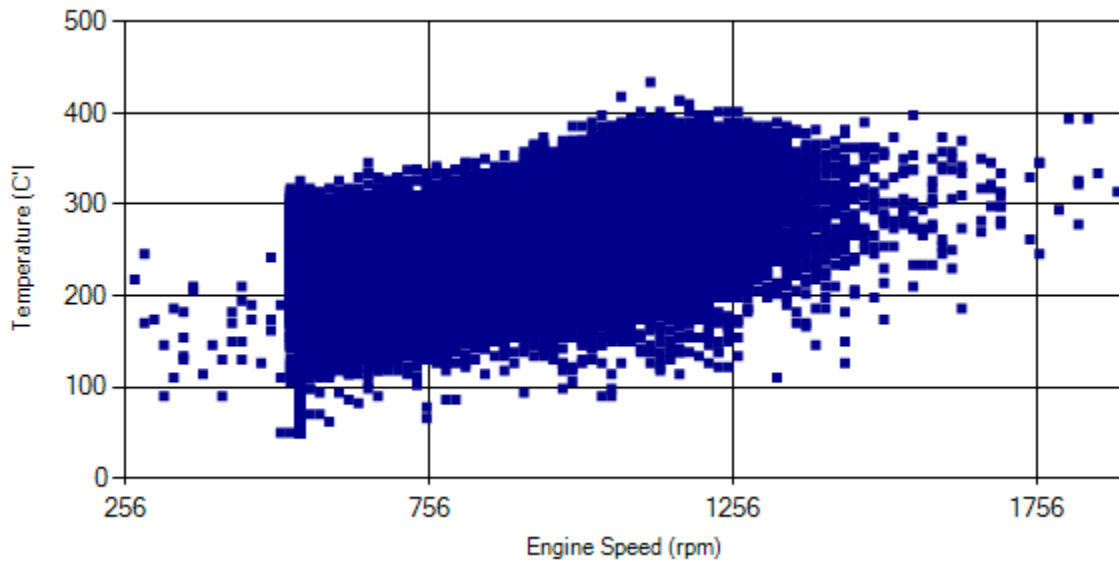


Figure 13- Temperature against engine speed

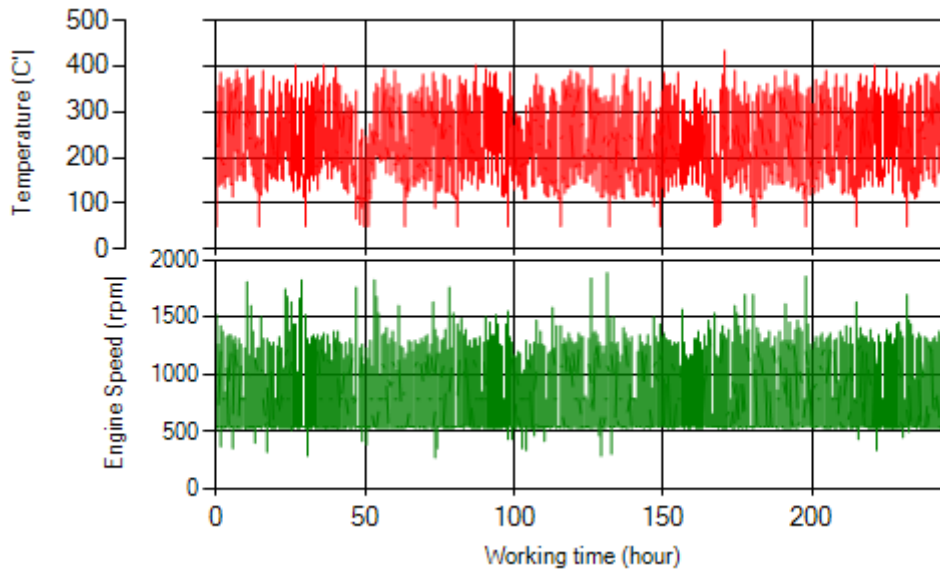


Figure 14- T, N distribution vs. working hours

Filter Operation Analysis

Notice: System was working over this period without DPF.

Notice: System was working over this period without DPF.

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	16/Oct/2015 – 31/Oct/2015 (sixteen 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 th . After receiving cleaning machine DPF was cleaned on Aug 10 th and was installed on Aug 22 nd but worked only for ten days. The last cleaning was done on Sep 24 th but cleaning issue was unavoidable after only three days working. Finally DPF was replaced by muffler on Sep 8 th and system have been working from that date without DPF.
Dosing status	Additive dosing was increased 60% of its initial value for tests two and three.

Table 3- Fuel and Additive Consumption Information

Bus mileage over the period	2358 km
Working days over the period	12 days
Stop days	4 days
Data logger working days	12 days
Working hours over the period	187 hours 48 minutes
Average working hours per day (including stop days)	11 hours 44 minutes
Bus average speed	12.56 km/hr
idle speed time to all working time ration	50.66 %
Total Bus fuel consumption over the period	1611 lit
Fuel consumption per hour ²³	8.58 lit/hr
Average fuel consumption	0.63 lit/km

Temperature, Pressure and Engine Speed Overview

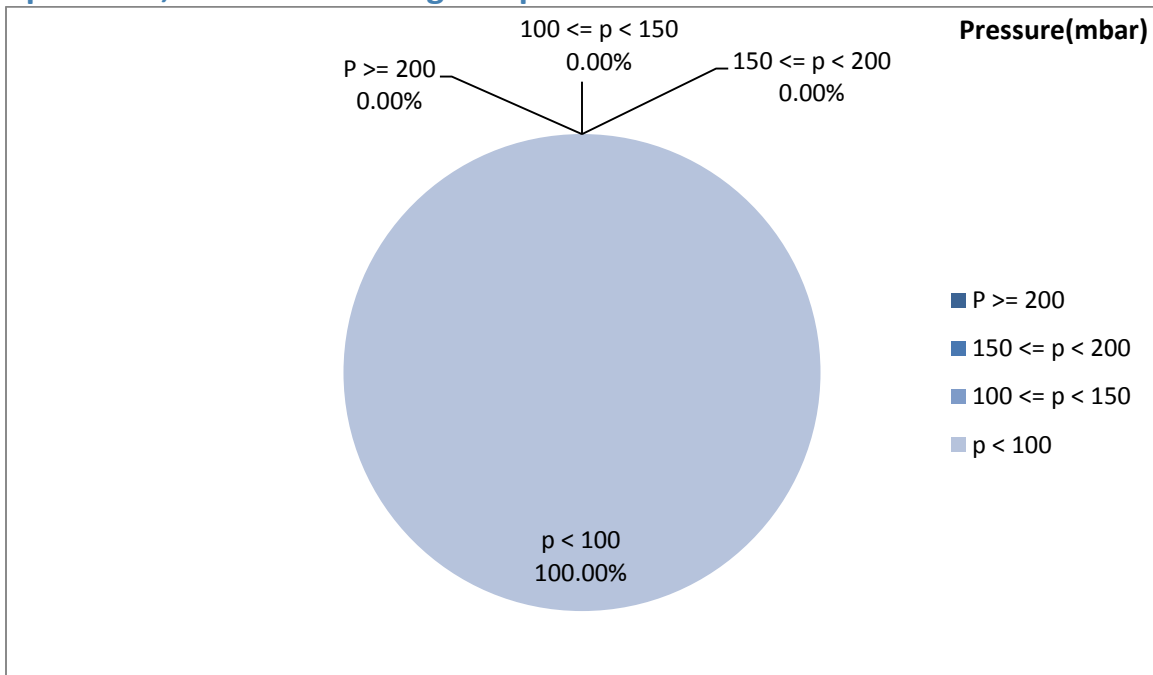


Figure 1- Pressure distribution over the working hours

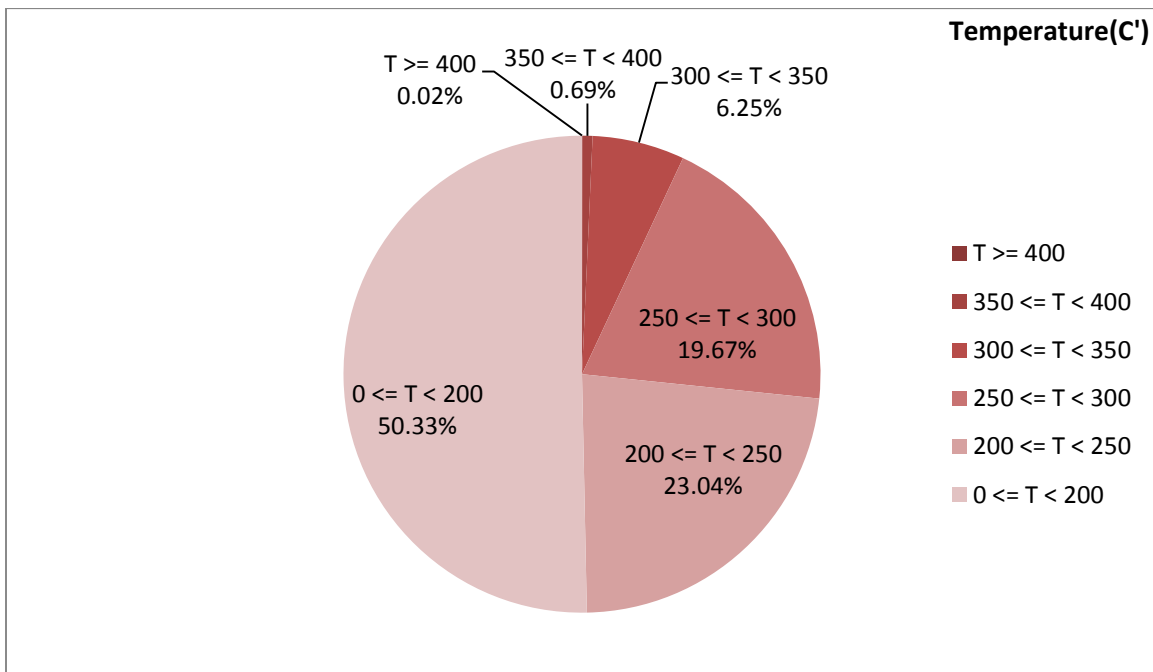


Figure 2-Temperature distribution over the working hours

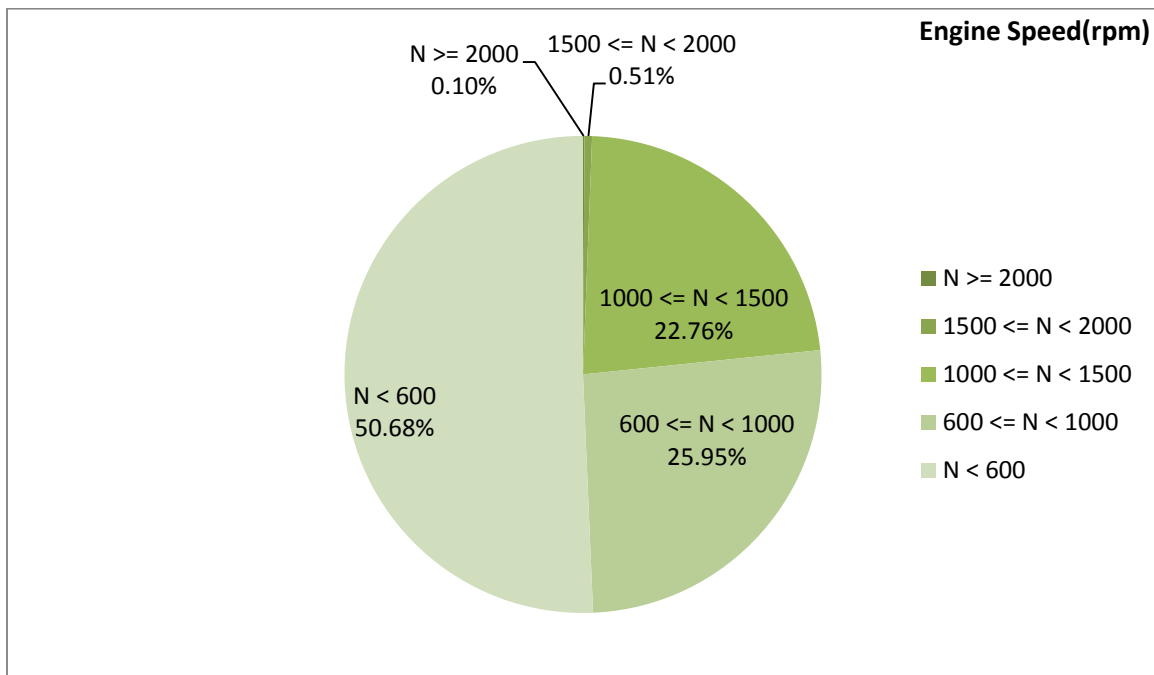


Figure 3- Engine speed distribution over the working hours

Table 4- Mean values

Mean temperature (C)	Mean pressure(mbar)	Mean engine speed(rpm)
200.8	1.25	754

Table 5- Mean values without idling

Mean temperature (C)	Mean pressure(mbar)	Mean engine speed(rpm)
247.63	2.54	967

Table 6- Max-min values

Max-min temperature(C)	Max-min pressure(mbar)	Max-min engine speed(rpm)
414-50	78-0	2144-288

Detailed Pressure Analysis

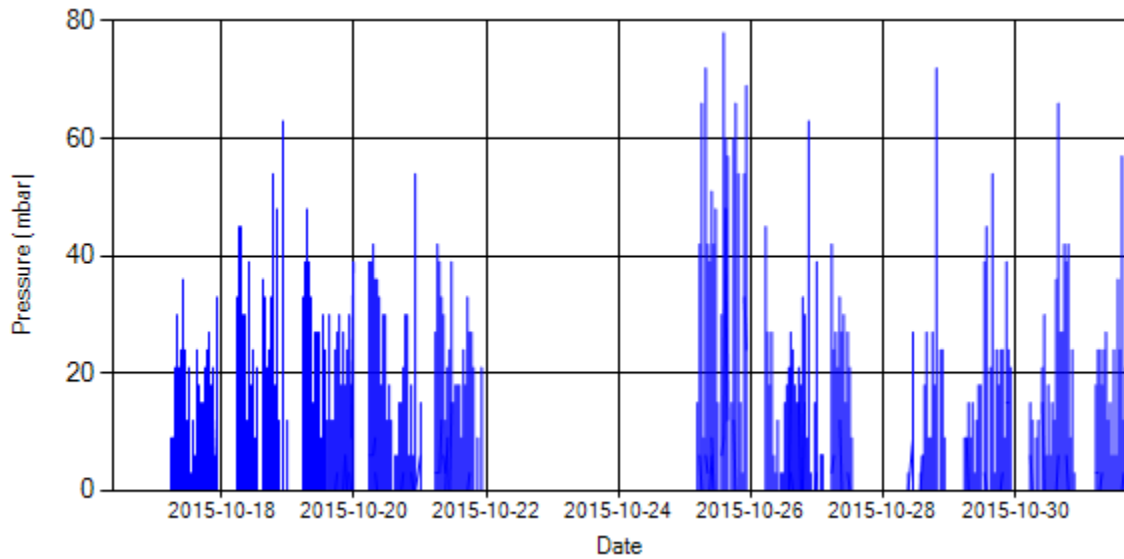


Figure 4- Pressure distribution over the period

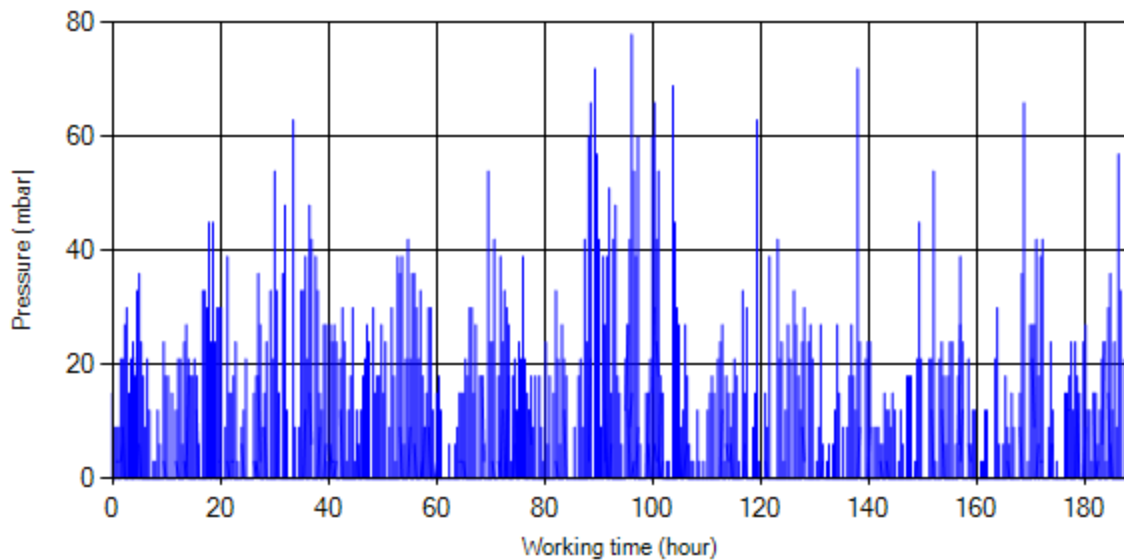


Figure 5- Pressure vs. working hours

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.

Detailed Temperature Analysis

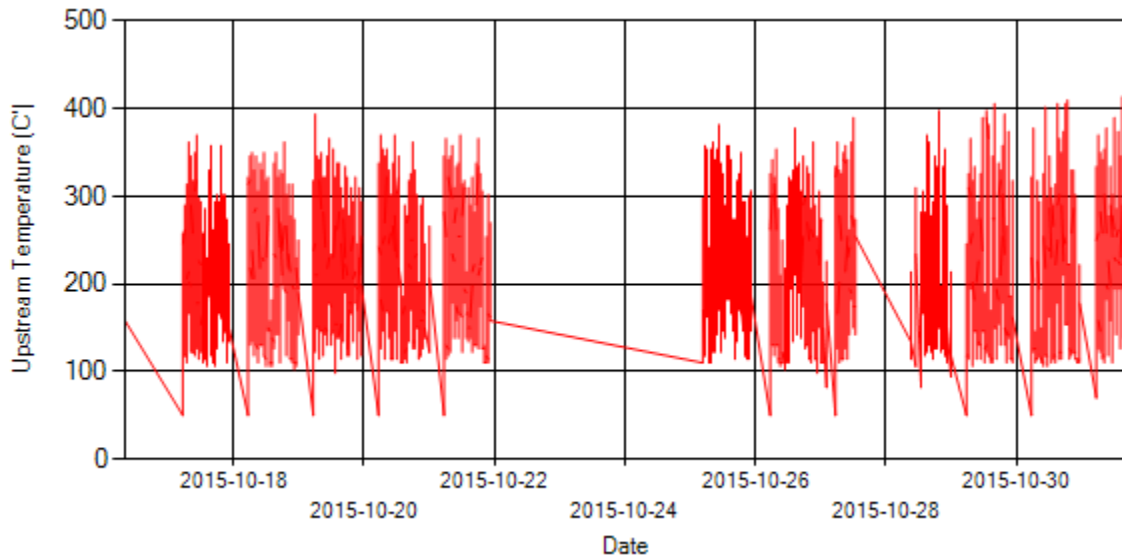


Figure 6- Temperature distribution over the period

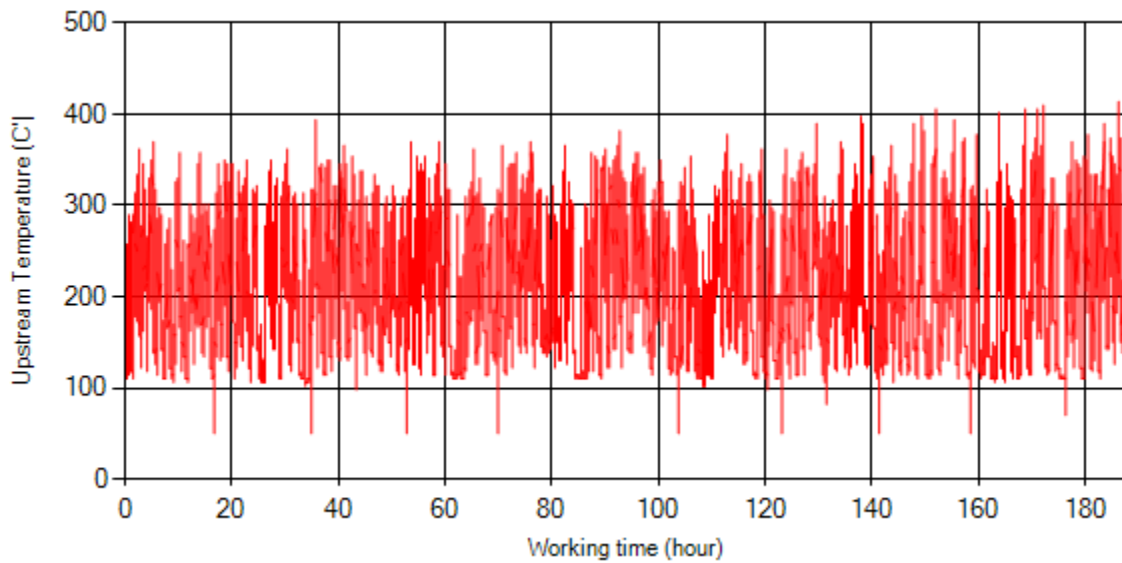


Figure 7- Temperature vs. working hours

Engine Speed Diagrams

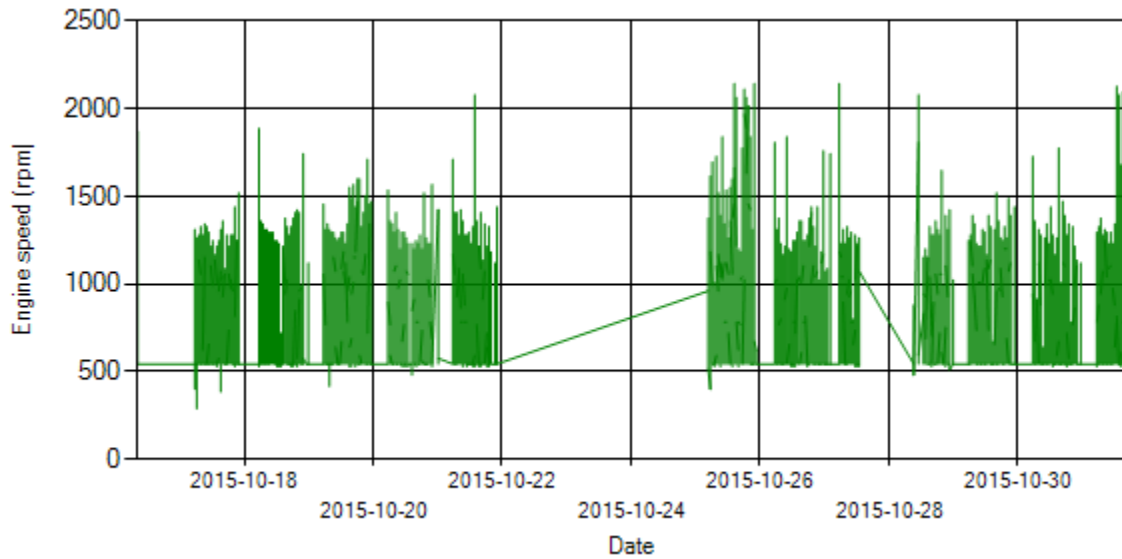


Figure 8- Engine speed distribution over the period

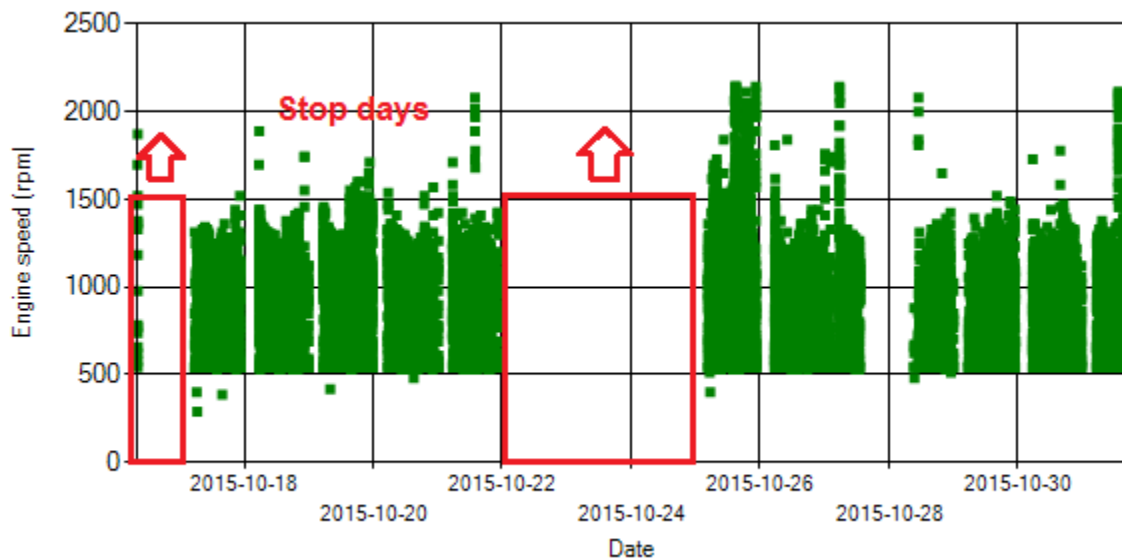


Figure 9- Engine speed diagram for calculating CPK's working days

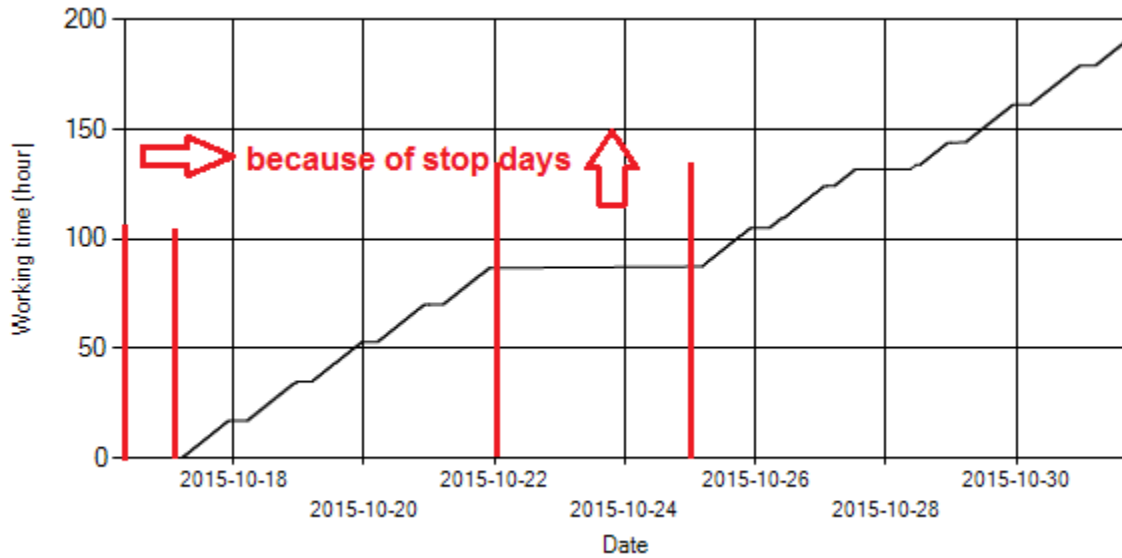


Figure 10- Time diagram for calculating CPK's working days

Notice: Data logger sampling time can be calculated from Figure 12. The lines parallel with Date axis show days without data logger data.

Pressure-Engine Speed diagrams

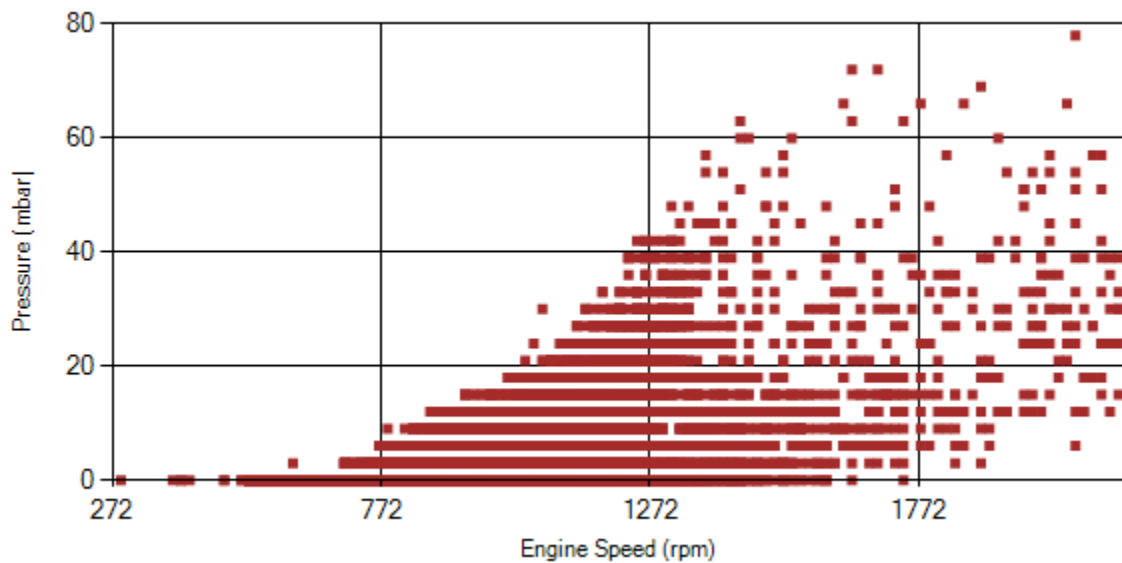


Figure 11- Pressure against engine speed

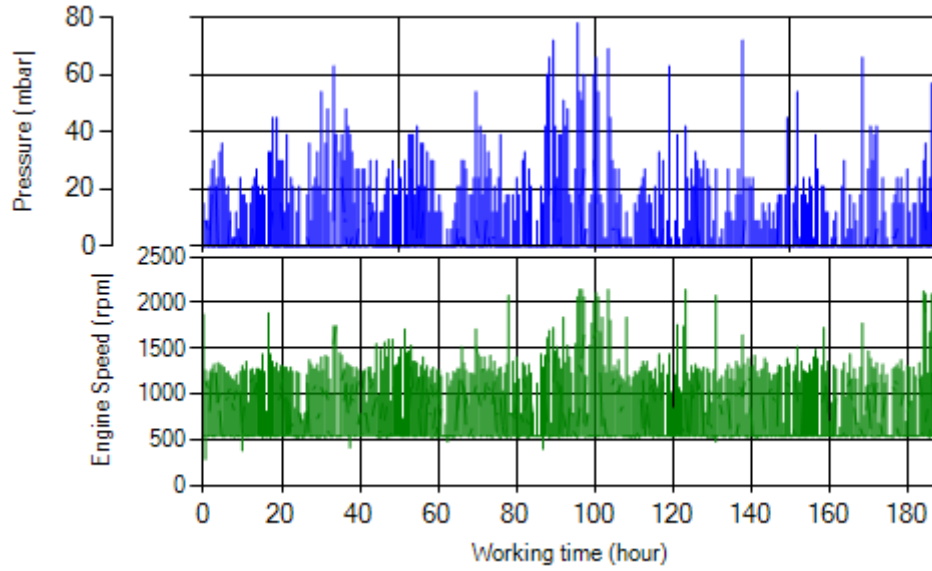


Figure 12- P, N distribution vs. working hours

Temperature-Engine Speed diagrams

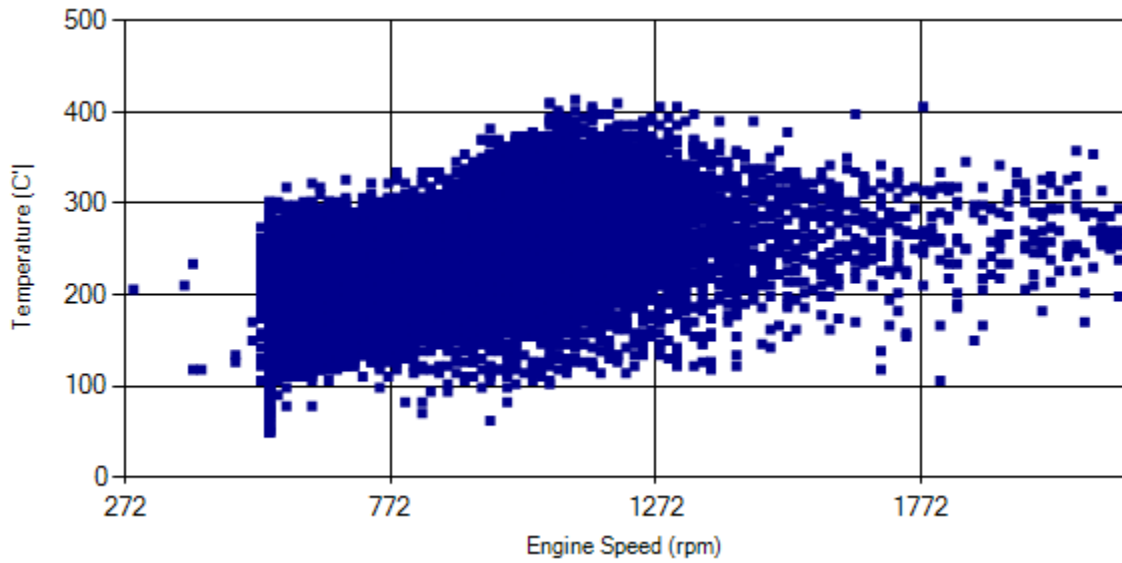


Figure 13- Temperature against engine speed

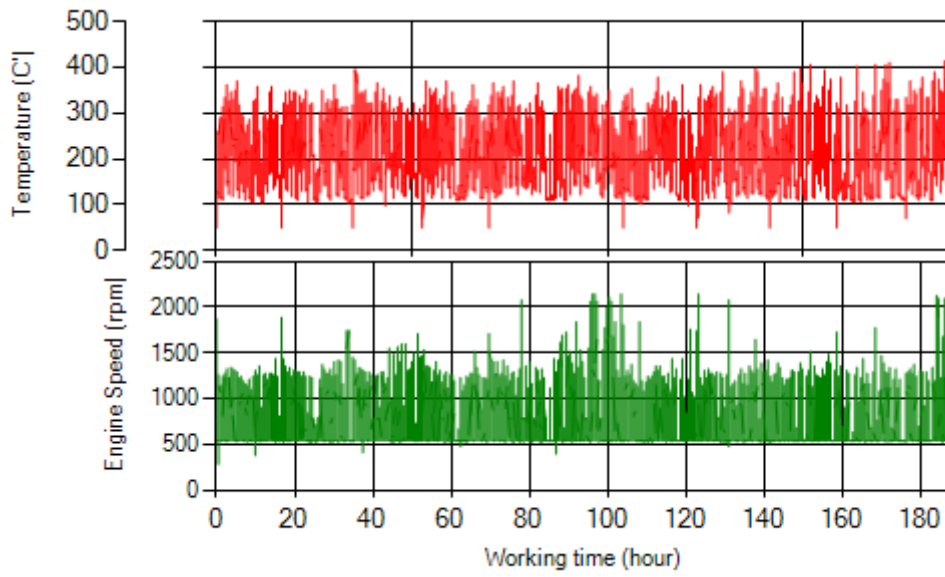
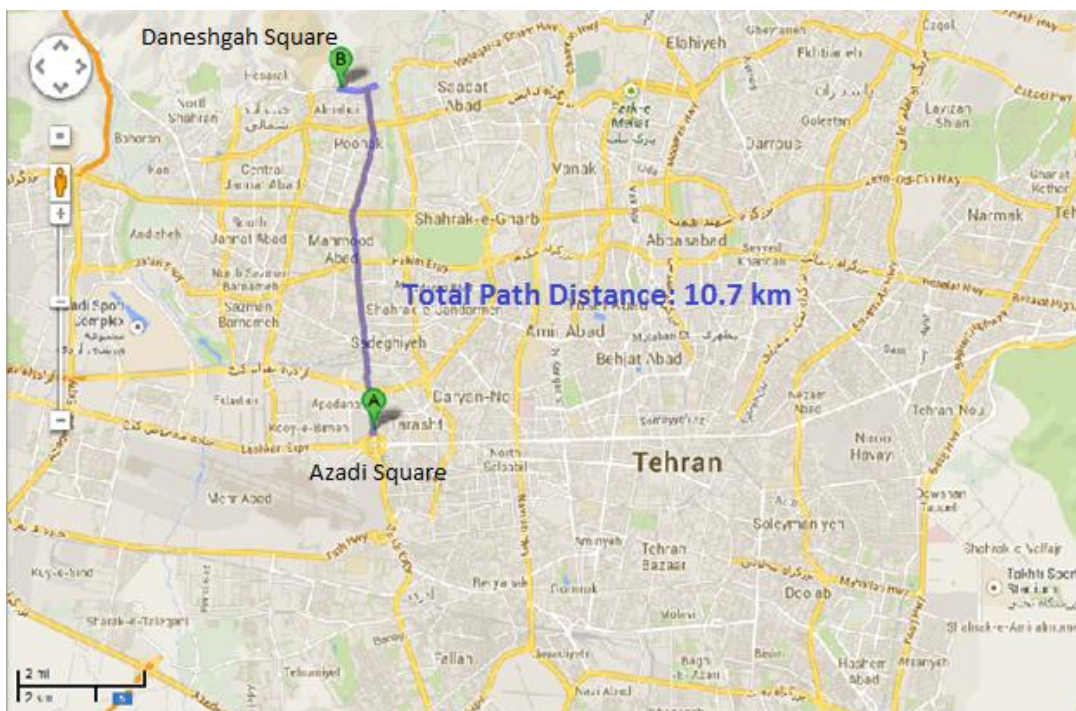


Figure 14- T, N distribution vs. working hours

Filter Operation Analysis

Notice: System was working over this period without DPF.

Vehicle plate number	85476
Bus line	Number 10 (south to north Bus line)
DPF producer company	HJS_04 (Passive system with FBC)



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Overall Information

Table1- Overall Information

Vehicle plate number	85476
CPK data logger number	LN: 001508, DN: 2003, Sim +989218469624
Bus line	Number 10 (south to north Bus line)
Bus Terminals	Azadi square - Daneshgah square
Total path distance	10.7 km
DPF producer company	HJS_04 (Passive system with FBC)
Installation date	23/Feb/2015
Report period	01/Oct/2015 – 15/Oct/2015 (fifteen days)
K value - DPF upstream	1.80 [1/m]
K value – DPF downstream	0.02 [1/m]

Table 2- DPF Maintenance History

Filter maintenance date	DPF was cleaned on 22 nd Jul.
Dosing status	Dosing value has been kept constant from installation date until now.

Table 3- Fuel and Additive Consumption Information

Bus mileage (from DPF installation date)	35644 km
Bus mileage over the period	2676 km
Working days over the period	14 days
Stop days	1 day
Data logger working days	14 days
Working hours over the period	182 hours 24 minutes
Average working hours per day (including stop days)	12 hours 9 minutes
Bus average speed	14.67 km/hr
idle speed time to all working time ration	53 %
Total Bus fuel consumption over the period	1712 lit
Fuel consumption per hour	9.39 lit/hr
Average fuel consumption	0.64 lit/km
Total Bus additive consumption over the period	0.728 lit
Average additive consumption	272 cc/km
Additive consumption to fuel ration	425 cc/1000lit

Notice: Engine rotational speed data were unreasonable during this period due to rpm sensor problem. So related parameters were unreliable.

Temperature, Pressure and Engine Speed Overview

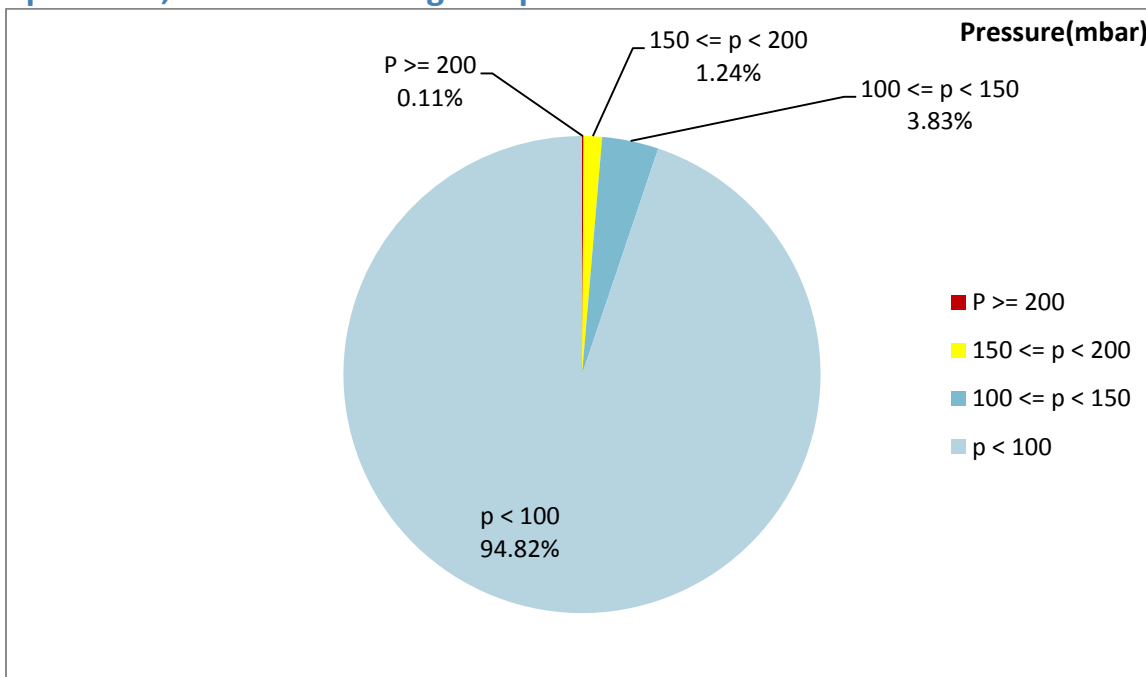


Figure 1- Pressure distribution over the working hours

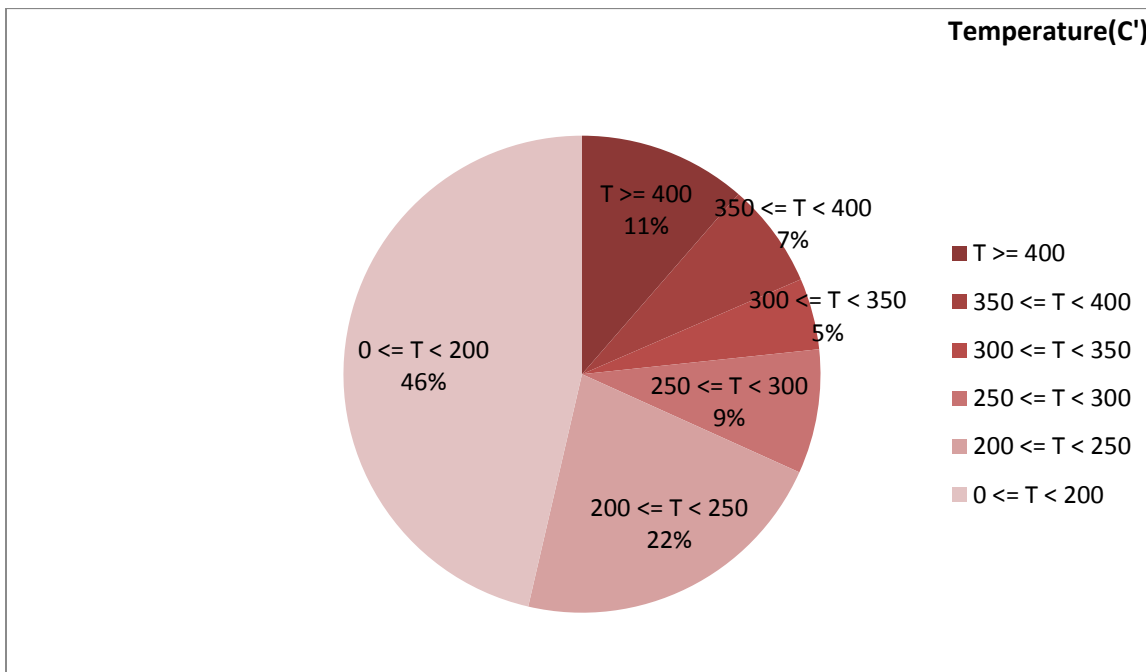


Figure 2-Temperature distribution over the working hours

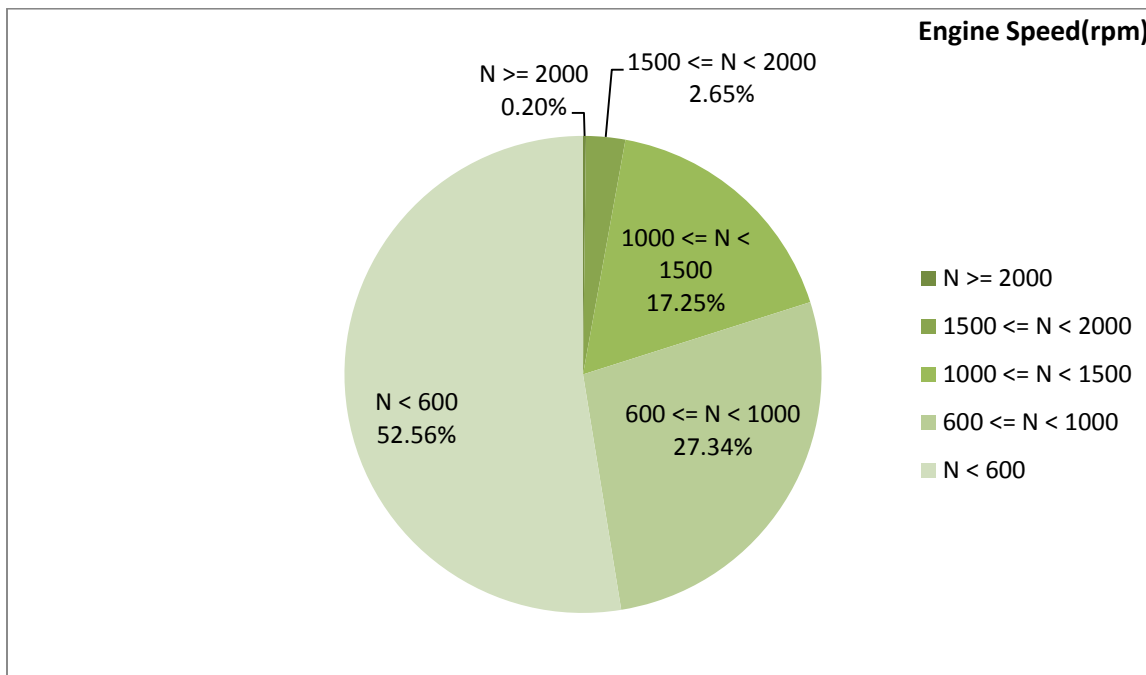


Figure 3- Engine speed distribution over the working hours

Table 4- Mean values

Mean temperature (C)	Mean pressure(mbar)	Mean engine speed(rpm)
237.05	24.5	737

Table 5- Mean values without idling

Mean temperature (C)	Mean pressure(mbar)	Mean engine speed(rpm)
245.78	33.87	837

Table 6- Max-min values

Max-min temperature(C)	Max-min pressure(mbar)	Max-min engine speed(rpm)
538-50	228-3	2480-256

Notice: Temperature 1 and 2 data were incorrect from Nov 12th to Nov 20th, because of temp 2 sensor's short circuit problem. Temp 2 sensor was removed on Nov 20th, so first 10 days (Nov-1st to Nov-10th) temperature's data were used for providing figure 2 and tables 4,5,6 .

Detailed Pressure Analysis

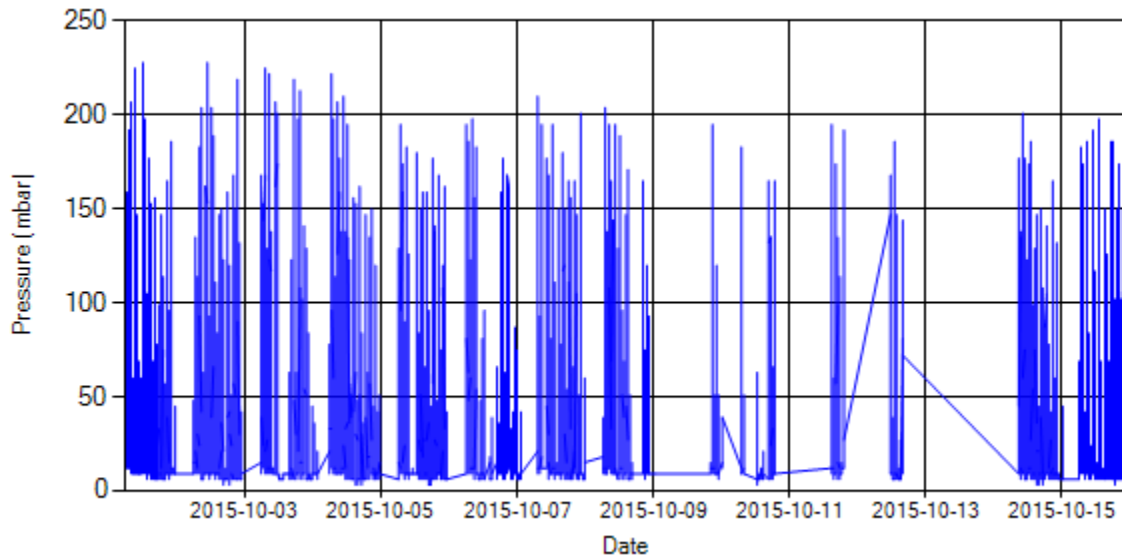


Figure 4- Pressure distribution over the period

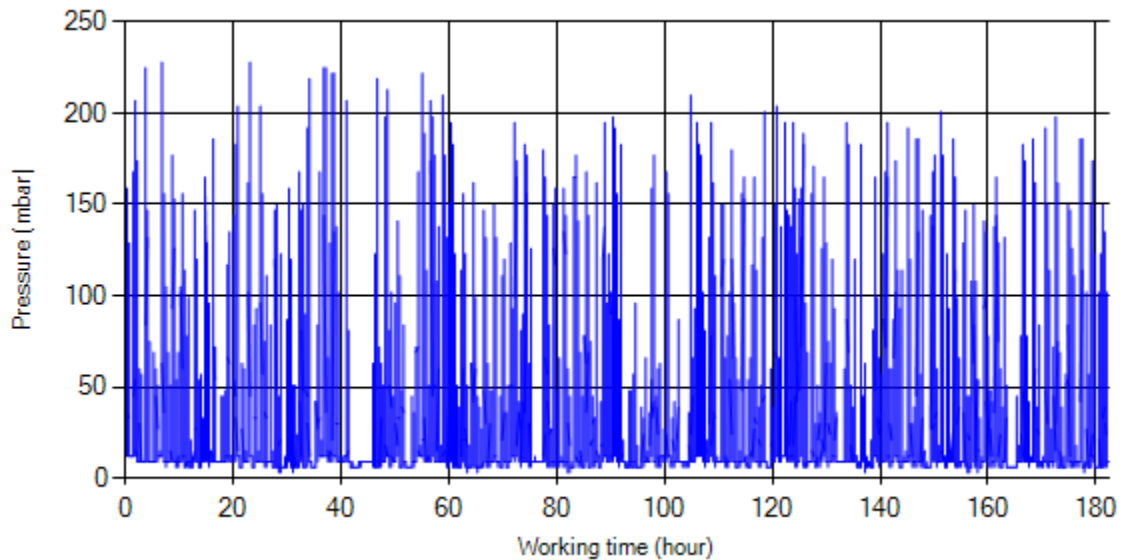


Figure 5- Pressure vs. working hours

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.

Detailed Temperature Analysis

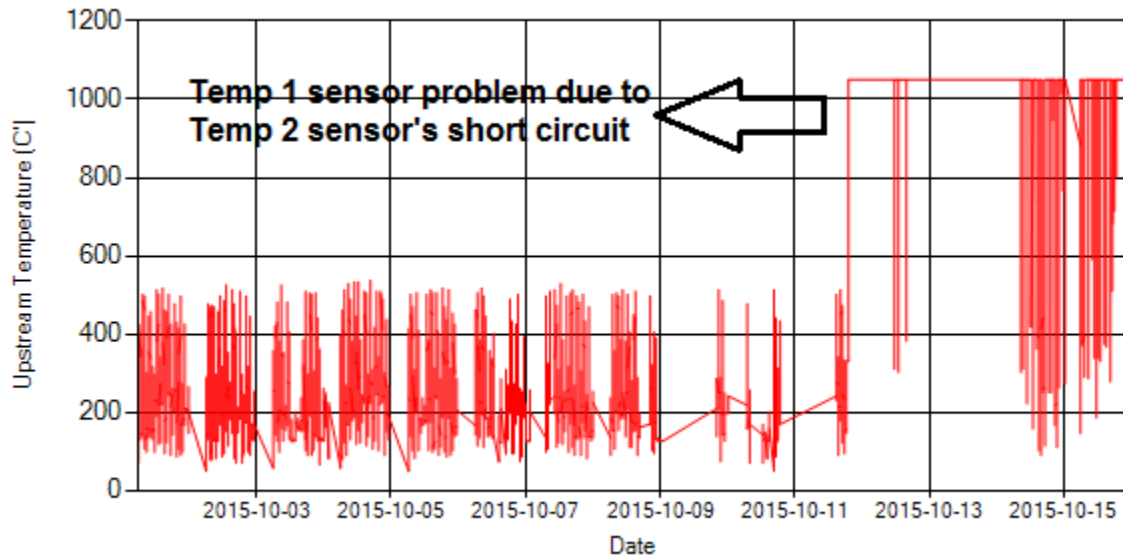


Figure 6- Temperature distribution over the period

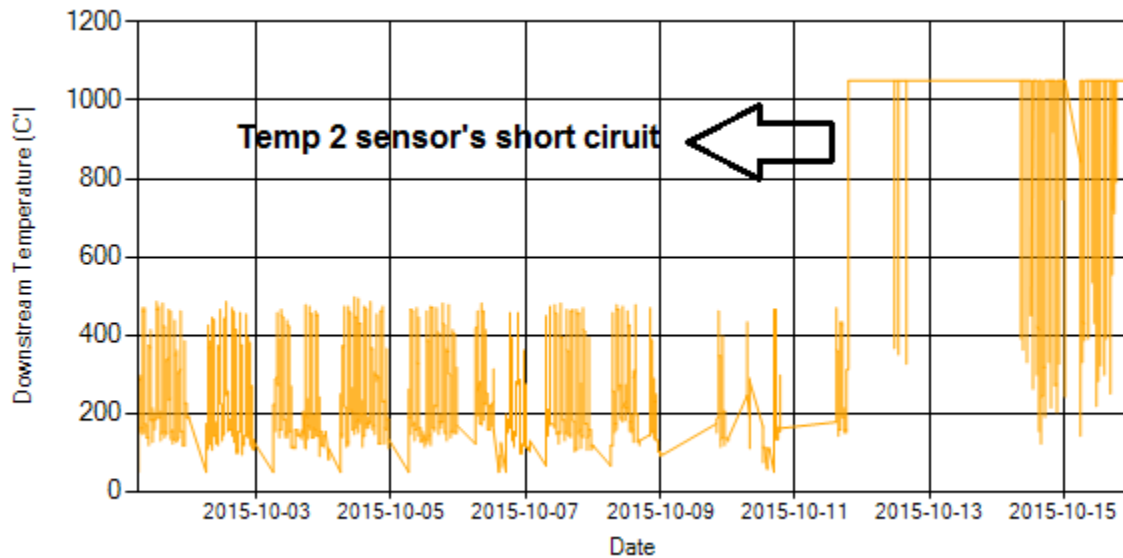


Figure 7- Temperature distribution over the period

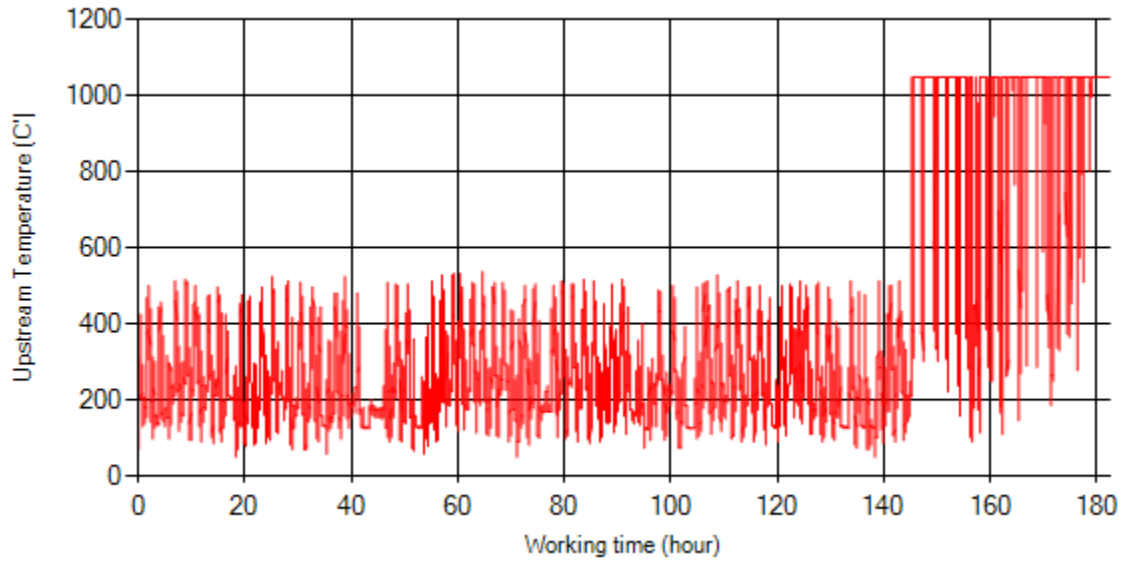


Figure 8- Temperature vs. working hours

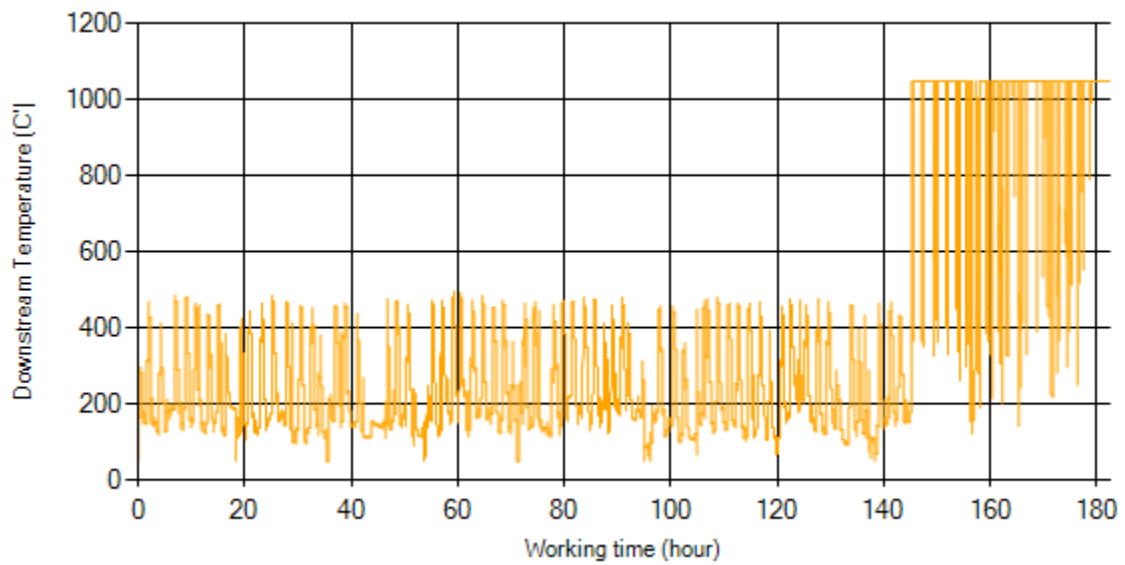


Figure 9- Temperature vs. working hours

Engine Speed Diagrams

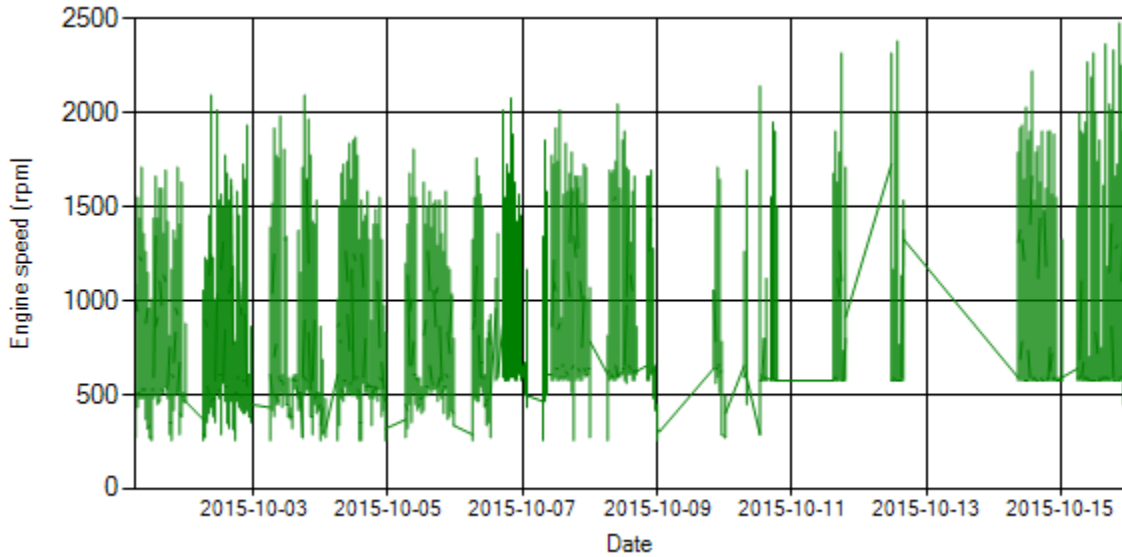


Figure 10- Engine speed distribution over the period

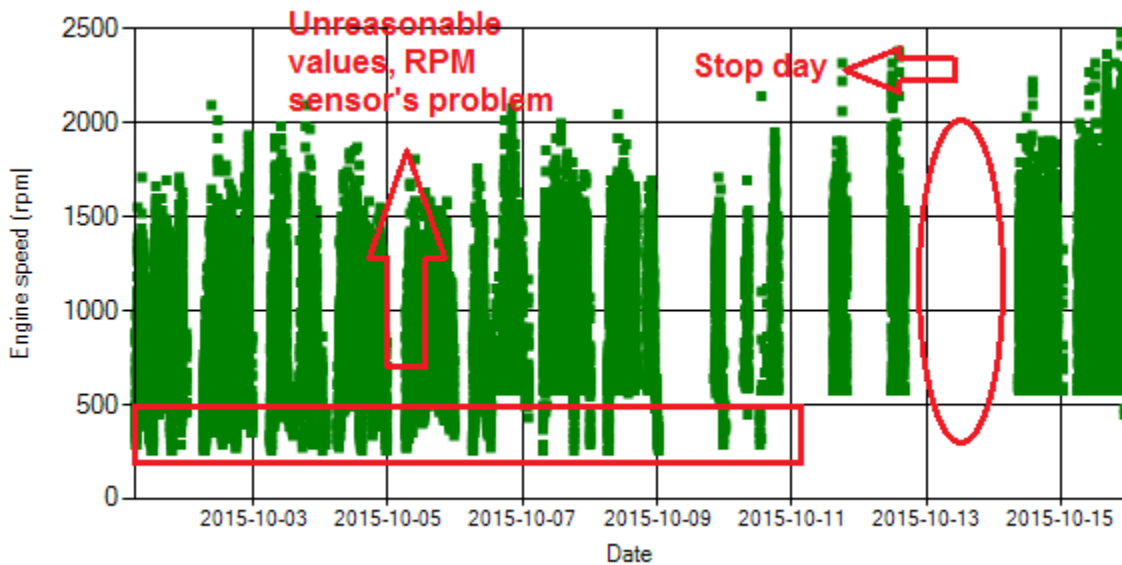


Figure 11- Engine speed diagram for calculating CPK's working days

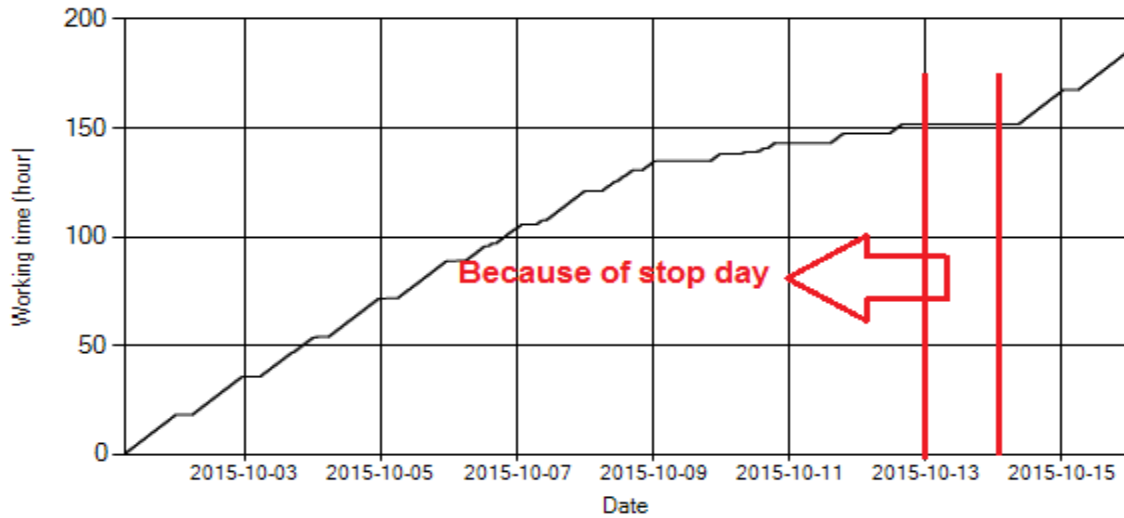


Figure 12- Time diagram for calculating CPK's working days

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 Figure 12, Nov 13th was stop day.

Pressure-Engine Speed diagrams

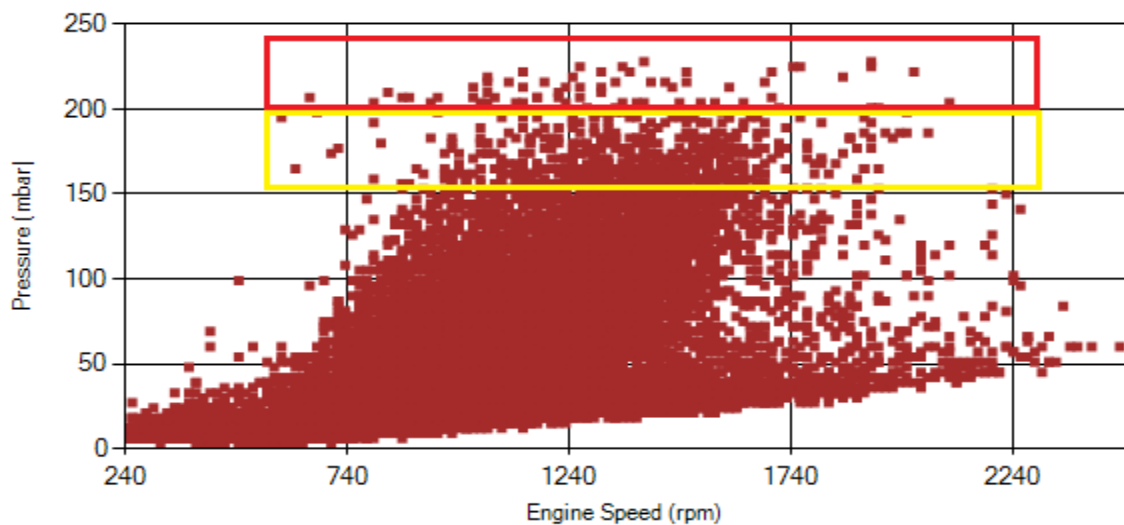


Figure 13- Pressure against engine speed

Notice: Red alarm (pressure > 200 mbar) and yellow alarm (200 > pressure > 150) ranges were indicated in figure 13.

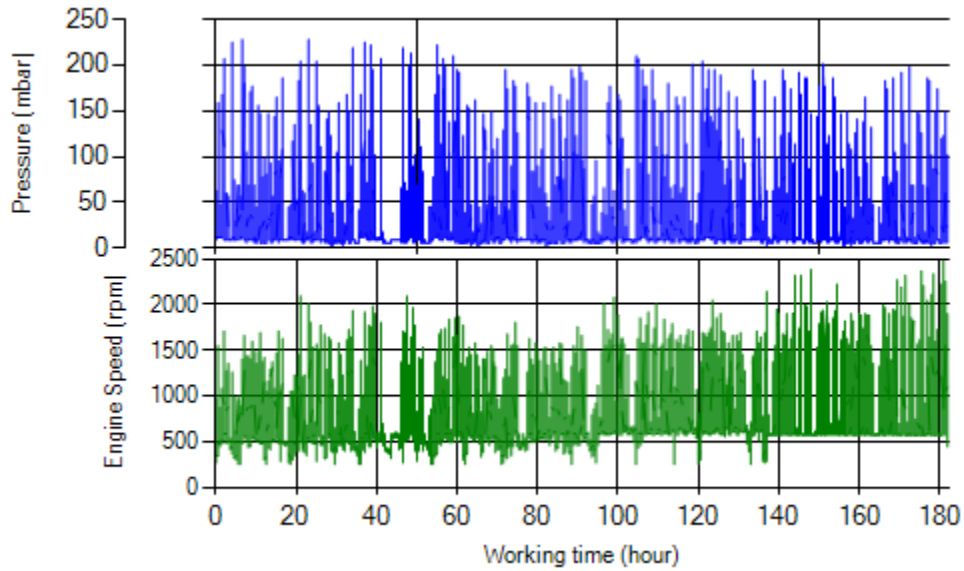


Figure 14- P, N distribution vs. working hours

Temperature-Engine Speed diagrams

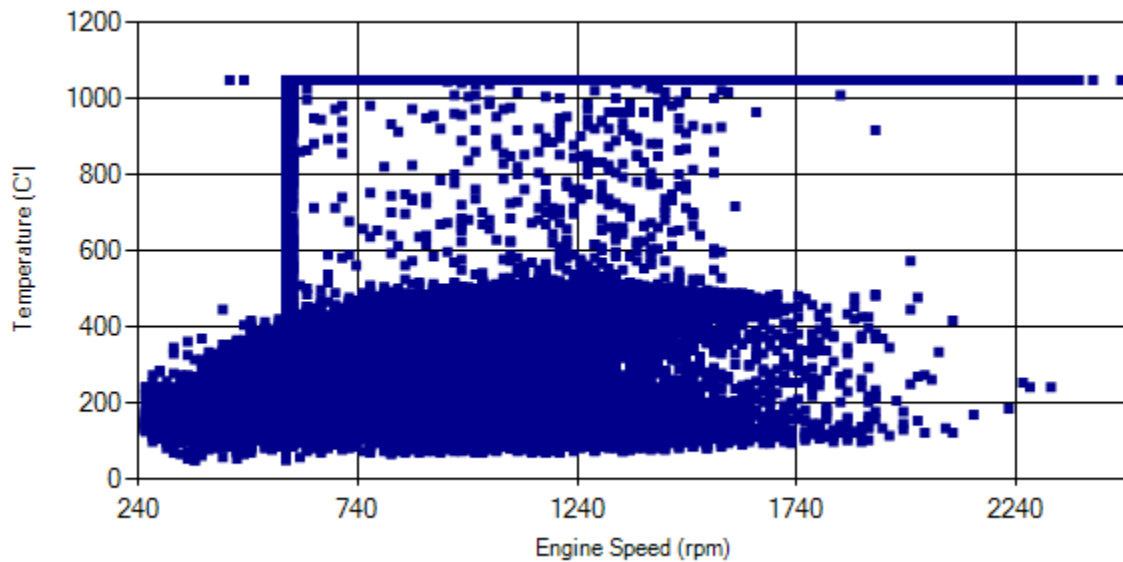


Figure 15- Temperature against engine speed

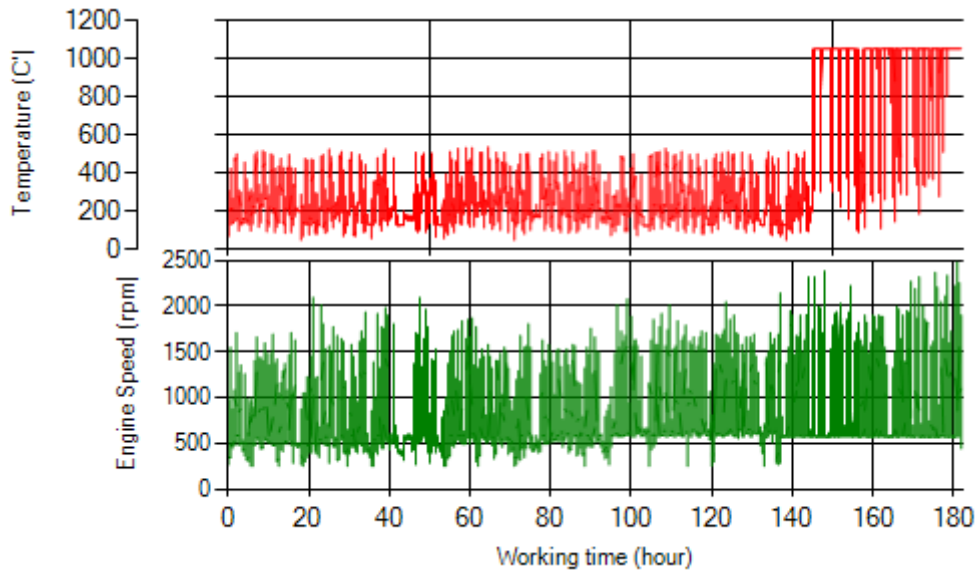


Figure 16- T, N distribution vs. working hours

Filter Operation Analysis

- As depicted in figure 1, 0.11% of total working time pressure is above 200 mbar and 1.35% above 150mbar.
- Considering October first ten days (figure 2), It can be obviously observed that 11% of total working-time temperature is above 400 °C and 18% above 350°C.

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

Overall Information

Table1- Overall Information

Vehicle plate number	85476
CPK data logger number	LN: 001508, DN: 2003, Sim +989218469624
Bus line	Number 10 (south to north Bus line)
Bus Terminals	Azadi square - Daneshgah square
Total path distance	10.7 km
DPF producer company	HJS_04 (Passive system with FBC)
Installation date	23/Feb/2015
Report period	16/Oct/2015 – 31/Oct/2015 (sixteen days)
K value - DPF upstream	1.80 [1/m]
K value – DPF downstream	0.02 [1/m]

Table 2- DPF Maintenance History

Filter maintenance date	DPF was cleaned on 22 nd Jul.
Dosing status	Dosing value has been kept constant from installation date until now.

Table 3- Fuel and Additive Consumption Information

Bus mileage (from DPF installation date)	38213 km
Bus mileage over the period	2569 km
Working days over the period	15 days
Stop days	1 day
Data logger working days	15 days
Working hours over the period	196 hours 56 minutes
Average working hours per day (including stop days)	11 hours 34 minutes
Bus average speed	13.04 km/hr
idle speed time to all working time ration	56.52 %
Total Bus fuel consumption over the period	1593 lit
Fuel consumption per hour	8.09 lit/hr
Average fuel consumption	0.62 lit/km
Total Bus additive consumption over the period	0.661 lit
Average additive consumption	257 cc/km
Additive consumption to fuel ration	415 cc/1000lit

Temperature, Pressure and Engine Speed Overview

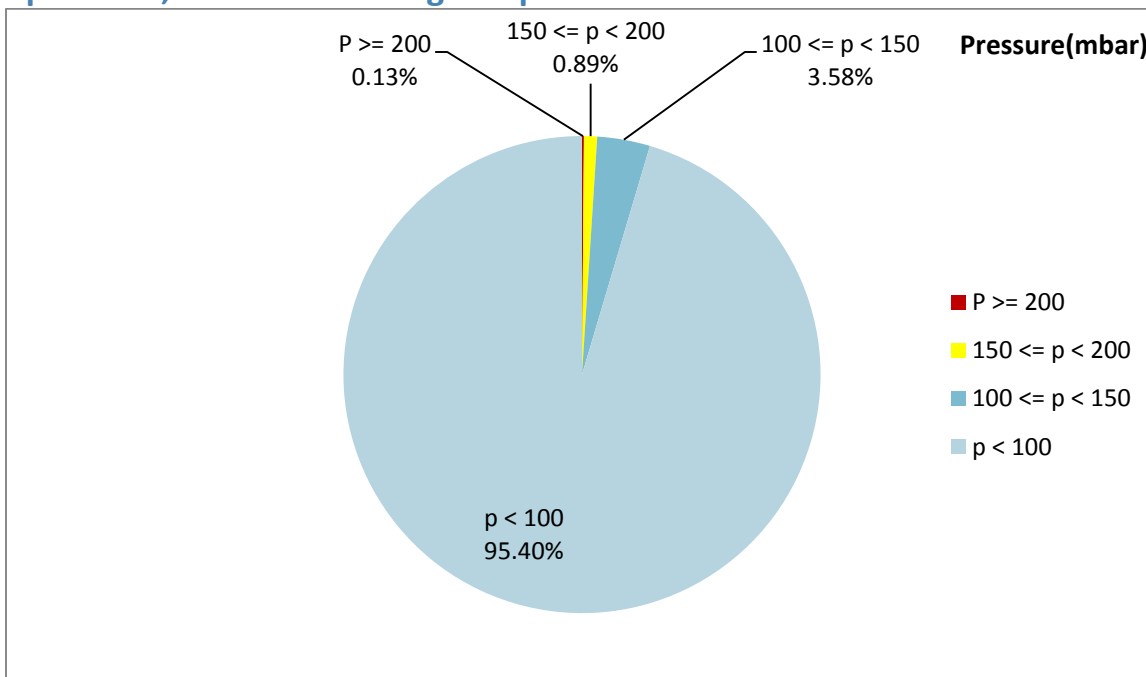


Figure 1- Pressure distribution over the working hours

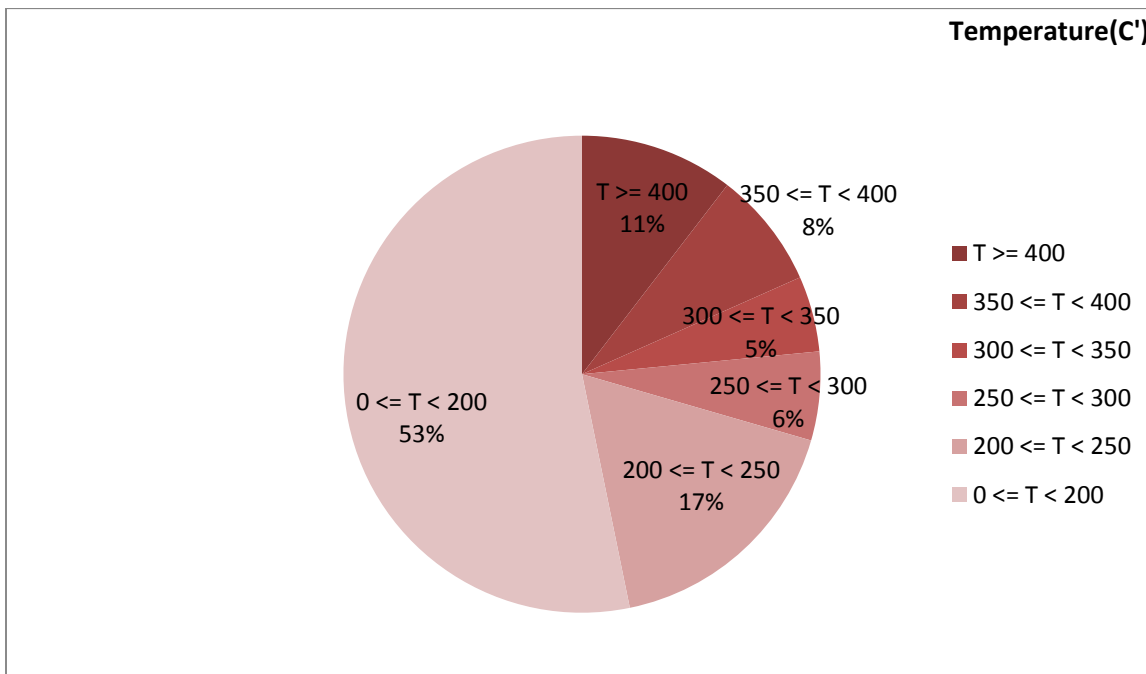


Figure 2-Temperature distribution over the working hours

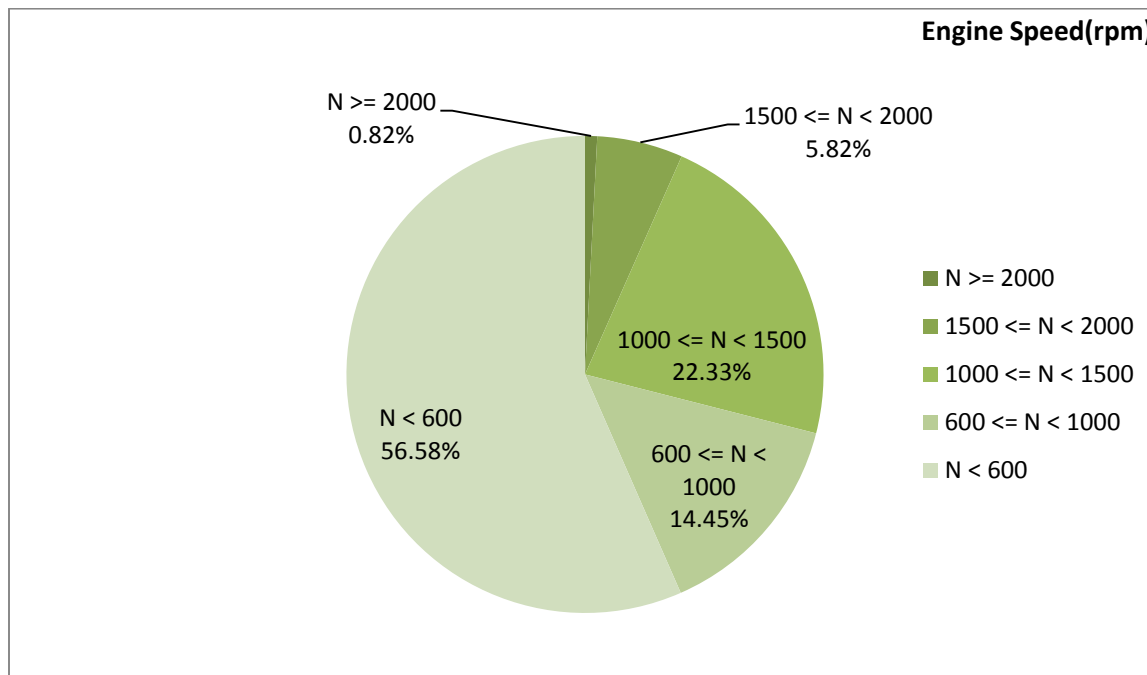


Figure 3- Engine speed distribution over the working hours

Table 4- Mean values

Mean temperature (C)	Mean pressure(mbar)	Mean engine speed(rpm)
226.64	24.2	830

Table 5- Mean values without idling

Mean temperature (C)	Mean pressure(mbar)	Mean engine speed(rpm)
285.24	44.92	1152

Table 6- Max-min values

Max-min temperature(C)	Max-min pressure(mbar)	Max-min engine speed(rpm)
534-50	270-3	2560-304

Notice: Temperature 1 and 2 data were incorrect from Nov 12th to Nov 20th, because of temp 2 sensor's short circuit problem. Temp 2 sensor was removed on Nov 20th, so last 10 days (Nov-21st to Nov-31st) temperature's data were used for providing figure 2 and tables 4,5,6 .

Detailed Pressure Analysis

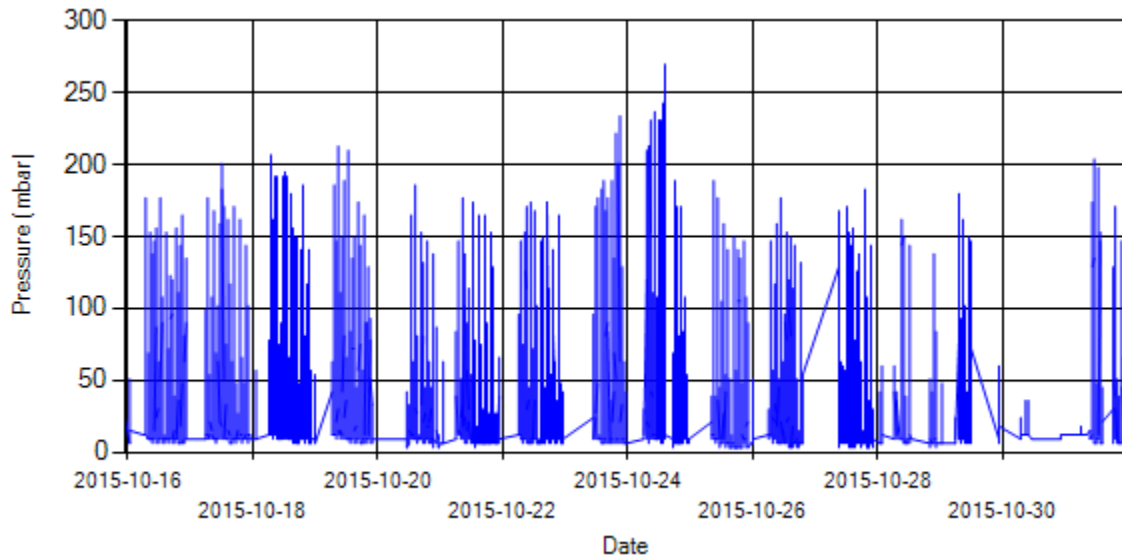


Figure 4- Pressure distribution over the period

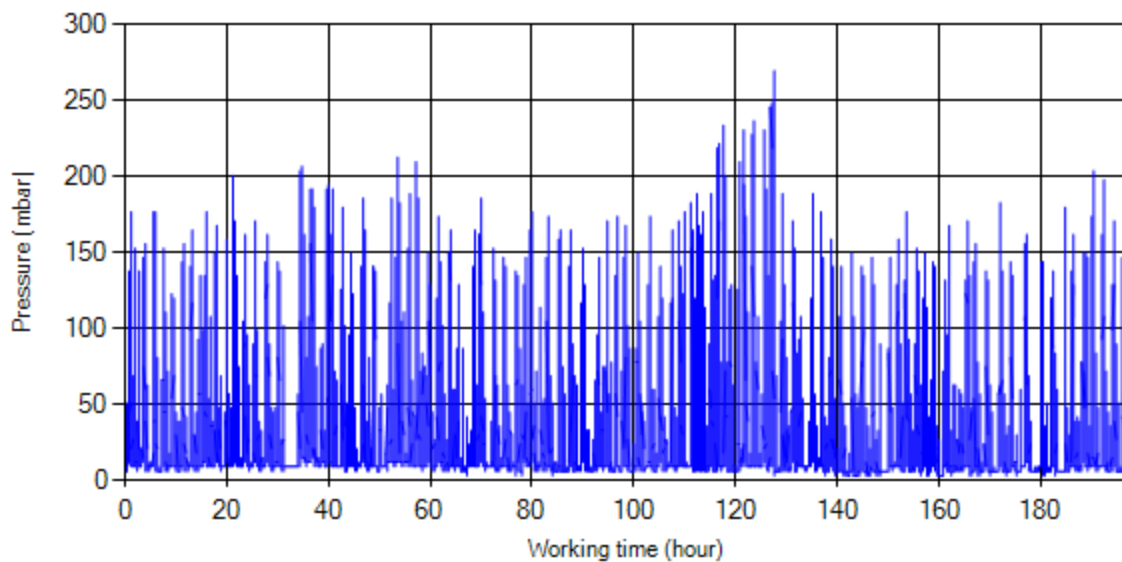


Figure 5- Pressure vs. working hours

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.

Detailed Temperature Analysis

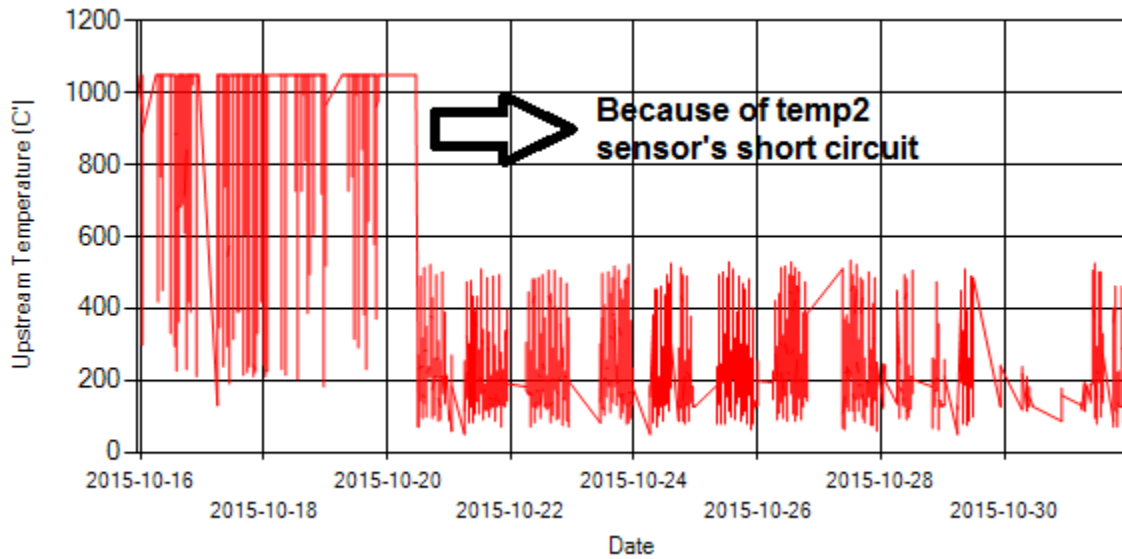


Figure 6- Temperature distribution over the period

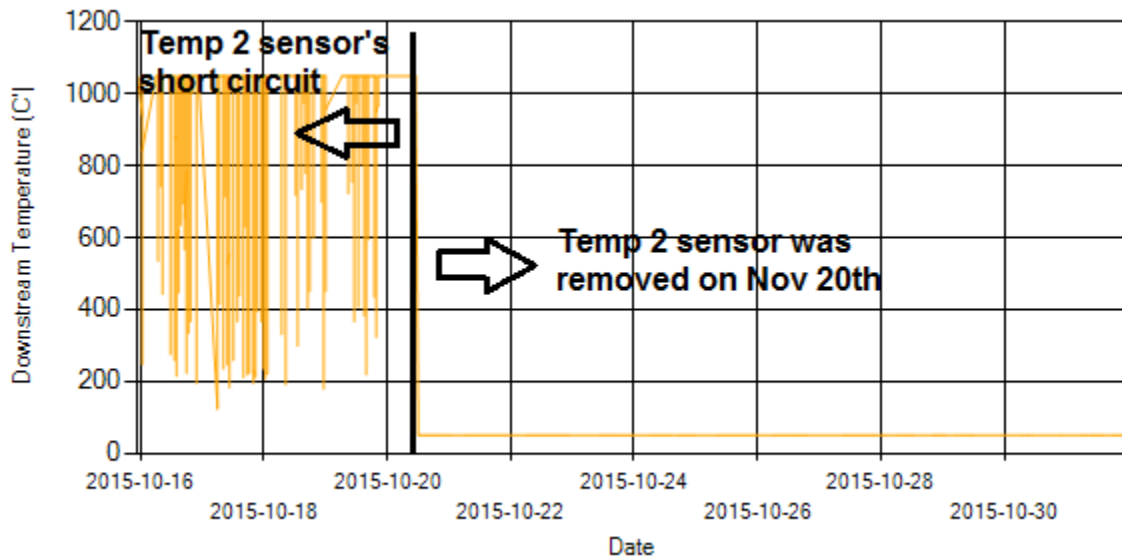


Figure 7- Temperature distribution over the period

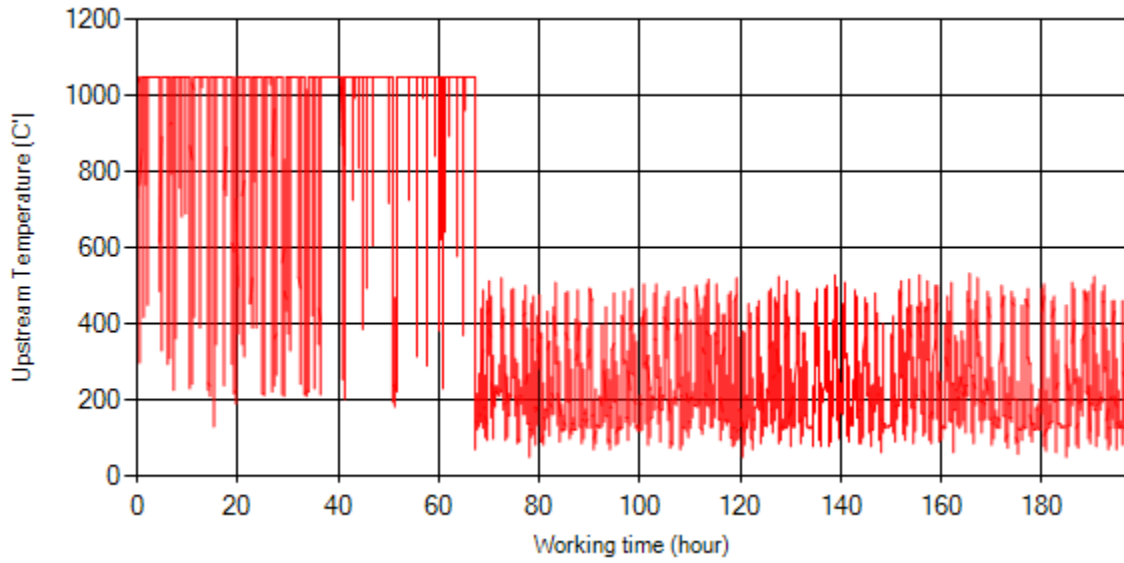


Figure 8- Temperature vs. working hours

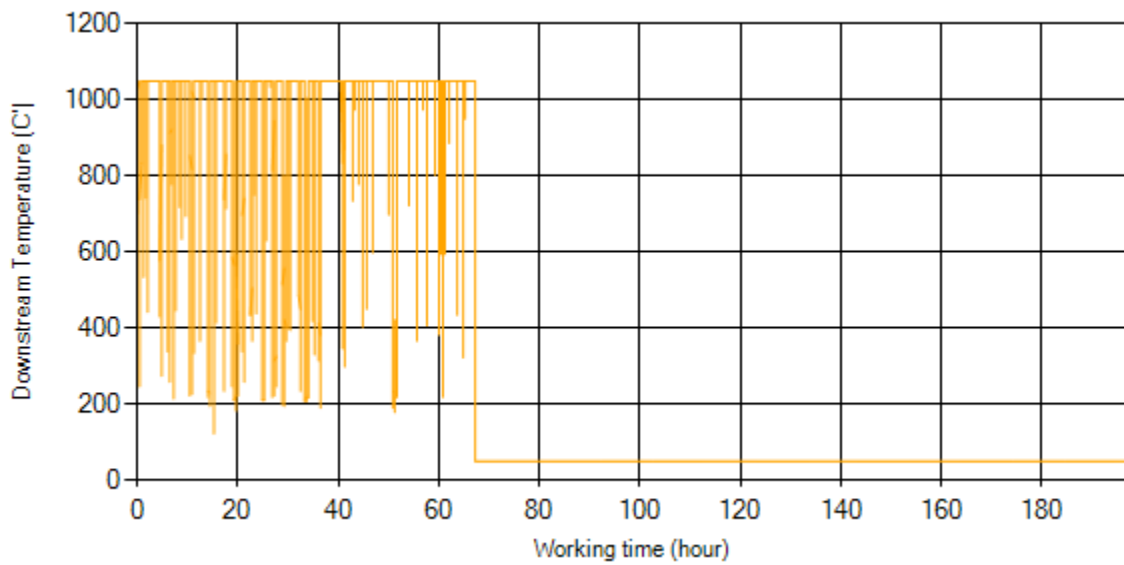


Figure 9- Temperature vs. working hours

Engine Speed Diagrams

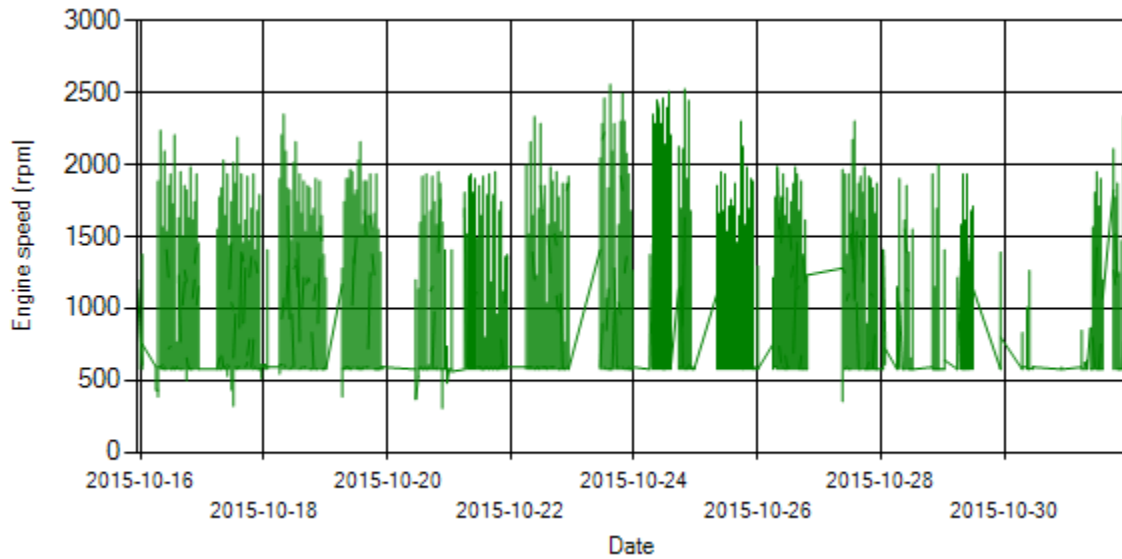


Figure 10- Engine speed distribution over the period

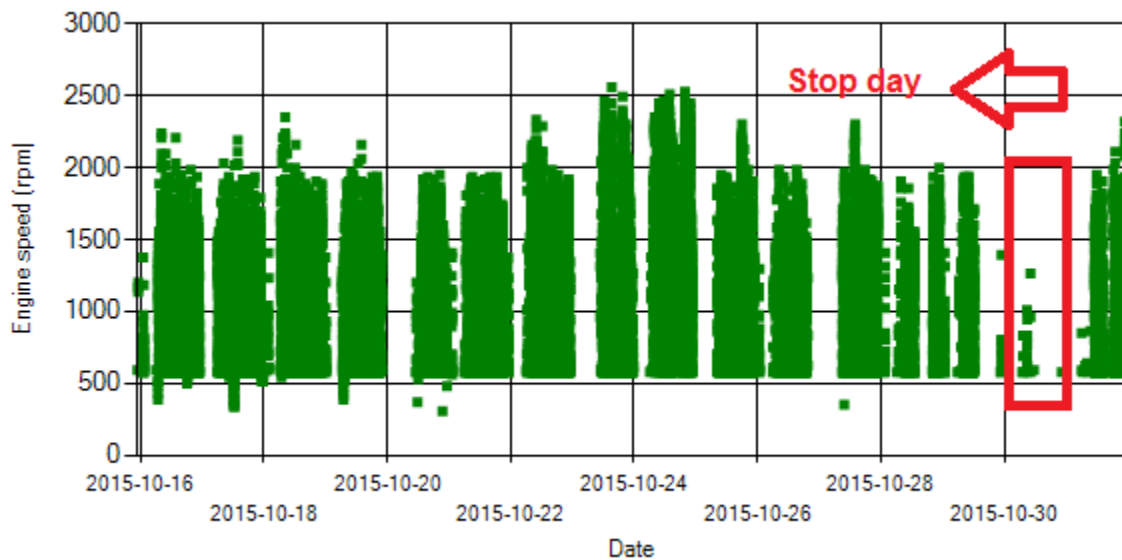


Figure 11- Engine speed diagram for calculating CPK's working days

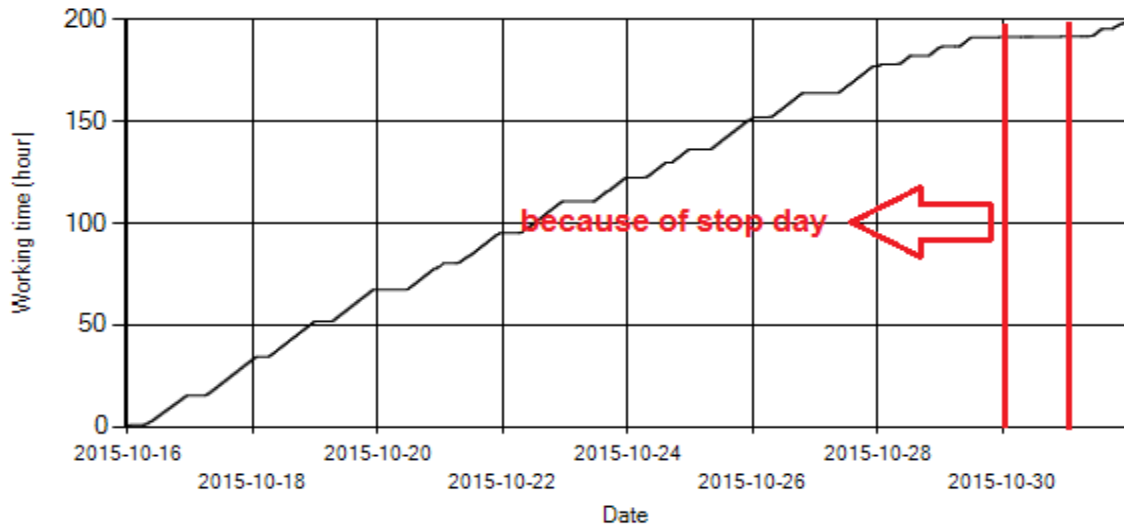


Figure 12- Time diagram for calculating CPK's working days

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 Figure 12, Nov 30th was stop day.

Pressure-Engine Speed diagrams

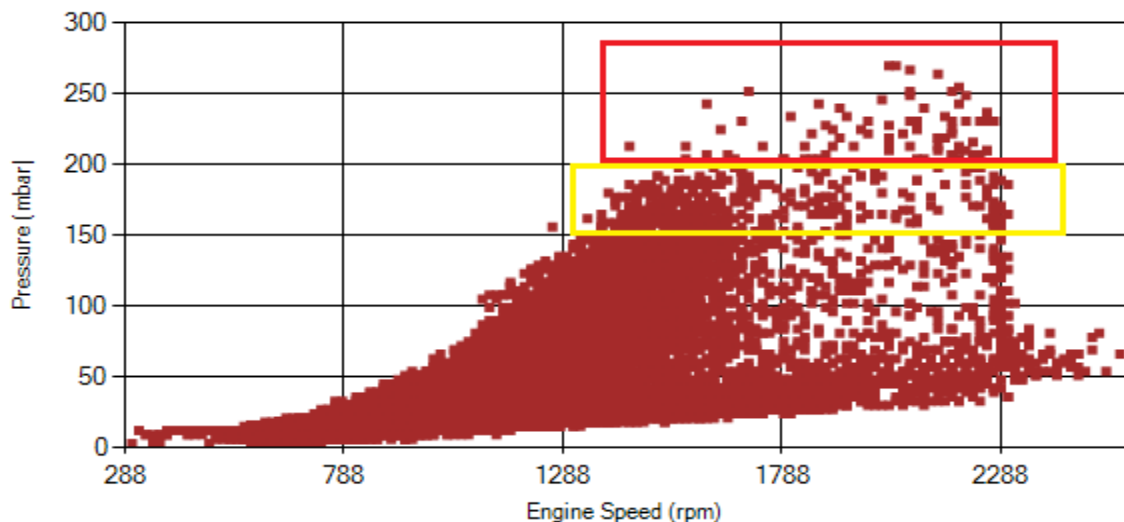


Figure 13- Pressure against engine speed

Notice: Red alarm (pressure > 200 mbar) and yellow alarm (200 > pressure > 150) ranges were indicated in figure 13.

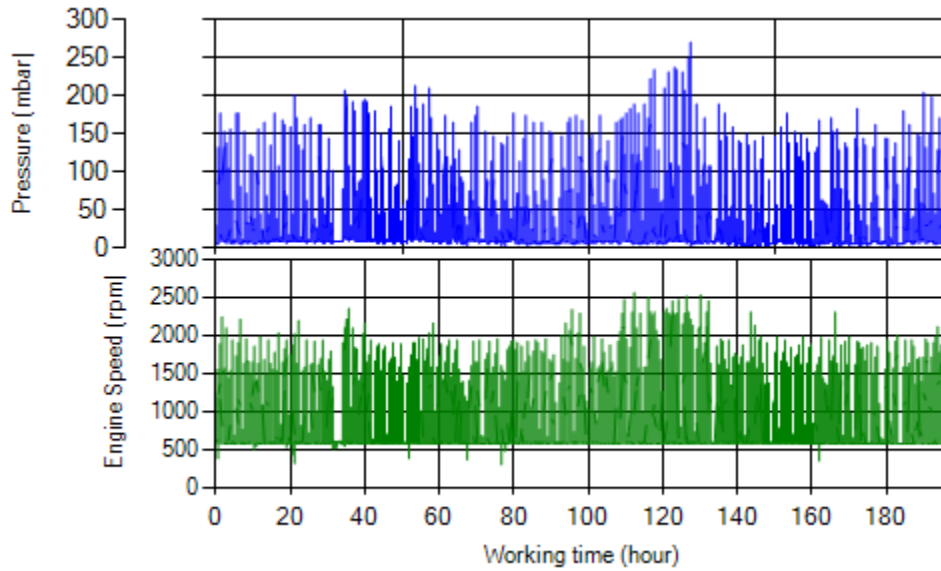


Figure 14- P, N distribution vs. working hours

Temperature-Engine Speed diagrams

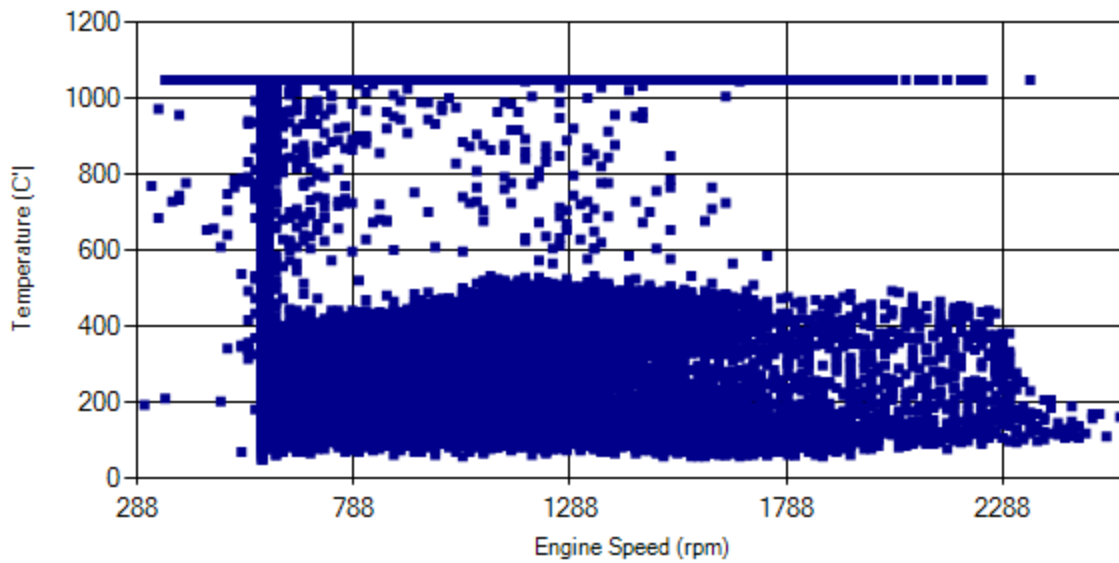


Figure 15- Temperature against engine speed

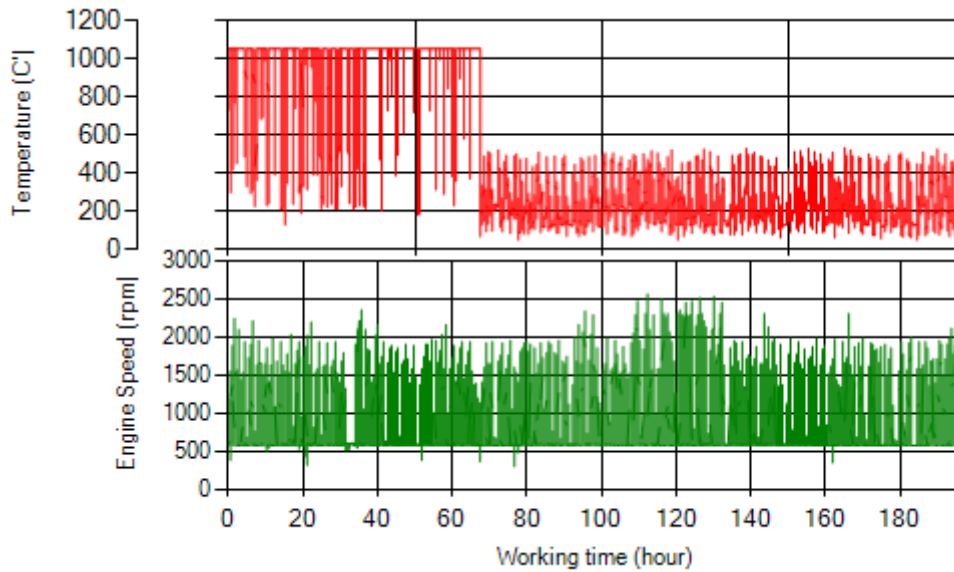


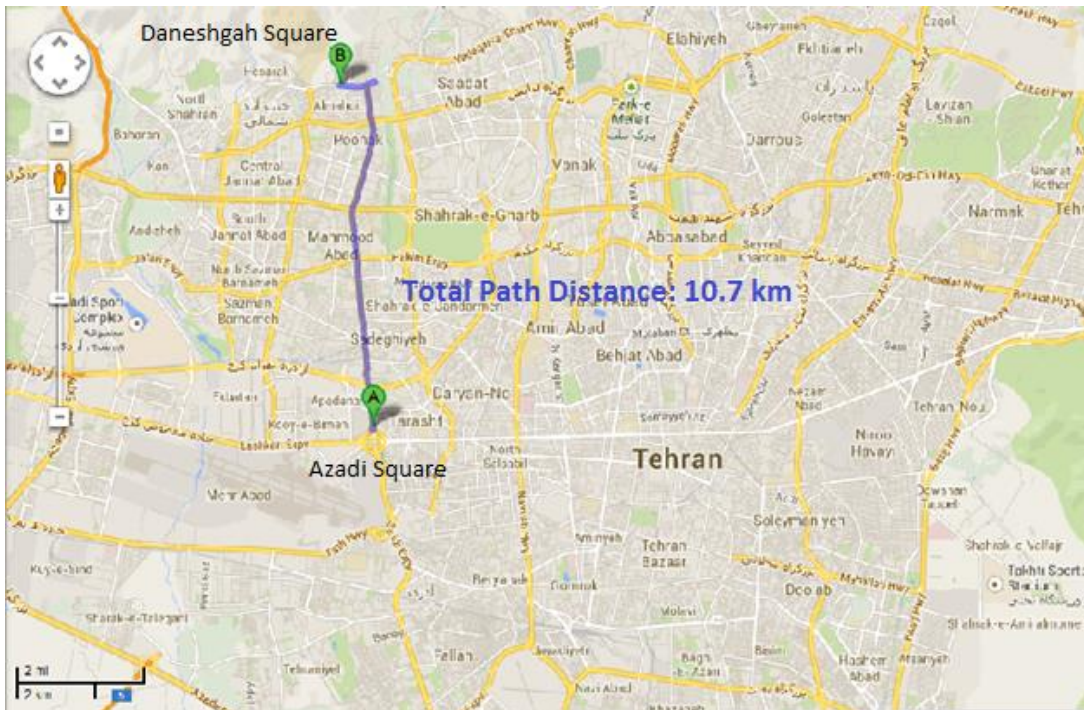
Figure 16- T, N distribution vs. working hours

Filter Operation Analysis

- As depicted in figure 1, 0.13% of total working time pressure is above 200 mbar and 1.02% above 150mbar.
- Considering October last ten days (figure 2), it can be obviously observed that 11% of total working-time temperature is above 400 °C and 19% above 350°C.

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

Vehicle plate number	85182
Bus line	Number 10 (south to north Bus line)
DPF producer company	Tehag_01 (Catalyzed DPF)



Overall Information

Table1- Overall Information

Vehicle plate number	85182
CPK data logger number	LN: 001502, DN: 1999
Bus line	Number 10 (south to north Bus line)
Bus Terminals	Azadi square - Daneshgah square
Total path distance	10.7 km
DPF producer company	Tehag_01 (Catalyzed DPF)
Installation date	24/Sep/2015
Report period	01/Oct/2015 – 15/Oct/2015 (fifteen days)
K value - DPF upstream	1.86 [1/m]
K value – DPF downstream	0.02 [1/m]

Table 2- DPF Maintenance History

Filter maintenance date	Filter have been working from installation date without any cleaning.
Dosing status	This system doesn't use additive

Table 3- Fuel and Additive Consumption Information

Bus mileage (from DPF installation date)	1393 km
Bus mileage over the period	727 km
Working days over the period	9 days
Stop days	6 days
Data logger working days	9 days
Working hours over the period	93 hours 28 minutes
Average working hours per day (including stop days)	6 hours 13 minutes
Bus average speed	7.78 km/hr
idle speed time to all working time ration	72.26 %
Total Bus fuel consumption over the period	419 lit
Fuel consumption per hour	4.48 lit/hr
Average fuel consumption	0.58 lit/km
Total Bus additive consumption over the period	- lit
Average additive consumption	- cc/km
Additive consumption to fuel ration	- cc/1000lit

Notice: This system doesn't use additive (CDPF).

Temperature, Pressure and Engine Speed Overview

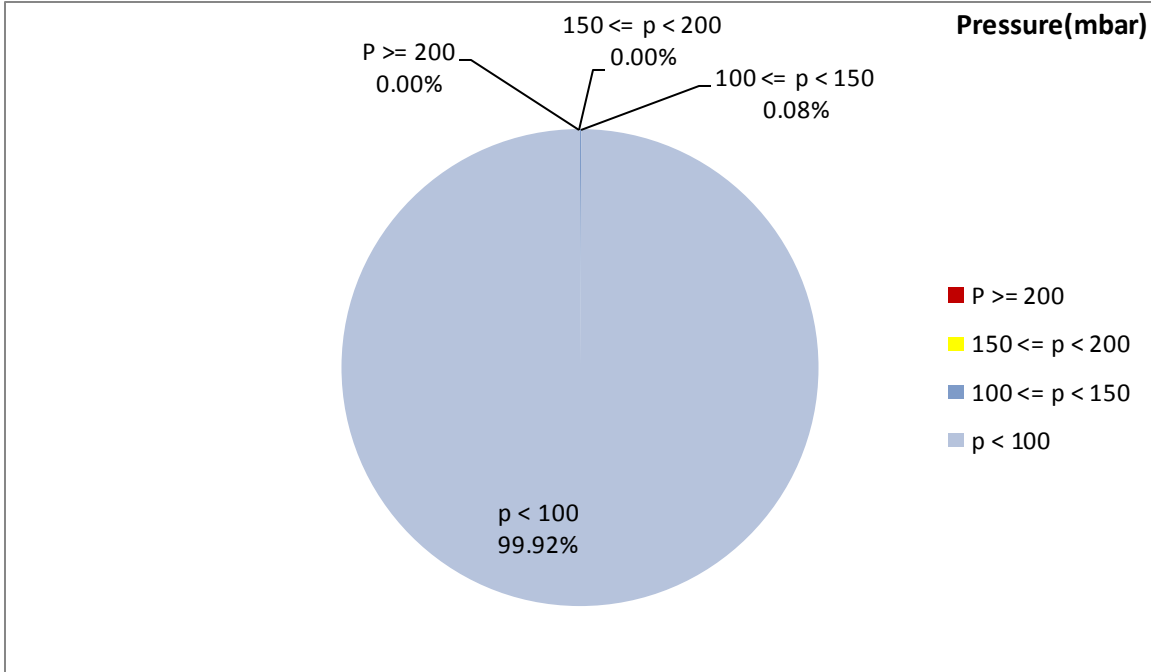


Figure 1- Pressure distribution over the working hours

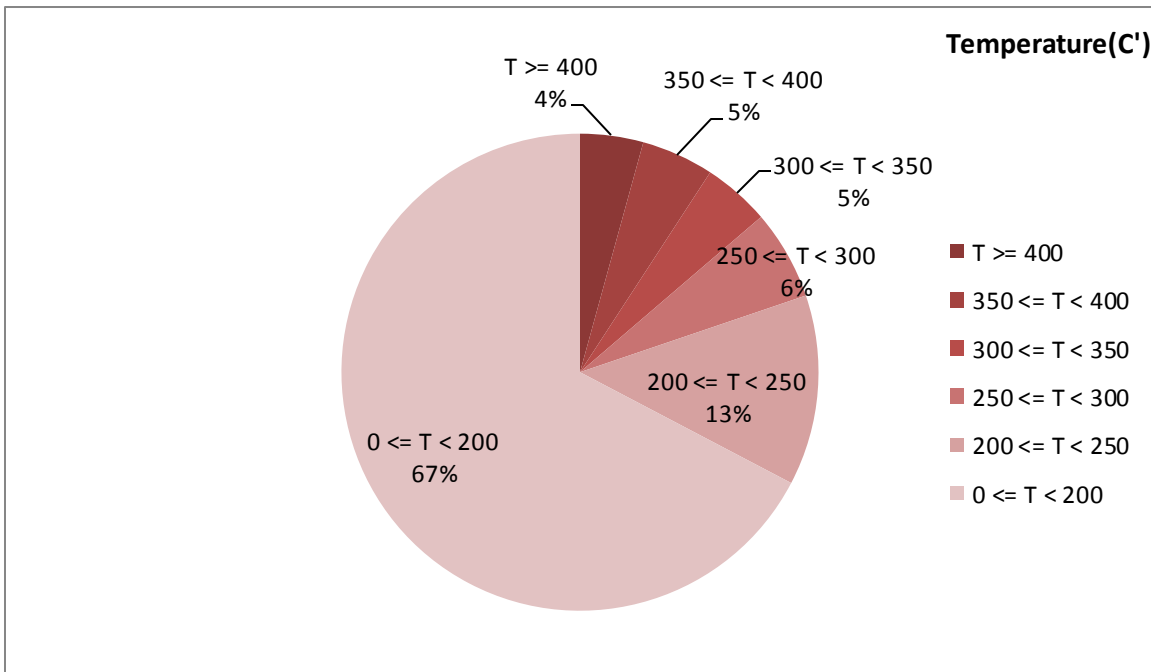


Figure 2- Temperature distribution over the working hours

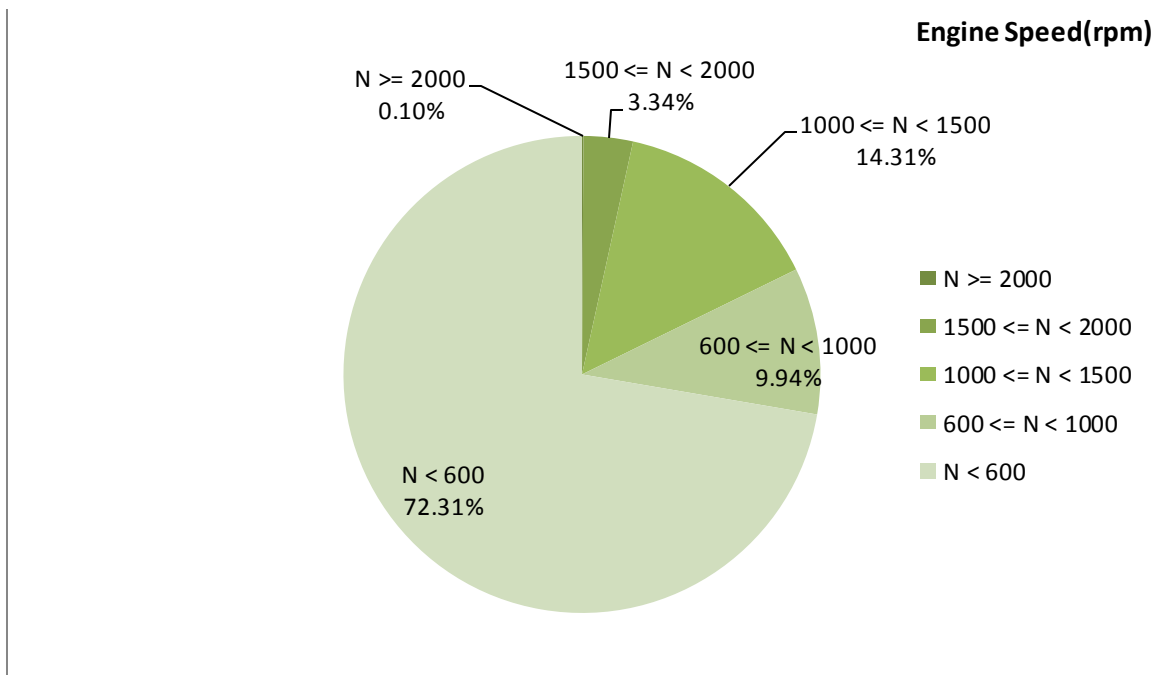


Figure 3- Engine speed distribution over the working hours

Table 4- Mean values

Mean temperature (C)	Mean pressure(mbar)	Mean engine speed(rpm)
195.69	4.46	706

Table 5- Mean values without idling

Mean temperature (C)	Mean pressure(mbar)	Mean engine speed(rpm)
271.23	15.69	1124

Table 6- Max-min values

Max-min temperature(C)	Max-min pressure(mbar)	Max-min engine speed(rpm)
522-50	114-0	2416-256

Detailed Pressure Analysis

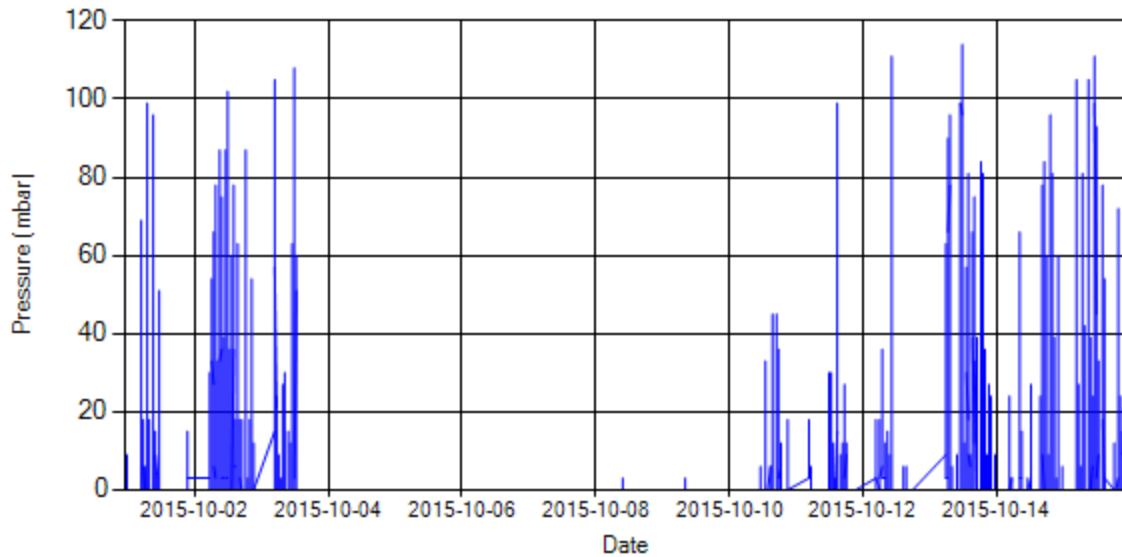


Figure 4- Pressure distribution over the period

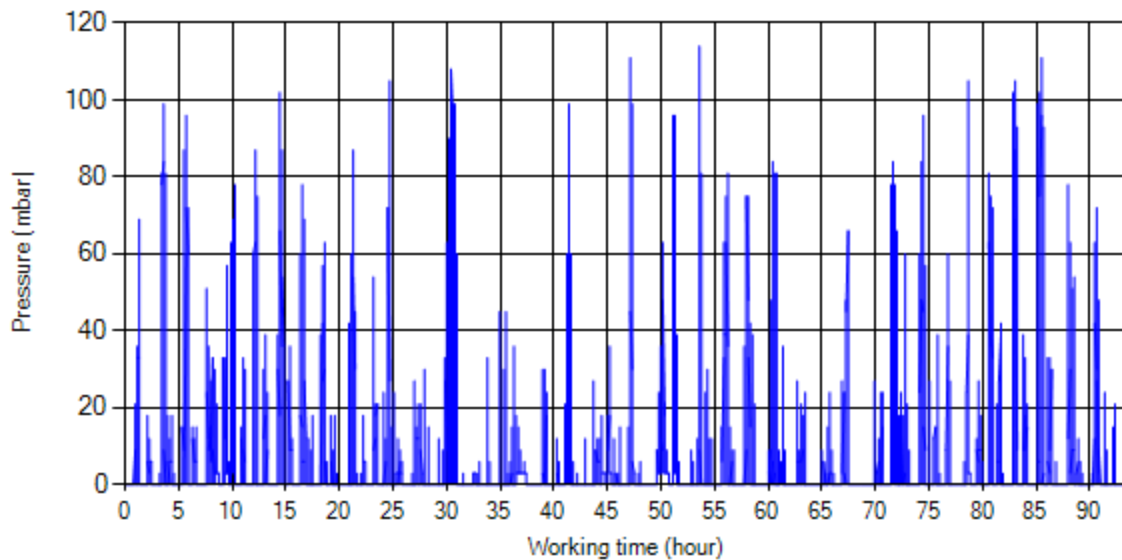


Figure 5- Pressure vs. working hours

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.

Detailed Temperature Analysis

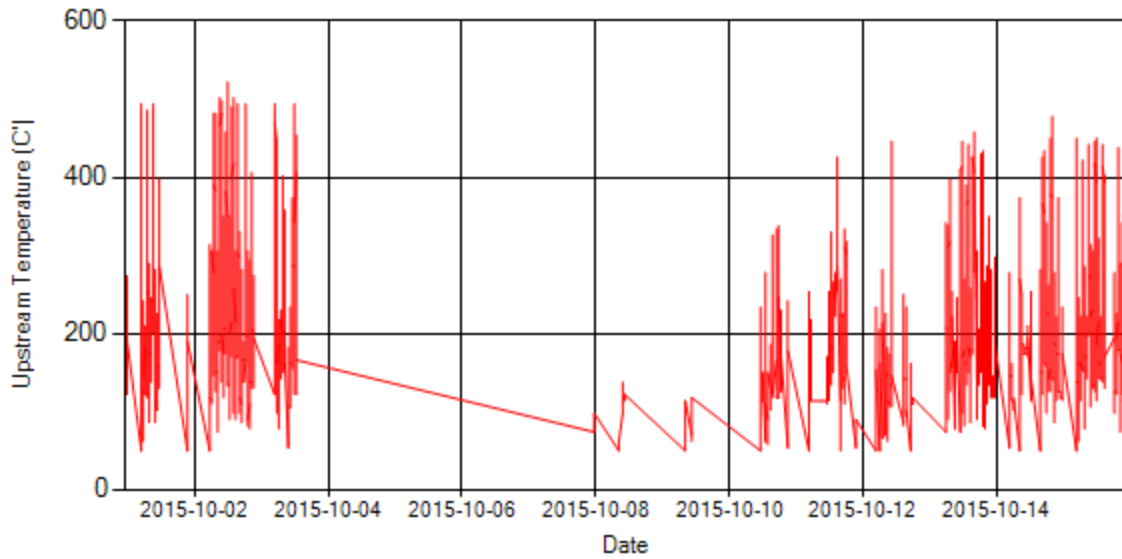


Figure 6- Temperature distribution over the period

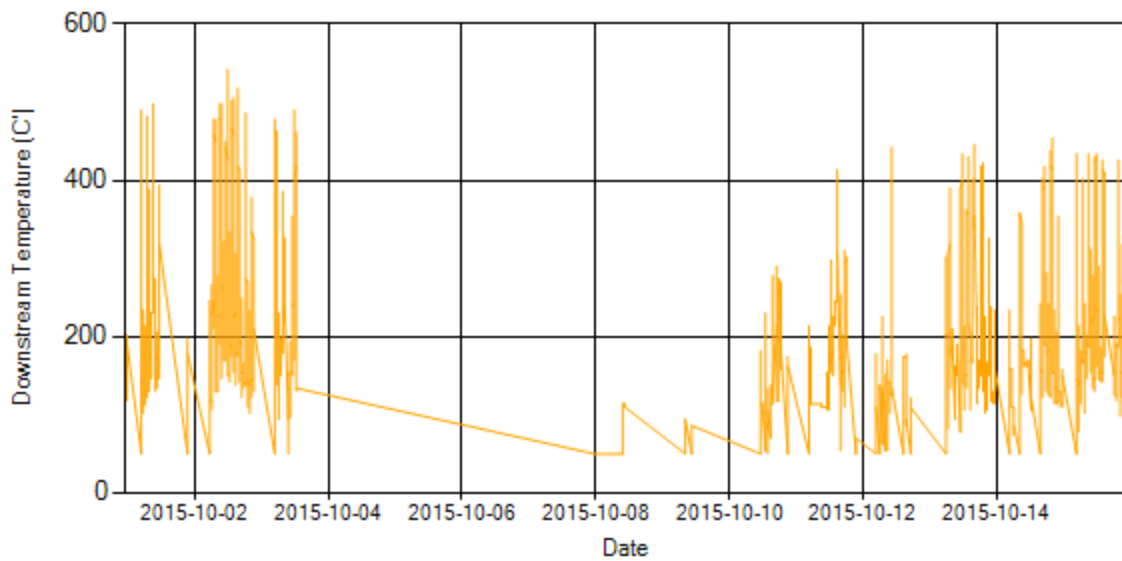


Figure 7- Temperature distribution over the period

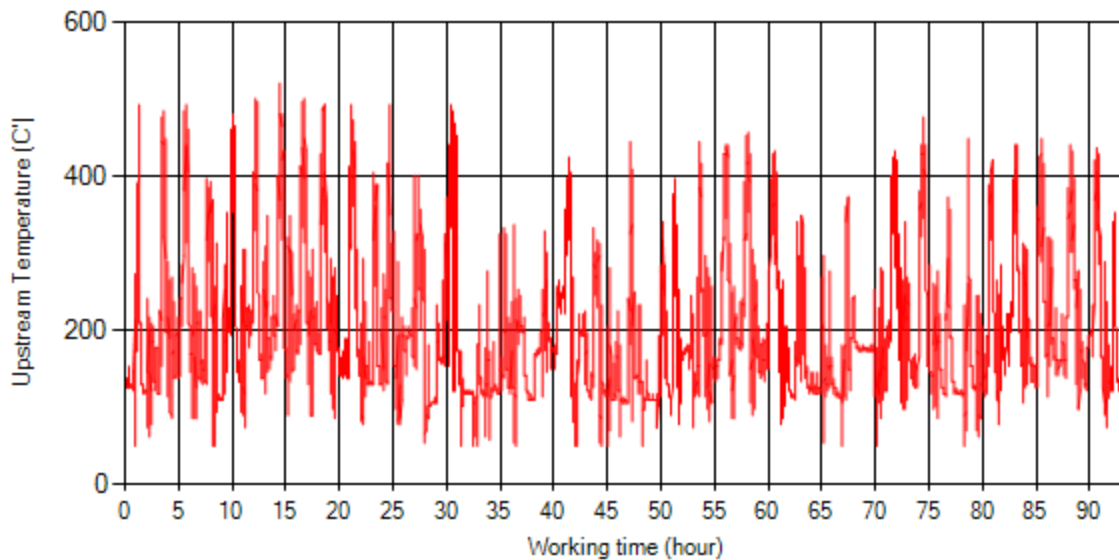


Figure 8- Temperature vs. working hours

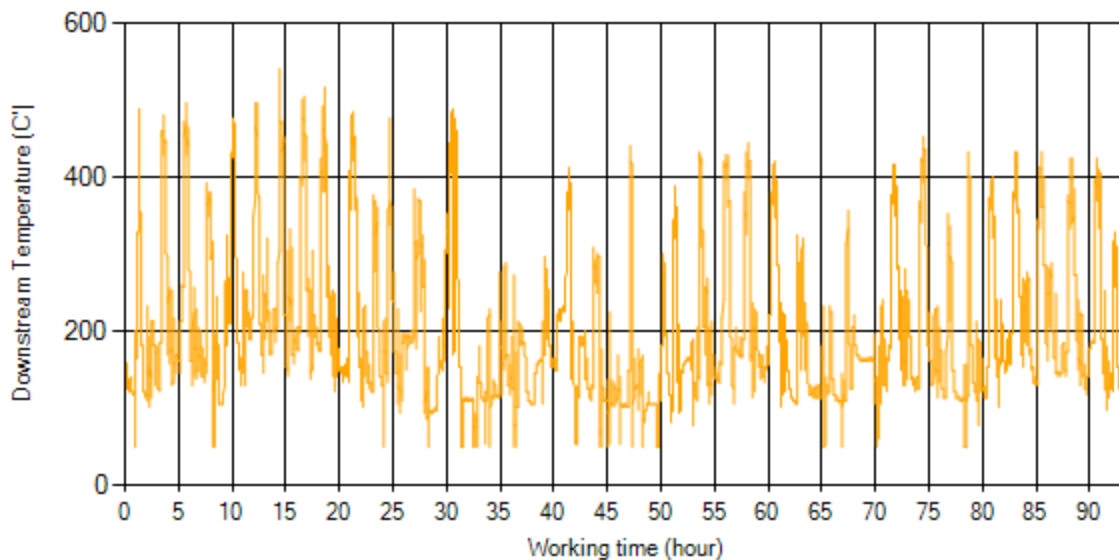


Figure 9- Temperature vs. working hours

Engine Speed Diagrams

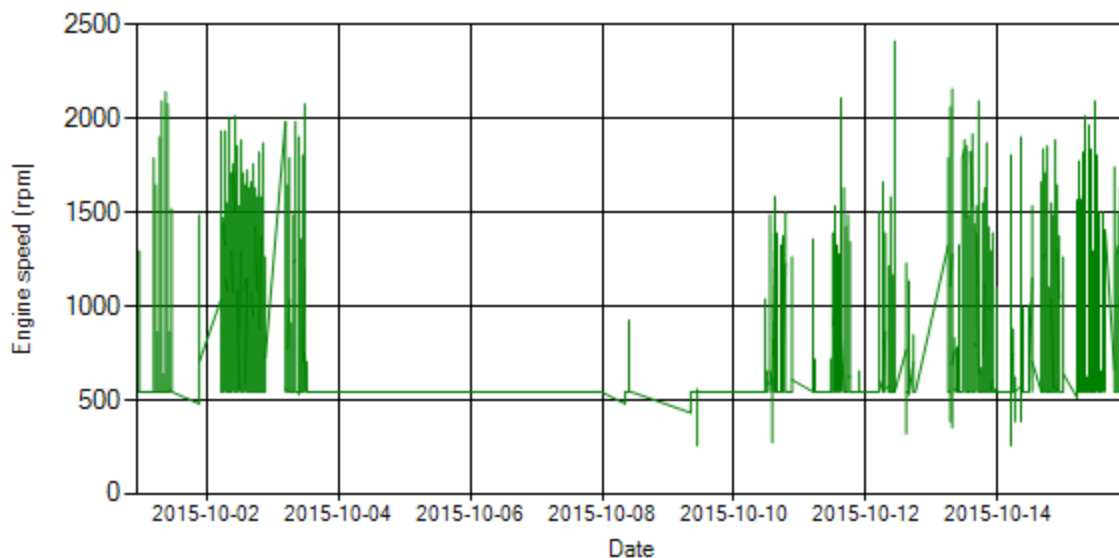


Figure 10- Engine speed distribution over the period

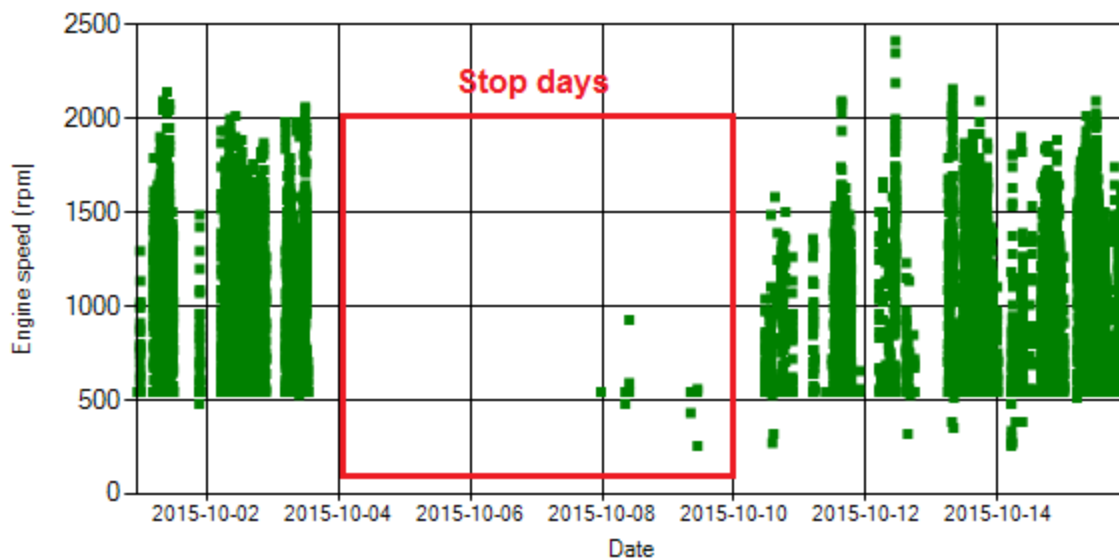


Figure 11- Engine speed diagram for calculating CPK's working days

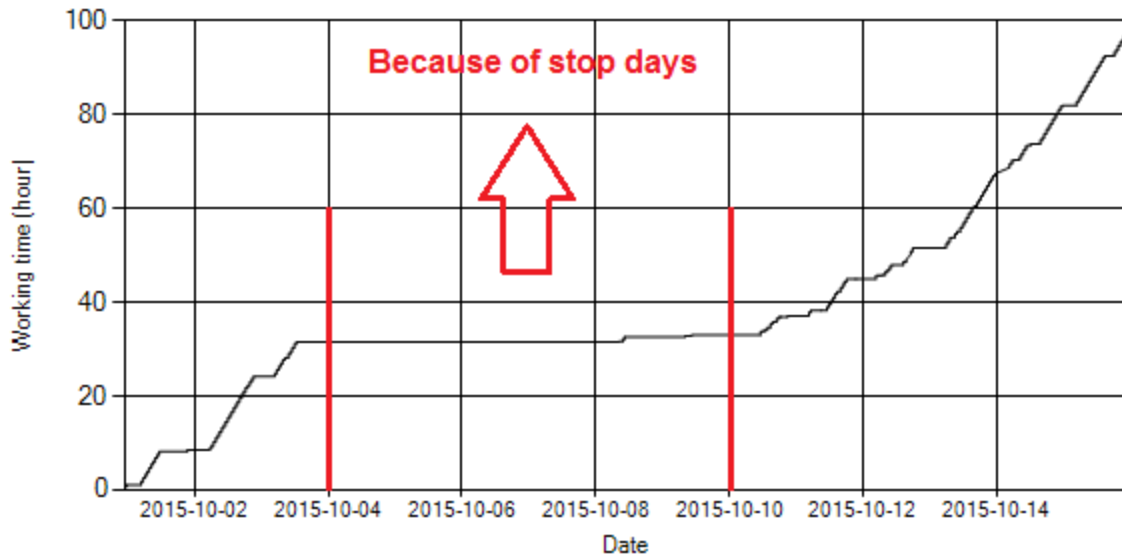


Figure 12- Time diagram for calculating CPK's working days

Notice: Data logger sampling time can be calculated from Figure 12. The lines parallel with Date axis show days without data logger data.

Pressure-Engine Speed diagrams

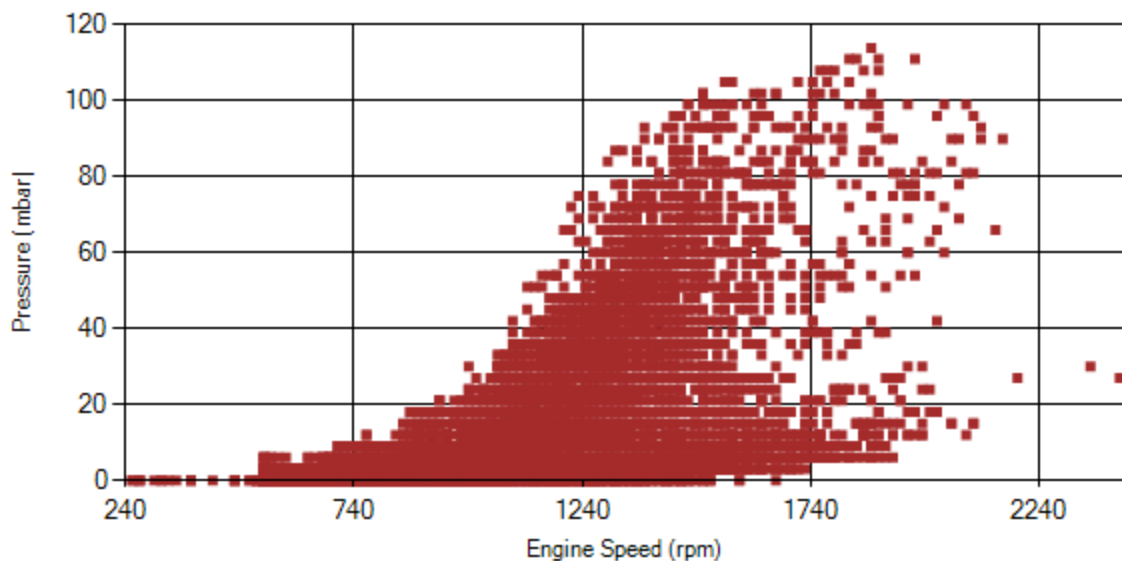


Figure 13- Pressure against engine speed

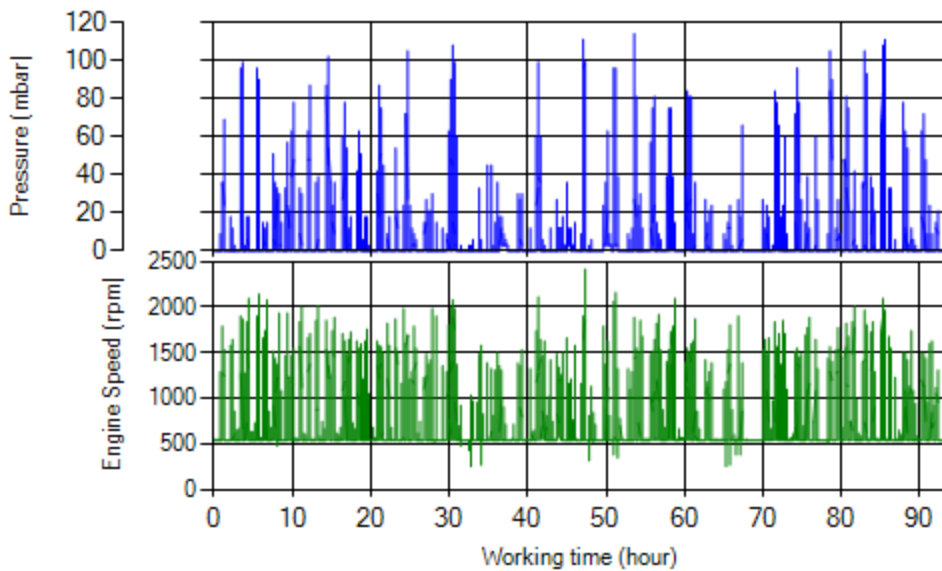


Figure 14- P, N distribution vs. working hours

Temperature-Engine Speed diagrams

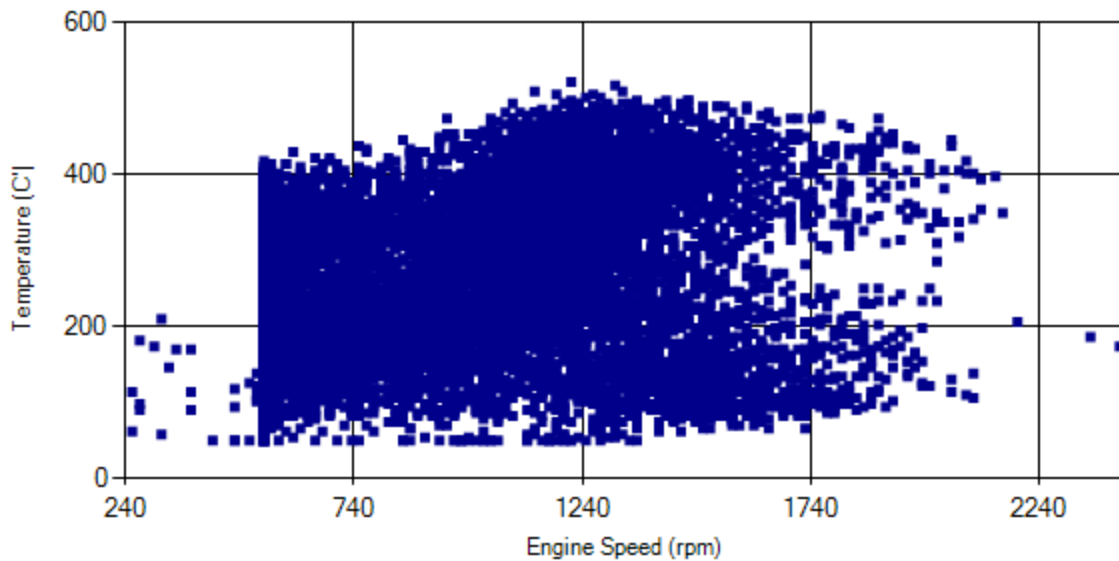


Figure 15- Temperature against engine speed

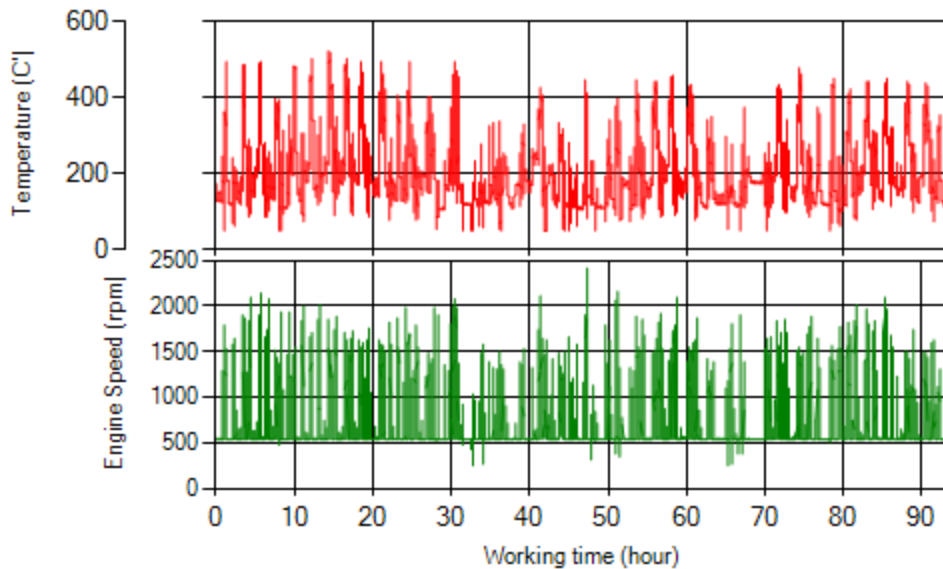


Figure 16- T, N distribution vs. working hours

Filter Operation Analysis

- As depicted in figure 1, only 0.08% of working time pressure was above 100 mbar during this period.
- Figure 2, 17 display flow temperature distribution for DPF's upstream. It can be obviously observed that 9% of total working-time temperature is above 350 °C and 19% above 250°C. Considering DPF company recommended operable situation (30% above 250°C), beside high idle working time (72%) during this period, it could be concluded this DPF operation was fantastic during this period.

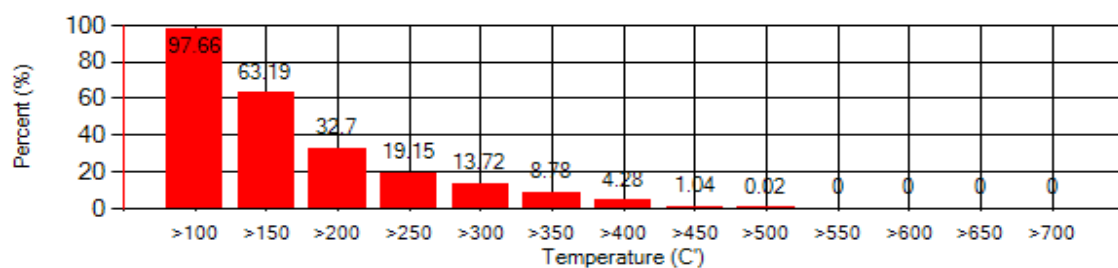


Figure 17. Cumulative diagram of exhaust gas temperature

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

Overall Information

Table1- Overall Information

Vehicle plate number	85182
CPK data logger number	LN: 001502, DN: 1999
Bus line	Number 10 (south to north Bus line)
Bus Terminals	Azadi square - Daneshgah square
Total path distance	10.7 km
DPF producer company	Tehag_01 (Catalyzed DPF)
Installation date	24/Sep/2015
Report period	16/Oct/2015 – 31/Oct/2015 (Sixteen days)
K value - DPF upstream	1.86 [1/m]
K value – DPF downstream	0.02 [1/m]

Table 2- DPF Maintenance History

Filter maintenance date	Filter have been working from installation date without any cleaning.
Dosing status	This system doesn't use additive

Table 3- Fuel and Additive Consumption Information

Bus mileage (from DPF installation date)	3771 km
Bus mileage over the period	2378 km
Working days over the period	14 days
Stop days	2 days
Data logger working days	14 days
Working hours over the period	214 hours 2 minutes
Average working hours per day (including stop days)	13 hours 22 minutes
Bus average speed	11.11 km/hr
idle speed time to all working time ration	61.99 %
Total Bus fuel consumption over the period	1530 lit
Fuel consumption per hour	7.15 lit/hr
Average fuel consumption	0.64 lit/km
Total Bus additive consumption over the period	- lit
Average additive consumption	- cc/km
Additive consumption to fuel ration	- cc/1000lit

Notice: This system doesn't use additive (CDPF).

Temperature, Pressure and Engine Speed Overview

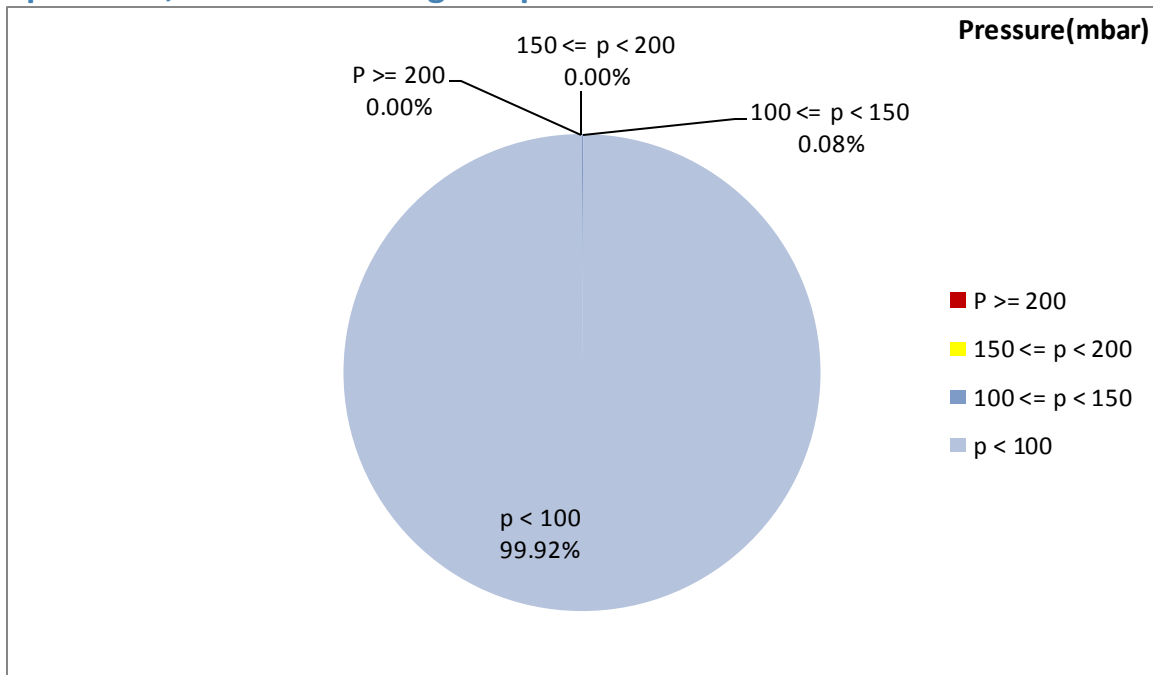


Figure 1- Pressure distribution over the working hours

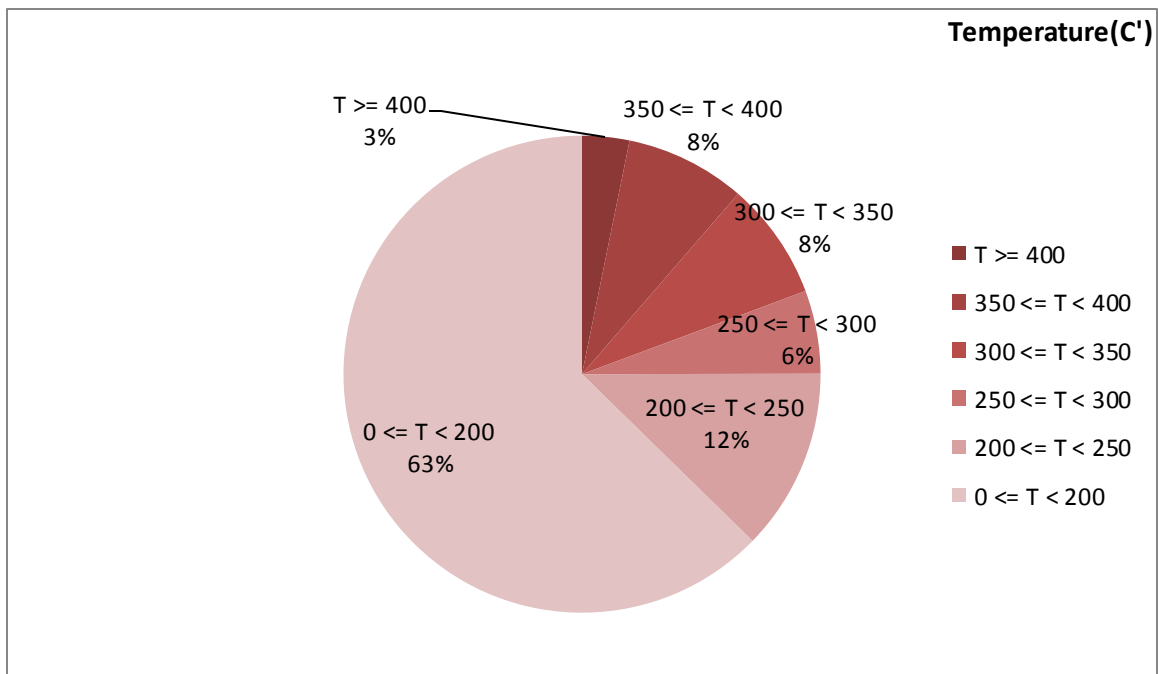


Figure 2-Temperature distribution over the working hours

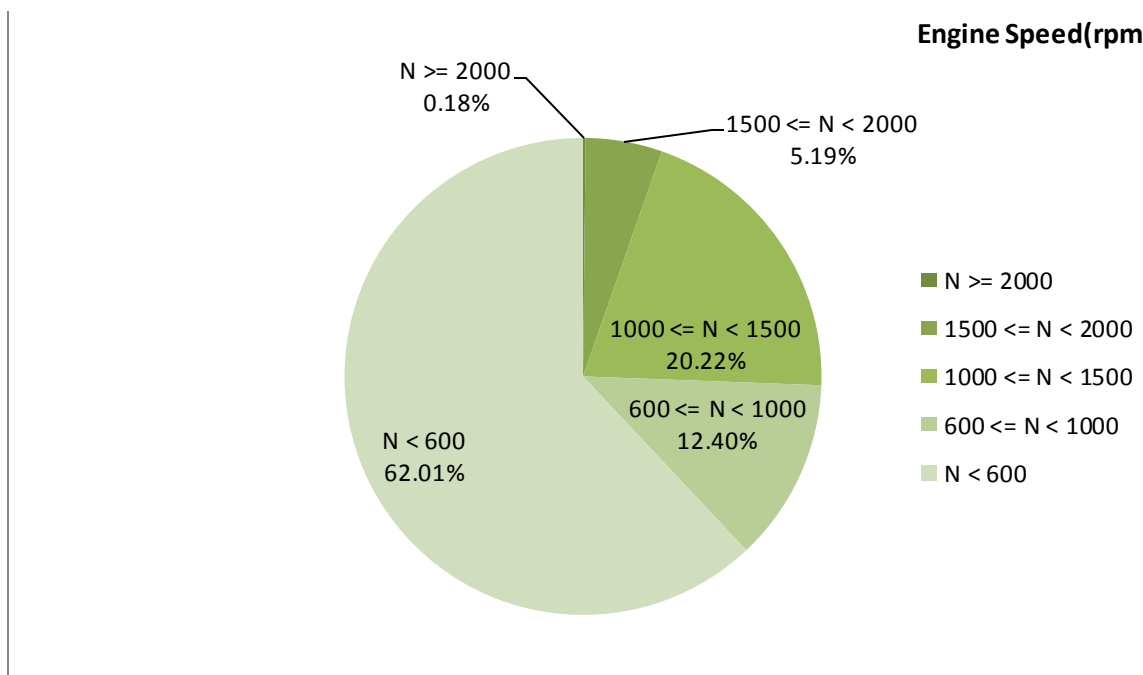


Figure 3- Engine speed distribution over the working hours

Table 4- Mean values

Mean temperature (C)	Mean pressure(mbar)	Mean engine speed(rpm)
206.26	6.71	776

Table 5- Mean values without idling

Mean temperature (C)	Mean pressure(mbar)	Mean engine speed(rpm)
255.75	17.39	1151

Table 6- Max-min values

Max-min temperature(C)	Max-min pressure(mbar)	Max-min engine speed(rpm)
470-50	119-0	2304-272

Detailed Pressure Analysis

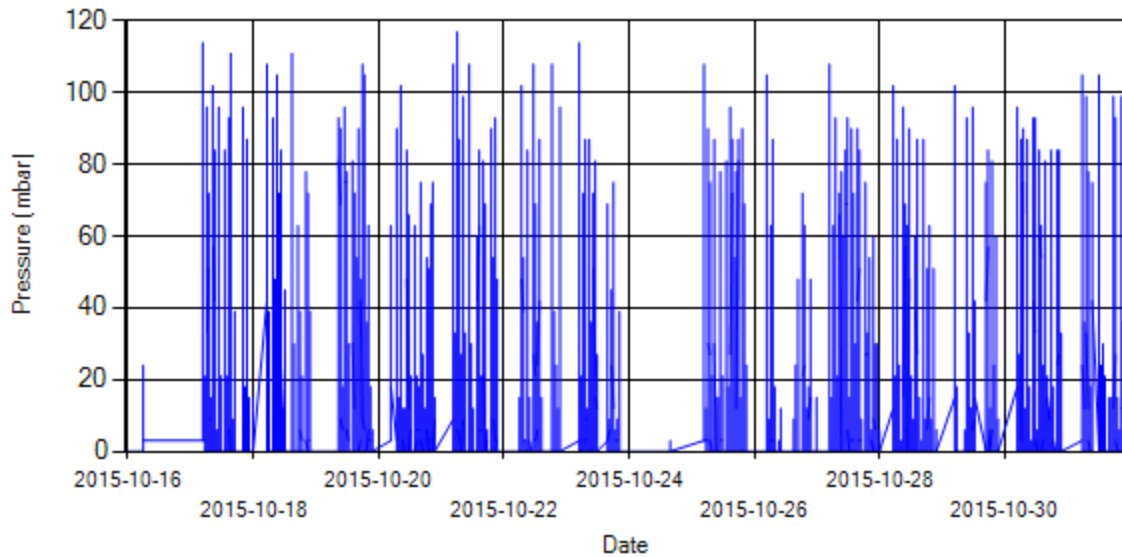


Figure 4- Pressure distribution over the period

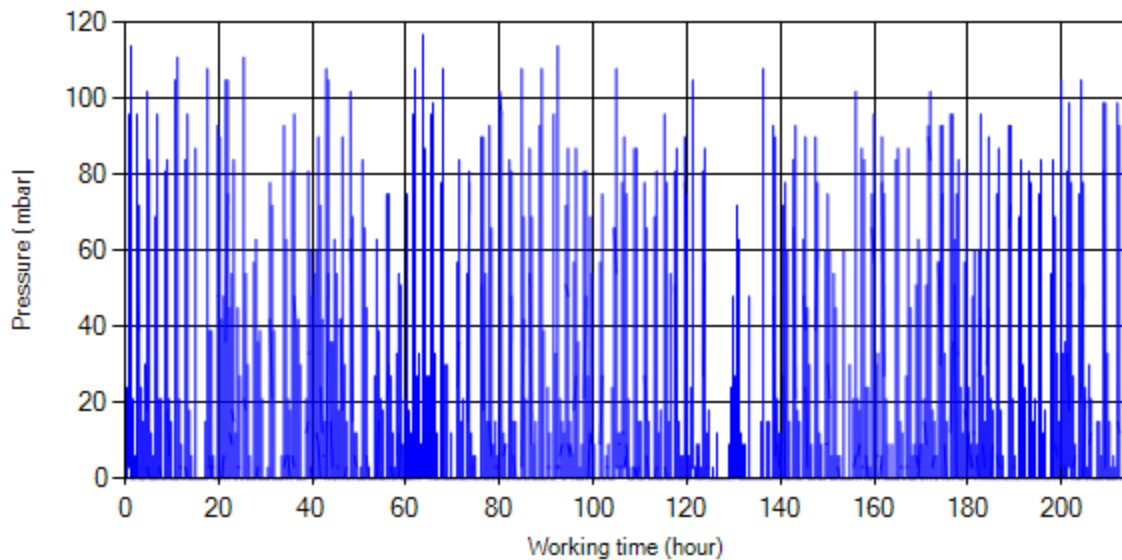


Figure 5- Pressure vs. working hours

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.

Detailed Temperature Analysis

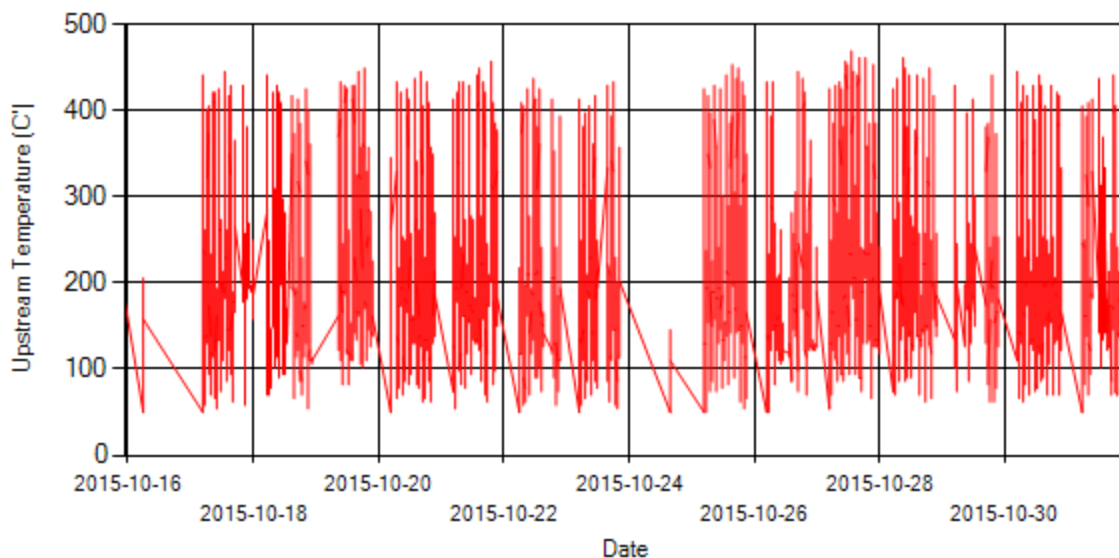


Figure 6- Temperature distribution over the period

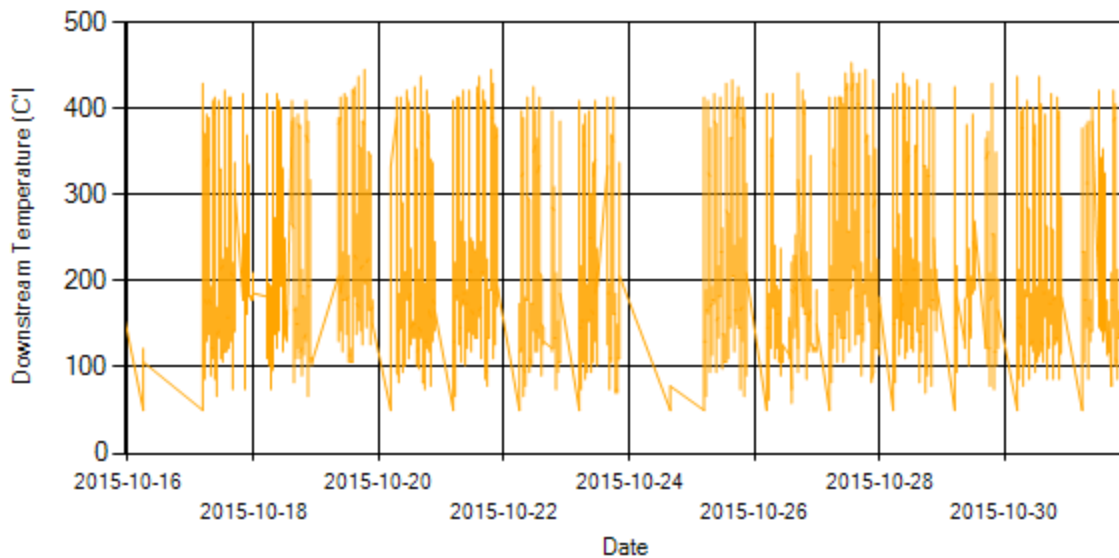


Figure 7- Temperature distribution over the period

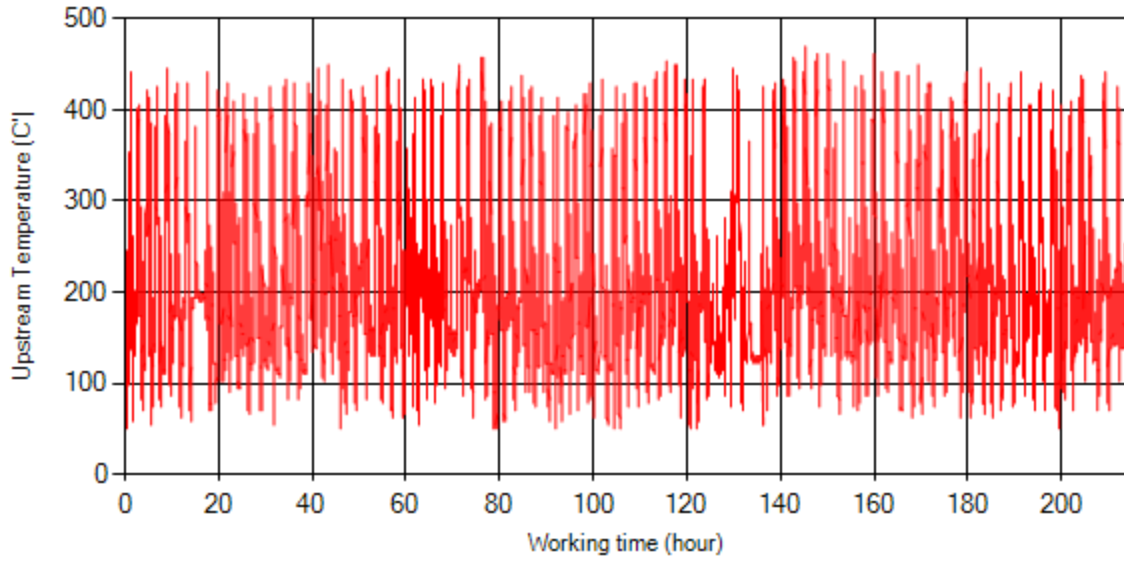


Figure 8- Temperature vs. working hours

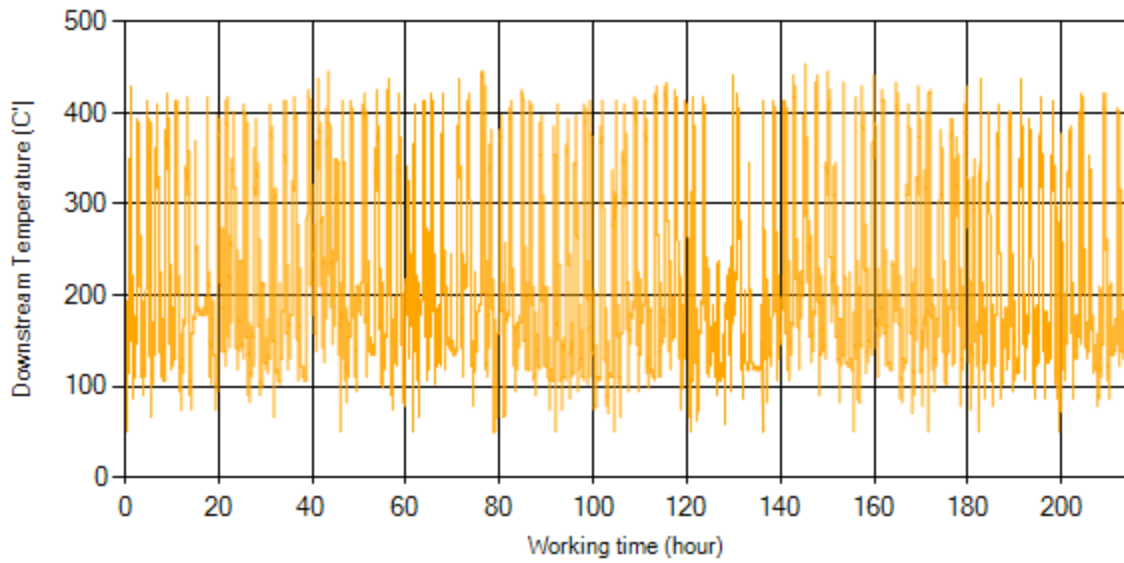


Figure 9- Temperature vs. working hours

Engine Speed Diagrams

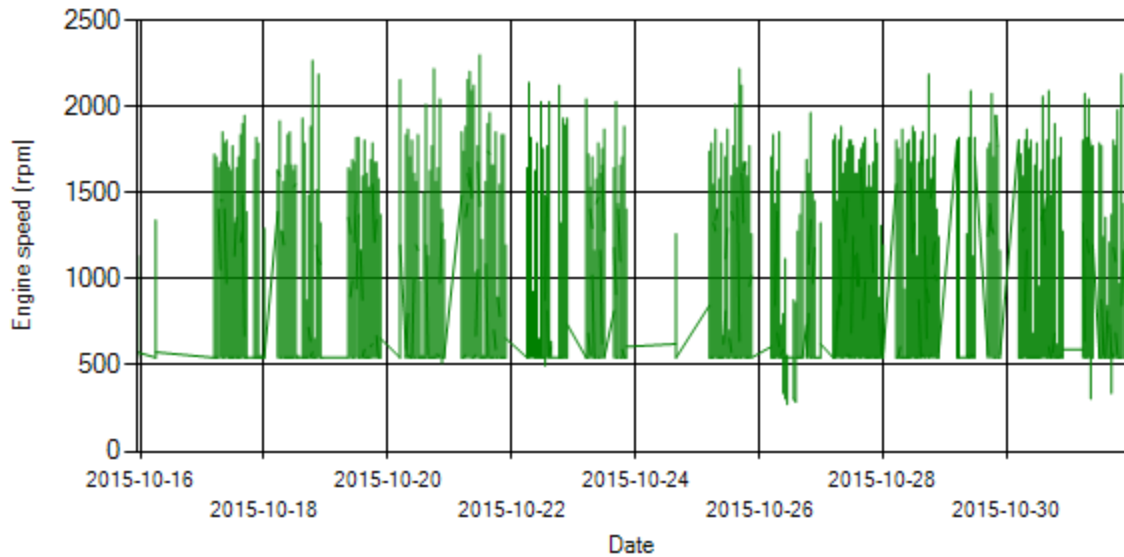


Figure 10- Engine speed distribution over the period

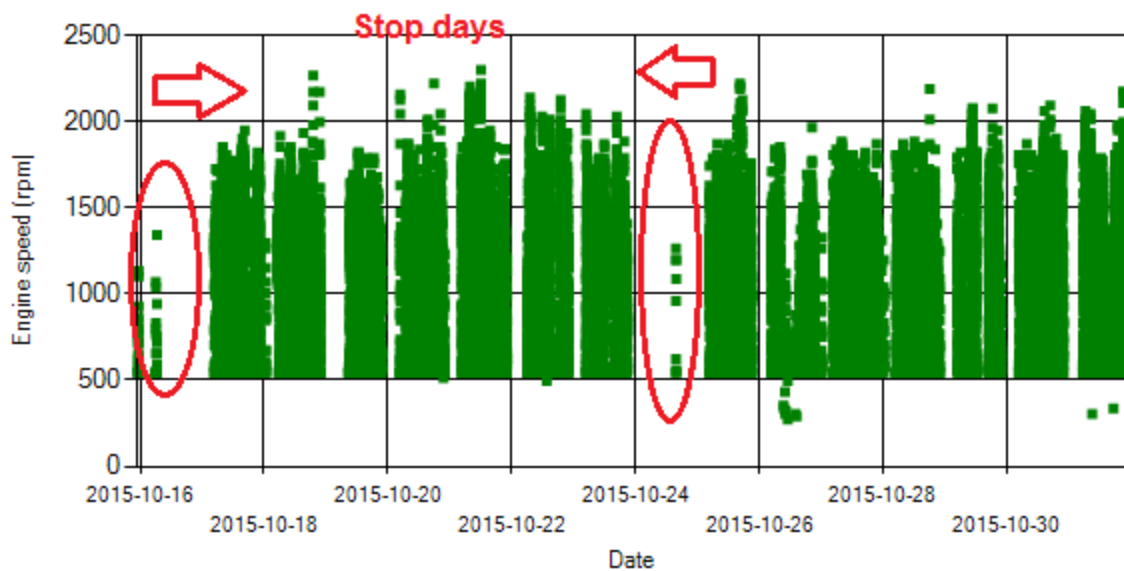


Figure 11- Engine speed diagram for calculating CPK's working days

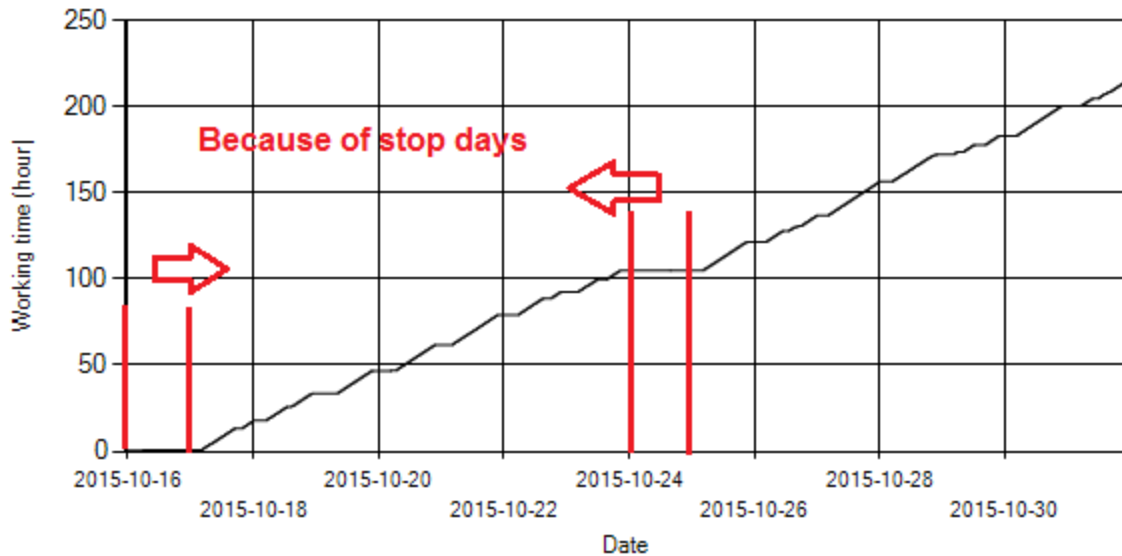


Figure 12- Time diagram for calculating CPK's working days

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Pressure-Engine Speed diagrams

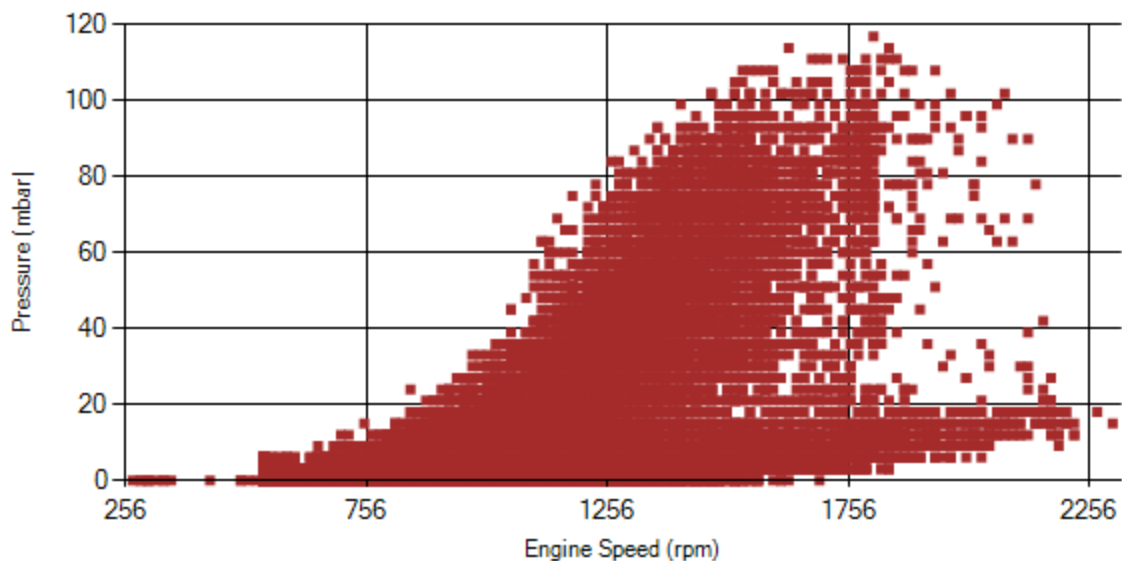


Figure 13- Pressure against engine speed

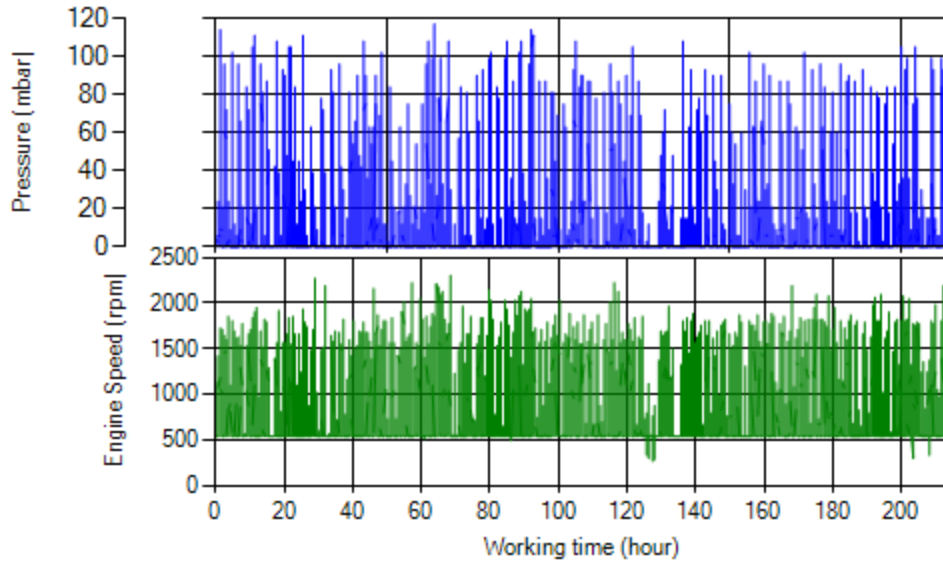


Figure 14- P, N distribution vs. working hours

Temperature-Engine Speed diagrams

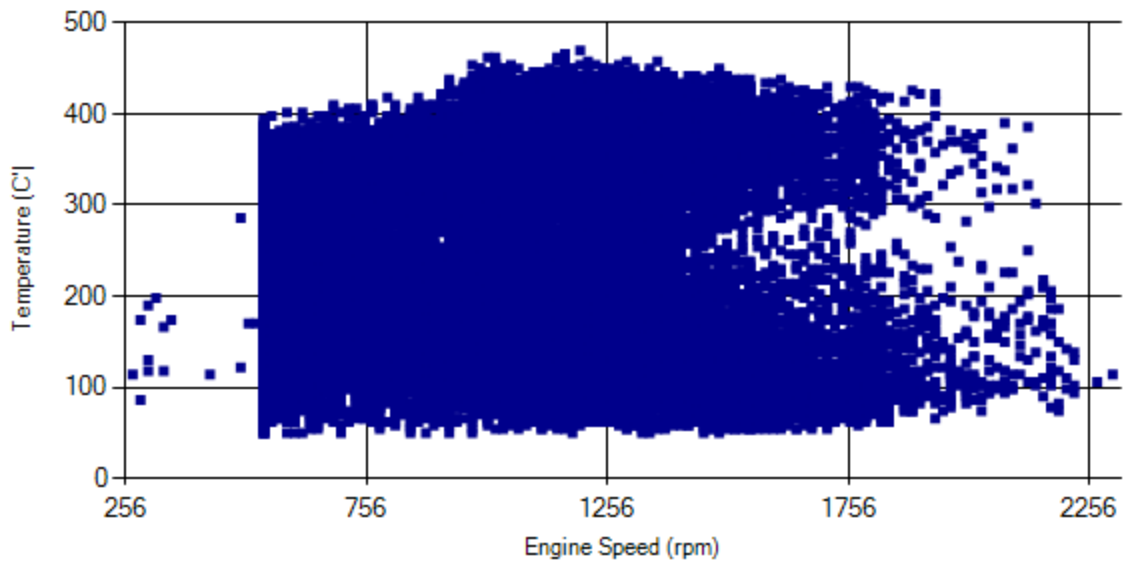


Figure 15- Temperature against engine speed

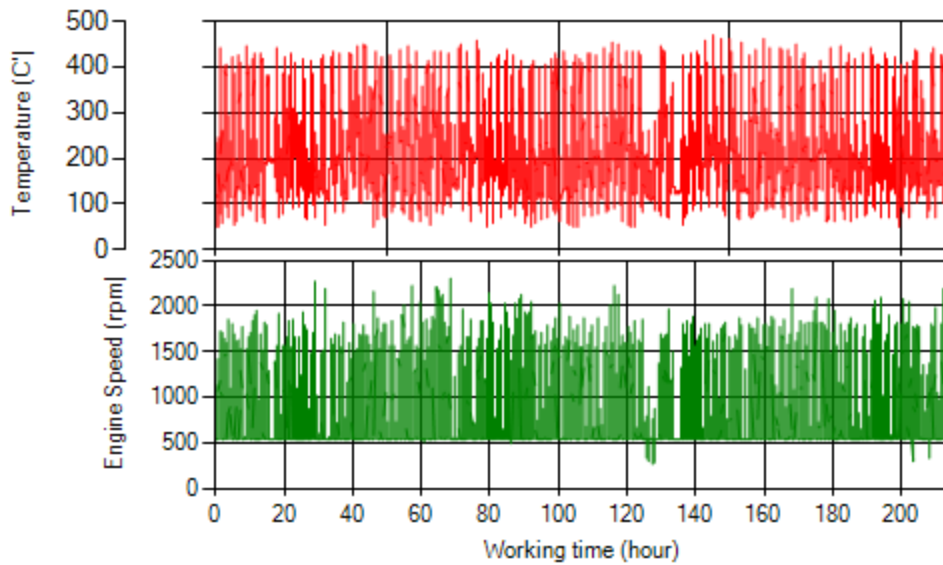


Figure 16- T, N distribution vs. working hours

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- Figure 2, 17 display flow temperature distribution for DPF's upstream. It can be obviously observed that 11% of total working-time temperature is above 350 °C and 24.5% above 250°C. Considering DPF company recommended operable situation (30% above 250°C), temperature profile distribution was relatively suitable for the DPF excellent operation.

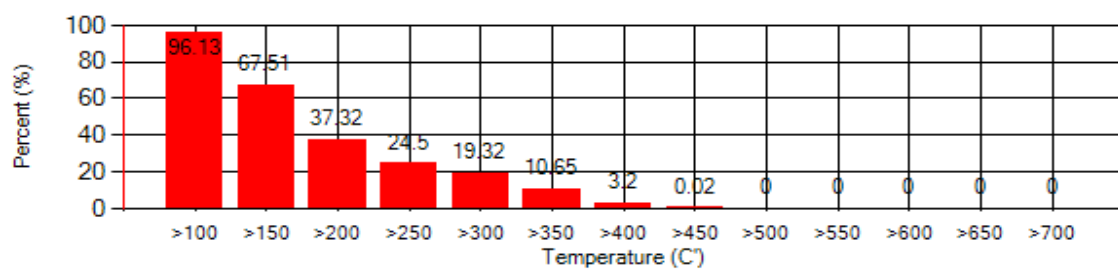
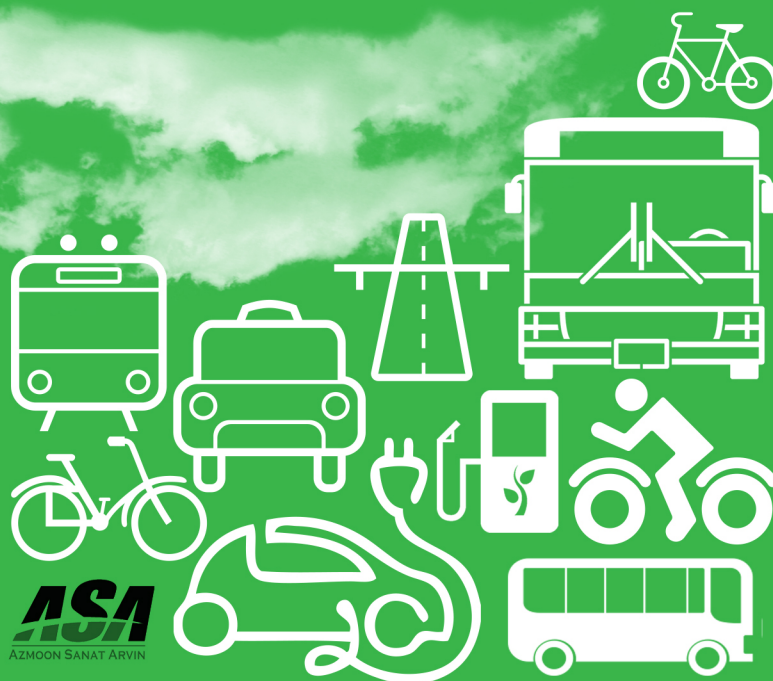


Figure 17. Cumulative diagram of exhaust gas temperature

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

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