



To Go Green,
add a bit of Blue!®



NPL BlueSky Automotive

Technical JV between Nandan Petrochem and KRUSE Automotive GmbH, Germany

AdBlue® / AUS 32 / DEF

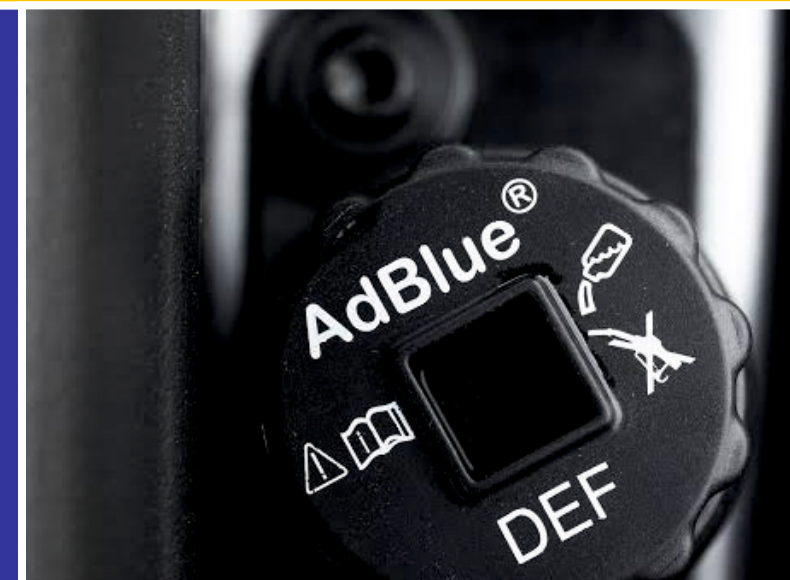
India Market
Current Scenario and Way Forward

N A Joshi

CEO

NPL BlueSky Automotive Pvt Ltd

#AdBlue is the Registered Trademark of
Verband der Automobilindustrie e.V (VDA)



- ▶ Pioneer of AdBlue[®] Manufacturing in India.
- ▶ First Plant established in 2011.
- ▶ NPL BlueSky Automotive Pvt Ltd is a Technical Joint Venture between Nandan Petrochem Ltd (NPL) and KRUSE Automotive GmbH, Germany.
- ▶ Manufacturing plants across the country to produce AdBlue[®] meeting ISO 22241 standards to meet the increasing demand in the country,
- ▶ The objective in setting up this company was to supply AdBlue[®] to Automotive OEMs in India for their first fill as well as aftermarket requirement.

- ▶ KRUSE Automotive is a part of the Stockmeier Group which was founded in 1920
- ▶ Kruse Automotive has a market share of about 25% in the German AdBlue® market
- ▶ KRUSE offers custom-made filling solutions (packaged and dispensing) and In house fleet of tank trucks for timely supplies of bulk deliveries
- ▶ Stockmeier Group turnover is about €1.25Bn, of which KRUSE accounts for roughly 20%



Our Valued Customers



What is AdBlue® (AUS32 / DEF) ?



What is AdBlue® ...

AdBlue® is a high specification solution and is manufactured to the ISO 22241 standards.

AdBlue® is essential for the correct operation of Selective Catalytic Reduction (SCR) in Diesel Engines to meet Bharat Stage IV & VI emission norms.

AdBlue® is a clear, non-toxic liquid that is safe to handle and does not damage the environment.

AdBlue® is not a fuel or fuel additive.

AdBlue® is carried on the vehicle in an additional tank.

AdBlue® Specification

Characteristics	Unit	Limits		Test methods
		min.	max.	
Urea content ^a	% (m/m) ^d	31,8	33,2	ISO 22241–2 Annex B ^e ISO 22241–2 Annex C ^e
Density at 20 °C ^b	kg/m ³	1 087,0	1 093,0	ISO 3875 or ISO 12185
Refractive index at 20 °C ^c	—	1,381 4	1,384 3	ISO 22241–2 Annex C
Alkalinity as NH ₃	% (m/m) ^d	—	0,2	ISO 22241–2 Annex D
Biuret	% (m/m) ^d	—	0,3	ISO 22241–2 Annex E
Aldehydes	mg/kg	—	5	ISO 22241–2 Annex F
Insoluble matter	mg/kg	—	20	ISO 22241–2 Annex G
Phosphate (PO ₄)	mg/kg	—	0,5	ISO 22241–2 Annex H
Calcium	mg/kg	—	0,5	ISO 22241–2 Annex I
Iron	mg/kg	—	0,5	
Copper	mg/kg	—	0,2	
Zinc	mg/kg	—	0,2	
Chromium	mg/kg	—	0,2	
Nickel	mg/kg	—	0,2	
Aluminium	mg/kg	—	0,5	
Magnesium	mg/kg	—	0,5	
Sodium	mg/kg	—	0,5	
Potassium	mg/kg	—	0,5	
Identity	—	identical to reference		ISO 22241–2 Annex J

Urea Specification

Characteristics	Limit: Fertilizer Grade Urea (IS: 5406)	Limit: Automotive Grade Urea (ISO 22241)
Total nitrogen, percent by mass, Min	46	46
Moisture, percent by mass, Max	1	0.2
Biuret, percent by mass, Max	1.5	0.8
Aldehydes	Coated with formaldehyde/Neem	< 5 ppm
Source	Locally manufactured, import through STE's	Import in 1000 Kg Bags

Deionized water specification



Characteristics	Limit: Fertilizer Grade Urea (IS: 5406)	Limit: Automotive Grade Urea (ISO 22241)
Aluminium mg/l, max	0.03	0.5
Calcium mg/l, max	75	0.5
Iron mg/l, max	0.3	0.5
Magnesium mg/l, max	30	0.5
Conductivity, μ S/m	5,000-50,000	5.5

Distribution Channel

Channels:

OEM dealership/ franchise workshops
OEM spare - part distributors
Oil Distributors
Aftermarket OES
Fuel Retail Outlets

AdBlue® is available through
IOC, BPCL and HPCL Retail Outlets.



Pack sizes:

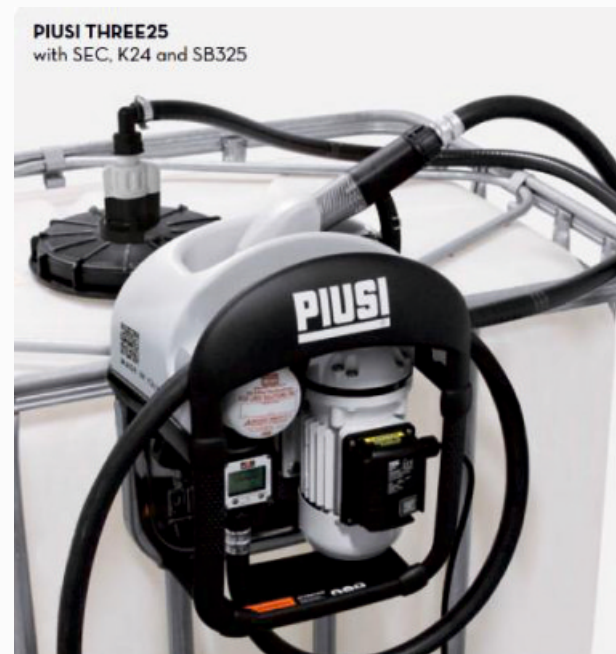
Pails/Drums (26L, 20L, 10L)
Barrels (210L)
Intermediate bulk
container (IBC)



- Pumps are available for Barrel and IBC dispensing system
- ISO 22241:3 standard defines handling, storing and transportation standards for AUS 32
- These pumps meet the above standard and can help in reducing contamination at the filling/refilling point



Motorized barrel dispensing solution

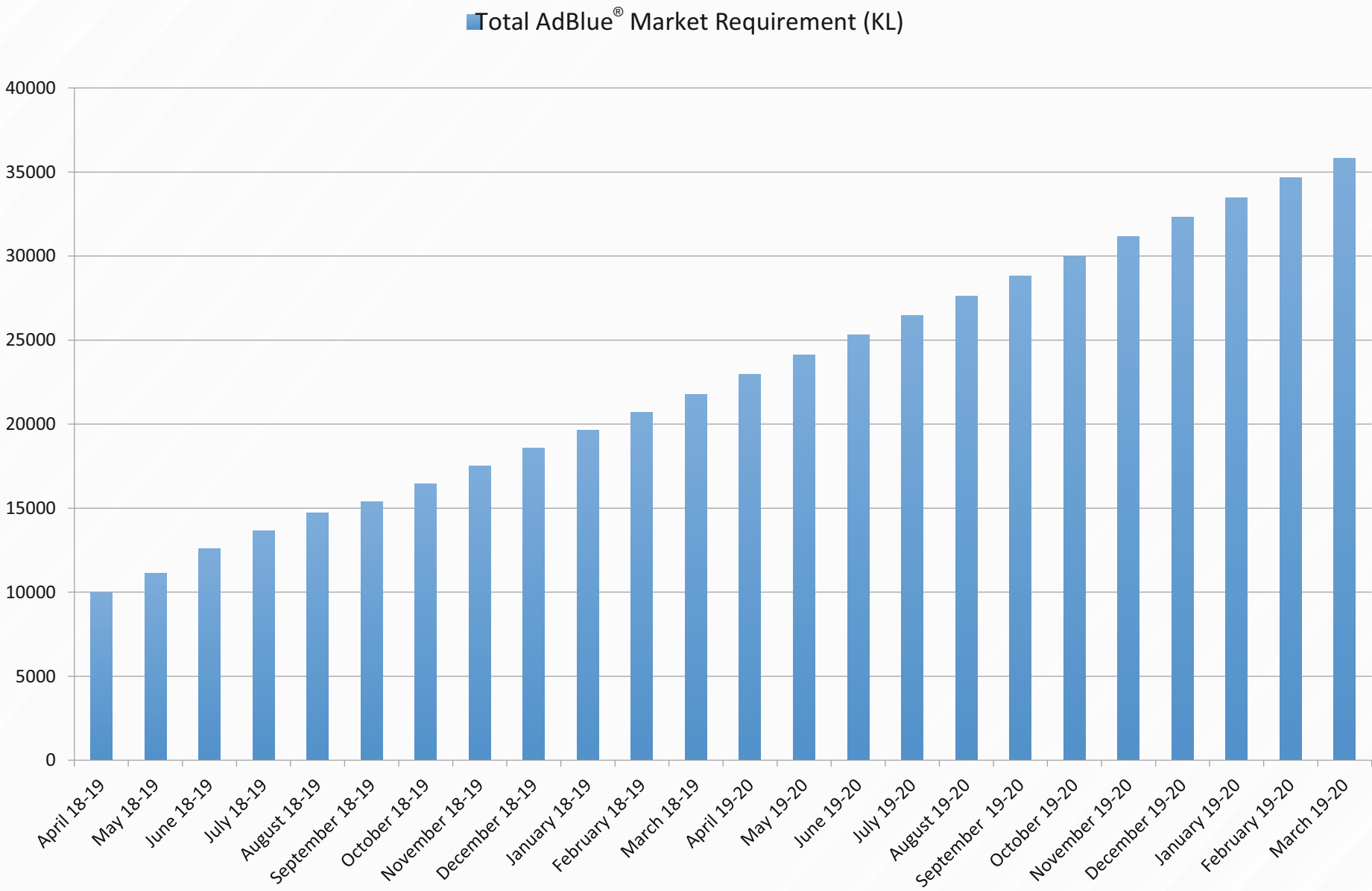


IBC Dispensing system



Manual barrel dispensing system

Total AdBlue® Market Requirement (KL)



Future of AdBlue® Dispensing System

Dispensing equipment at large consumers



Bulk Transport of AdBlue®



Dispensing units at fuel retail outlets

- With volume increase, in addition to Organised players, many small manufacturers are setting up shop to provide AUS 32 in the market
- To ensure consistent quality of every batch produced there is lack of Quality Assurance Systems/in-house testing infrastructure at smaller manufacturers.
- Cheaper Industrial/Agricultural grade urea being used to reduce cost
- Spurious manufacturers supplying AUS 32 with lower concentration urea to reduce cost
- AUS 32 contamination is taking place due to Non dedicated dispensing equipment
- Manufacturers supplying AUS 32 with trademark AdBlue® without VDA license



Product Name: AUS 32/DEF/AdBlue®

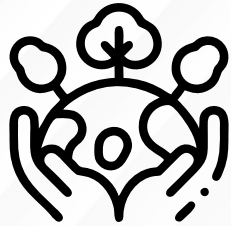
Other supplier's samples

Sr. No.	Test Parameter	Test Method	Unit	Sample 1	Sample 2	Sample 3	Sample 4	Specification
1	Appearance	Visual		Clear Liquid	Transparent Clear Liquid	Transparent Clear Liquid	Transparent Clear Liquid	Transparent Clear Liquid
2	Urea Content	ISO 22241-2 (B & C)	% (m/m)	28.7	32.3	32.2	32.1	31.8 - 33.2
3	Density @ 20°C	ISO 3675 / ISO 12185	kg/m³	1079.2	1088.2	1088.5	1088.3	1087.0 - 1093.0
4	Biuret	ISO 22241-2 (E)	mg/kg	0.15	0.31	0.20	0.21	0.3 Max.
5	Aldehyde	ISO 22241-2 (F)	mg/kg	0.092	5.680	0.072	0.0875	5.0 Max.
6	Phosphate as (PO)4	ISO 22241-2 (H)	mg/kg	0.026	0.897	2.017	2.024	0.5 Max.
7	Calcium	ISO 22241-2 (I)	mg/kg	>10.139	0.013	0.259	0.246	0.5 Max.
8	Iron	ISO 22241-2 (I)	mg/kg	< 0.07	0.034	< 0.001	< 0.011	0.5 Max.
9	Copper	ISO 22241-2 (I)	mg/kg	< 0.119	< 0.001	NIL	NIL	0.2 Max.
10	Zinc	ISO 22241-2 (I)	mg/kg	0.015	< 0.000	NIL	NIL	0.2 Max.
11	Chromium	ISO 22241-2 (I)	mg/kg	< 0.055	0.021	0.011	0.009	0.2 Max.
12	Nickel	ISO 22241-2 (I)	mg/kg	< 0.06	0.007	0.014	0.011	0.2 Max.
13	Magnesium	ISO 22241-2 (I)	mg/kg	>5.375	< 0.000	1.2	0.001	0.5 Max.
14	Sodium	ISO 22241-2 (I)	mg/kg	>74.321	0.013	1.1	NIL	0.5 Max.
15	Potassium	ISO 22241-2 (I)	mg/kg	>104.662	0.020	2.4	NIL	0.5 Max.
16	Aluminum	ISO 22241-2 (I)	mg/kg	< 0.3	0.040	0.007	0.007	0.5 Max.

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		min.	max.
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Refractive index at 20 °C ^c	—	1,381 4	1,384 3
Alkalinity as NH ₃	% (m/m) ^d	—	0,2
Biuret	% (m/m) ^d	—	0,3
Aldehydes	mg/kg	—	5
Insoluble matter	mg/kg	—	20
Phosphate (PO ₄)	mg/kg	—	0,5
Calcium	mg/kg	—	0,5
Iron	mg/kg	—	0,5
Copper	mg/kg	—	0,2
Zinc	mg/kg	—	0,2
Chromium	mg/kg	—	0,2
Nickel	mg/kg	—	0,2
Aluminium	mg/kg	—	0,5
Magnesium	mg/kg	—	0,5
Sodium	mg/kg	—	0,5
Potassium	mg/kg	—	0,5
Identity	—	identical to reference	

Characteristics	Significance
Urea Content	It is very critical to be in the range as an ideal solution as it provides the lowest freezing point. Also, to get the optimum Nox reduction, the SCR system will be calibrated to 32.5% Urea content
Density @ 20°C	Product Identification and to check possible contamination
Refractive Index at 20°C,	Product Identification and to check possible contamination
Alkalinity as NH ₃	To Determines its shelf life
Biuret	Poison to catalyst
Aldehyde	Form Deposits
Insoluble Matter	Causing Injector Clog
Phosphate (PO ₄)	Poison to catalyst
Calcium	Causing Injector Clog
Iron	Poison to catalyst
Copper	Poison to catalyst
Zinc	Poison to catalyst
Chromium	Poison to catalyst
Nickel	Poison to catalyst
Aluminium	Poison to catalyst
Magnesium	Causing Injector Clog
Sodium	Poison to catalyst
Potassium	Poison to catalyst

Effect of the Sub standard product



Environment:

- Increased NOx emissions in the environment equal to BS-I levels thereby worsening air quality
- Purpose of huge investment for BS-IV implementation gets defeated



Vehicle Owner:

- Engine de-ration due to ineffective NOx conversion
- Repair costs especially post warranty
- Loss of business due to frequent breakdown



OEMS:

- Breakdown of SCR system leading to increase in repair costs
- Negative perception on BS-IV technology affecting OEM Brand Equity



Cheat Technology:

- In addition there are cheat technologies called OBD Emulators are available
- These devices bypass the SCR system to avoid usage of AdBlue®, hence increasing NOx emissions.

Lessons to be learnt - Brazil

Empresa (Company)	Parâmetro	Resultado	Especificação
Empresa A	Aldeído (Aldehyde)	8,1 mg/kg	Máx. 5,0 mg/kg
Empresa B	Aldeído	146,5 mg/kg	Máx. 5,0 mg/kg
	Cálcio (Calcium)	3,8 mg/kg	Máx. 0,5 mg/kg
	Fosfato (Fosphate)	29,44 mg/kg	Máx. 0,5 mg/kg
	Magnésio (Magnesium)	1,6 mg/kg	Máx. 0,5 mg/kg
	Potássio (Potassium)	26,10 mg/kg	Máx. 0,5 mg/kg
	Sódio (Sodium)	2,98 mg/kg	Máx. 0,5 mg/kg
Empresa C	Aldeído	864,8 mg/kg	Máx 5,0 mg/kg
	Sódio	1,54 mg/kg	Máx. 0,5 mg/kg
Empresa D	Aldeído	821,9 mg/kg	Máx. 5,0 mg/kg
	Fosfato	1,71 mg/kg	Máx. 0,5 mg/kg
	Sódio	4,79 mg/kg	Máx 0,5 mg/kg
Empresa E	Aldeído	12,0 mg/kg	Máx. 5,0 mg/kg
	Densidade (Density)	1070,7 kg/m ³	Min. 1087,0 e Máx. 1093,0
	Índice de refração (Refraction)	1,3721	Min. 1,3814 e Máx. 1,3843
	Teor de uréia (%)	25,3 %	Min. 31,8 e Máx. 33,2
Empresa F	Aldeído	51,5 mg/kg	Máx. 5,0 mg/kg

1. High aldehyde content
use of fertilizer-grade urea
2. High calcium, phosphates, magnesium, potassium, sodium content – use of tap water
3. Density, refractive index and urea content
dilution with de-ionized water

Lessons to be learnt - Brazil

- The Inmetro (Brazilian Institute of Metrology) is responsible for conformity assessment of a range of products manufactured and sold in Brazil
- Its goal is to run a systematic process with pre-established rules, monitored and evaluated in order to provide **ADEQUATE LEVEL OF CONFIDENCE** that a product, process or service, or a person meets the pre-established standards or regulations requirements with the best **COST BENEFIT** relation to the society
- For ARLA 32 (Brazilian for AdBlue®), it has tied up with 4 accredited Certification Bodies, and 2 accredited laboratories.

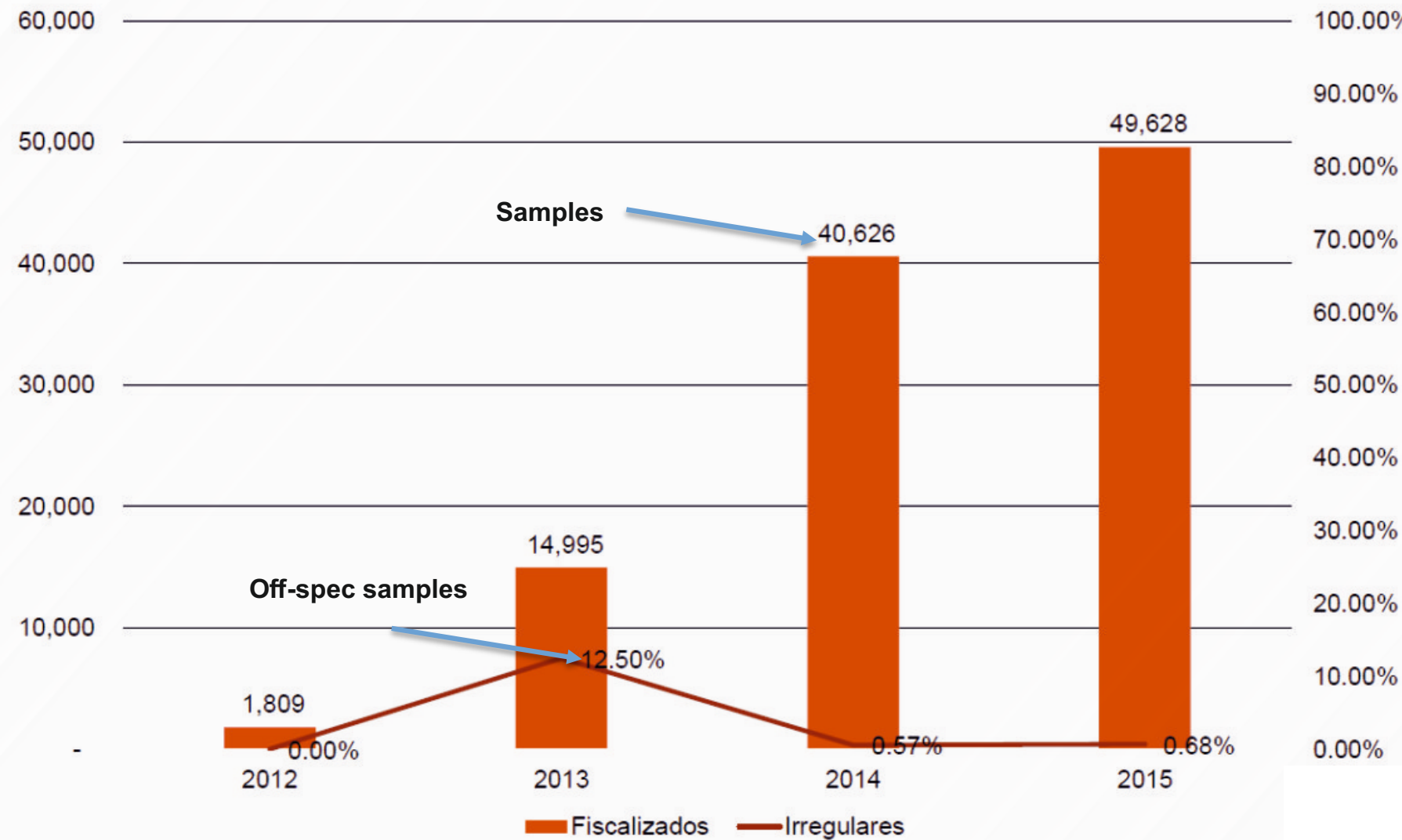


Regulatory framework:

Conformity assessment	Portaria 139, 21/03/2011
Regulation	Instrução Normativa IBAMA 23, 11/07/2009
Standard	ISSO 22241:2006 Part 2

Source: Integer

ARLA 32 quality control program – 2012 to 2015



Lessons to be learnt - China

- National standard, GB 29518, introduced in 2013. This standard follows the ISO standards for urea and AdBlue®.
- Four Chinese companies hold VDA licenses to use the AdBlue® trademark and are subject to regular quality checks from the VDA (German Automotive Association)
- According to Chinese AUS 32 producers, more than 40% of AUS 32 volumes are below standard.
- AdBlue® quality control has always been one of the biggest challenges for OEMs, to track the product source and to fix responsibility in case of failure.
- The OEM industry appealed to the Government and Industry Association to conduct stricter inspection and monitoring process for a sustainable market development



Use of agricultural urea and tap water

- AdBlue® is a registered trademark of VDA Germany (Verband der Automobilindustrie)
- VDA is a German group of Automobile industry of both
- German Automobile Manufactures and
- German Automobile Component Suppliers.
- For using trademark AdBlue®, supplier should hold VDA license.
- Certified companies show their intention and commitment to produce and to provide a product, which fulfills the requirements of ISO 22241 in an exemplary manner
- VDA Audit steps
- Inspection of the management system documentation
- Inspection of the process instructions
- Observations on shop floor
- Lab analysis as per ISO 22241 is mandatory for each batch
- Creation of an audit report
- Presentation of audit reports

- An urgent need to have a certifying body to audit and license manufacturing units.
- A panel of Auditors can be formed to audit the manufacturing plants and collect samples from the market for testing at reputed laboratories.
- Only the units who meet the quality standards passing the audit requirements should be allowed to supply product in the market.
- Warning and fines may be introduced leading to cancellation of factory license for sample failures.
- Ban on sale of OBD Emulators (these are available on e-commerce websites in India)
- Since the development of the market for AdBlue® is in its nascent stage, this is the right time to set up a regulatory mechanism in the country to ensure that the emission norms are well and truly complied with and the citizens get cleaner air to breathe.

Vehicles running with inferior quality or without AdBlue® or AUS32 are more harmful to the environment as they emit more NOx than BS I standard



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