

Gestores en Soluciones Sustentables Para el Ambiente, S.C.

High emitters dominate PN emissions of petrol LDV fleets an urgent problem

11th VERT Forum

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March 25th,2021

Background Mexico City's Metropolitan Area



➤ CDMX≈ 1, 500 km² 876 km² conservation areas 8.8 million people

State of Mexico
 59 municipalities
 across 6,000 km²
 12.2 million people







2,410 regulated commerce & services



1,935 regulated industries



5.8 million homes

MCMA Fuel consumption 543 PJ







13% Habitational



3% Commerce & Services

	willions m
Gasoline	7.3
Diesel	2.0
L.P.G.	3.7
Natural Gas	3,436.9

1PJ= 1x10¹⁵ Joules 1 Joule= 0.2388 calories

Background

	Yr 2016	%	GASOLINE	DIESEL	LP GAS	NATURAL GAS
	2,322,423	Contribution	2,160,227 93.02%	148,584 6.40%	13,239 0.56%	373 0.02%
Cars	1,302,591	56.09%	1,300,350	2,100	15	126
SUVs	351,180	15.12%	346,407	4,725	40	8
Taxis	133,946	5.77%	133,649	260	31	16
Vans	7,989	0.34%	5,856	2,055	78	N/A
Minibuses	14,014	0.60%	1,178	98	12,592	151
Pick-up Trucks	73,657	3.17%	72,236	1,292	129	N/A
Vehicles < 3.8 t	13,576	0.58%	9,057	4,462	57	N/A
Tractor truck	67,386	2.90%	N/A	67,386	N/A	N/A
Buses	38,465	1.66%	137	38,220	36	72
Vehicles > 3.8 t	51,578	2.22%	23,916	27,401	261	N/A
Motorcycles	267,441	11.52%	267,441	N/A	N/A	N/A
Metrobuses	585	0.03%	N/A	585	N/A	N/A

Source: SEDEMA 2018. The Ministry of the Environment of Mexico City (know in Spanish as Secretaría del Medio Ambiente de la Ciudad de México). Emissions Inventory of Mexico City 2016. September, 2018. http://www.aire.cdmx.gob.mx/descargas/publicaciones/flippingbook/inventario-emisiones-2016/mobile/inventario-emisiones-2016.pdf

To describe the PN measurement **methodology in the Vehicle Inspection Centers** in Mexico City, and to perform the statistical analysis of the database of measurements made from **September to December 2018 and from January to December 2019** in order to show the behavior of **particle emissions regarding to gases emissions** in vehicle fleet.

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Description of vehicle fleet

DATA BASE

- 2018 2nd semester = 1,783,402
- 2019 1st semester = 1,551,848
- 2019 2nd semester = 1,391,055



PARTICLE MEASUREMENT = 442,976 (9.4%)



Government authorization to access emission information between July 2018 and December 2019



SECRETARIA DEL MEDIO AMBIENTE SEDIRECCION GENERAL DE CALIDAD DEL AIRE

2020 LEONA VICARI like

Ciudad de México, a 14 de febrero de 2020

SEDEMA/DGCA/ 0710/2020 ASUNTO: RESPUESTA A LA SOLICITUD **DE INFORMACIÓN PÚBLICA** FOLIO 0112000033420

LIC. LUDMILA VALENTINA ALBARRÁN ACUÑA **RESPONSABLE DE LA UNIDAD DE TRANSPARENCIA** DE LA SECRETARÍA DEL MEDIO AMBIENTE DE LA CIUDAD DE MÉXICO. PRESENTE.

Hago referencia a la solicitud de acceso a la información pública citada al rubro, a través de la cual se requirió lo siguiente:

"...Base de datos de verificación vehicular del periodo de julio de 2018 a diciembre de 2019 que incluva las características técnicas de los vehículos que realizaron la prueba de verificación, los resultados de las emisiones contaminantes y el resultado de la medición de los vehículos que realizaron la prueba de partículas..."

Al respecto, le informo que por medio de la presente le hago entrega en formato digital de las Bases de Datos sobre la medición de partículas que se generan en los Centros de Verificación Vehicular de la Ciudad de México correspondientes al periodo de julio del 2018 a diciembre del 2019.

Se anexa CD con la información digital de la Base de Datos.

Sin otro particular, reciba un cordial saludo.

ATENTAMENTE EL DIRECTOR GENERAL

146. SERGIO ZIRATH HERNÁNDEZ VILLASEÑOR



APROBÓ: SRMH

Tlaxcoaque 8 Piso 6, Col. Centro, Alcaldía Cuauhtémoc, C. P. 06090, Ciudad de México

CHIDAD INNOVADORA Y DF DERECHOS NUESTRA CASA

Authorization issued by SEDEMA for access to the database

Classification by Technology and Brand



OBDII - Model 2006 and later Injection-transition - Model 2005 to 2001 OBDI - Model 2000 to 1994 OBDI transition - Model 1993 to 1991 Carburetor - 1990 and previous



Classification by Technology and Fuel Type



*Tests with approved results

Hologram Stickers Classified in the Vehicle Inspection Process

DOUBLE ZERO (00)	New vehicles are subjected to the inspection procedure
ZERO (0)	Vehicles equipped with a three-way catalytic converter and a se Diagnostic system (OBDII or EOBD) (model-year 2006 on, accord new vehicles).
ONE (1)	Vehicles with electronic injection systems (model-year 1994 to a
TWO (2)	Vehicles with mechanical injection systems (model-year 1993 ar
REJECTION	All of the above that do not pass the test described.

e for the first time.

econd-generation On-Board ding to regulation NOM-042 for

about 2005).

nd earlier, approximately).

Classification by Results of Verification Test

CARBURETOR OBDI - TRANSITION OBDI OBD II - TRANSITION OBD II

Mexico City's Vehicle Inspection Program

Description of test methodologies

Description of test methodologies

The Vehicle Inspection Information System is operated by Mexico City's Ministry for Environment (SEDEMA). It uses centralized software to strengthen the security of data generated during vehicle inspection process.

Description of test methodologies

Meteorological stations measuring P, T, and Humidity conditions in a Verification Center

- Calibration of dynamometer MAHA.
- In order to comply with national standards, mass dynamometer calibration is performed daily and dynamic calibration is performed monthly.

NanoMet3 – CDMX version

Communication protocols adapted by SEDEMA software operates by following commands.

It is designed to be installed into the cabinets of Vehicle Verification Centers (CVV).

It may be adapted for use via a cabinet sampling probe. Sample dilution 1: 100.

Description, validation and debugging of the database

 Validation and debugging was made by mass balance according to combustion curves in relation to lambda (λ)

Average PN

Range 0

< 50,000

Range 1

50,000-250,000

Range 2

250,000-1,000,000

Range 3

1,000,000-5,000,000

Range 4

5,000,000-10,000,000

Range 5

10,000,000-100,000,000

Range 6

>100,000,000

PARTICLE MEASUREMENT = 442,976 (9.4%)

Classification by Brand

Classification by Brand and Technology

PARTICLE MEASUREMENT = 442,976 (9.4%)

Classification by Results of Verification Test

Hologram stickers

PARTICLE MEASUREMENT = 442,976 (9.4%)

■ CARBURETOR OBDI - TRANSITION OBD II - TRANSITION

Results of PN measurements in Vehicle Inspection Program CDMX, September and October 2018.

Average PN. September 2018 Stage 5024, Datasets 56,818		Hologram Stickers							
		0	DBL 00	1	2	Reiection	Total	% of	
								the sample	
<50,000		763	70	258	16	139	1,246	2.2%	
	50,000-100,000	25,685	2,628	7,961	342	3,204	39,820	70.1%	
	100,000-1,000,000	3,435	312	1,593	117	788	6,245	11.0%	
	1,000,000-10,000,000	4,352	447	1,766	141	1,112	7,818	13.8%	
	10,000,000-100,000,000	666	89	351	58	264	1,428	2.5%	
	>100,000,000 (R5)	100	12	61	24	64	261	0.5%	
	TOTAL	35,001	3,558	11,990	698	5,571	56,818	100%	

Average PN. October 2018 Stage 5024, Datasets 64,655		Hologram Stickers							
		0	DBL 00	1	2	Rejection	Total	% of	
								the sample	
<50,000		866	786	17	165	324	1,458	2.3%	
	50,000-100,000	31,159	2,917	399	4,125	9,676	48,276	74.7%	
	100,000-1,000,000	4,515	418	139	1,132	1,988	8,192	12.7%	
	1,000,000-10,000,000	2,840	283	162	823	1,278	5,386	8.3%	
	10,000,000-100,000,000	399	37	73	332	305	1,146	1.8%	
	>100,000,000	47	1	30	63	56	197	0.3%	
	TOTAL	39,826	3,742	820	6,640	13,627	64,655	100%	

Source: DATA BASE SEDEMA 2018.

Characteristics of high polluting vehicle fleet (PN > 1.000.000)

Technology/PN	< 50	50k – 250k	250K-1,000K	1,000K-5,000K	5,000K-10,000K	10,000K - 100,000K	> 100,000K
CARBURETOR	28%	24%	9%	13%	6%	17%	3%
CO (%)	0.90					1.11	
OBDI-TRANSITION	34%	29%	11%	11%	4%	8%	2%
CO (%)			0.37	0.39		0.54	
OBD II	57%	31%	5%	5%	1%	1%	0%
CO (%)						0.23	

Conclusions

- The wealth of information made available for statistical analysis through the Vehicle Inspection Program of Mexico City and in relation to trends by brand, sub-brand, model or vehicle stratum was taken from a database of more than one million vehicle inspections that were carried out in Mexico City every six months.
- More than 400,000 vehicle datasets of PN measurements will be analyzed.
- The 83.3% of the total vehicles have OBD II technology (Model \geq 2006).
- Of those datasets taken from PN measurements, the most representative brands are Nissan, Chevrolet and VW. The database shows the same behavior in classifications regarding the results of the verification test as in the total bases of all of the analyzed semesters.
- Carburetor technology presents higher particle emitters (PN). This could only be demonstrated due to the number of measurements that were analyzed.
- Carburetor and OBDI-transition were the technologies that present higher particle emitters (PN).
- There is a direct relationship between CO emissions and higher particle emitters (PN).
- The data suggest that PN-measurement is a very sensitive parameter to detect high polluters.
- This high emitter phenomenon of petrol engines might not be limited to Mexico.

GESPA

Gestores en Soluciones Sustentables Para el Ambiente, S.C.

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FOUNDERS

Gestores en Soluciones Sustentables Para el Ambiente. S.C.

CEO

Environmental Consultant at GESSPA. Candi has years of experience working for Mexico City's Ministry of **Environment as Director of Sustainable Transport and** Mobile Resource Programs. She has been responsible for implementing a range of projects and programs, including one for mandatory vehicle inspection and others related to pollution control and clean transport. Most recently, she has worked for Mexico City's Ministry of Mobility for Public Transport and Mobility.

Environmental Consultant at GESSPA. Iris has extensive experience in the energy sector. Her specific expertise lies in the development of renewable energy projects and for more than 7 years she has worked for the Electricity Company of Mexico.

About us

Gestores en Soluciones Sustentables para el Ambiente (GESSPA) is a leading company in environmental impact assessments and related services. GESSPA was founded by Candi Dominguez and Iris Cureno in 2010 and it is meeting a growing demand from organizations for accurate measurements of environmental and social impact.

M.Sc. Candi Dominguez

M.Sc. Iris Cureño **Executive Director**