AdBlue / AUS 32 / DEF
India Market
Current Scenario and Way Forward

N A Joshi

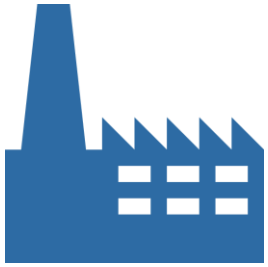
CEO

NPL BlueSky Automotive Pvt Ltd

NPL BlueSky Automotive

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 GmbH

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%

Nandan Petrochem Limited

VELVEX AdBlue by NPL KRUSE NPL BlueSky Automotive

Nandan Petrochem Limited

25+ Years of Exp in Lubricants

USD 75 Mn Annual Turnover

300+ Employees

700+ Range of products

Automotive Lubricants
Industrial Lubricants
Greases
Process Oils
Transformer Oils
AdBlue

German technology Lubricants

6 Production Plants. Equipped with R&D & In house accredited LAB facility

ISO 9001| 14001 Certified

1,02,000 MT Total Lubricant Production Capacity

1,80,000 MT Total AdBlue Production Capacity

Supplier of Genuine Oils & AdBlue to **10+ OEMs**

150+ Distributors

15+ Major industries Catered

Our Valued Customers

VELVEX AdBlue by NPL KRUSE NPL BlueSky Automotive

TATA

Mahindra

EICHER

MAN

AMW BUILT TO WIN

Cummins

Mercedes-Benz
Trucks you can trust

Albonair

BANGALORE METROPOLITAN TRANSPORT CORPORATION

What is AdBlue (AUS32 / DEF) ?

- **AdBlue® is registered trademark of VDA**.
- AdBlue® is a 32.5% solution of urea in deionized water.
- AdBlue® is essential for the correct operation of SCR After treatment device.
- AdBlue® is a clear, non-toxic liquid that is safe to handle and does not damage the environment.
- AdBlue® is a high specification solution and is manufactured to the ISO 22241 standards.

AdBlue® Specification

VELVEX AdBlue® by NPL KRUSE NPL BlueSky Automotive

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 3675 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

Source: Indian Standard IS 5406:1979 & ISO Standard 22241

Deionized water specification

Characteristics	Limit: Drinking Water (IS: 10500)	Limit: Deionized Water (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, µS/m	5,000-50,000	5.5

Source: Indian Standard IS 10500:2012 & ISO Standard 22241

Distribution Channel

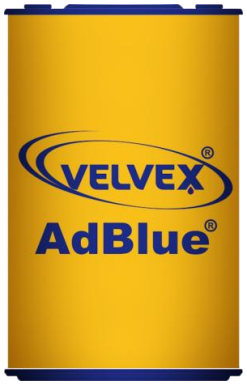
Channels:

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

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

Pack sizes

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



Dispensing Solutions

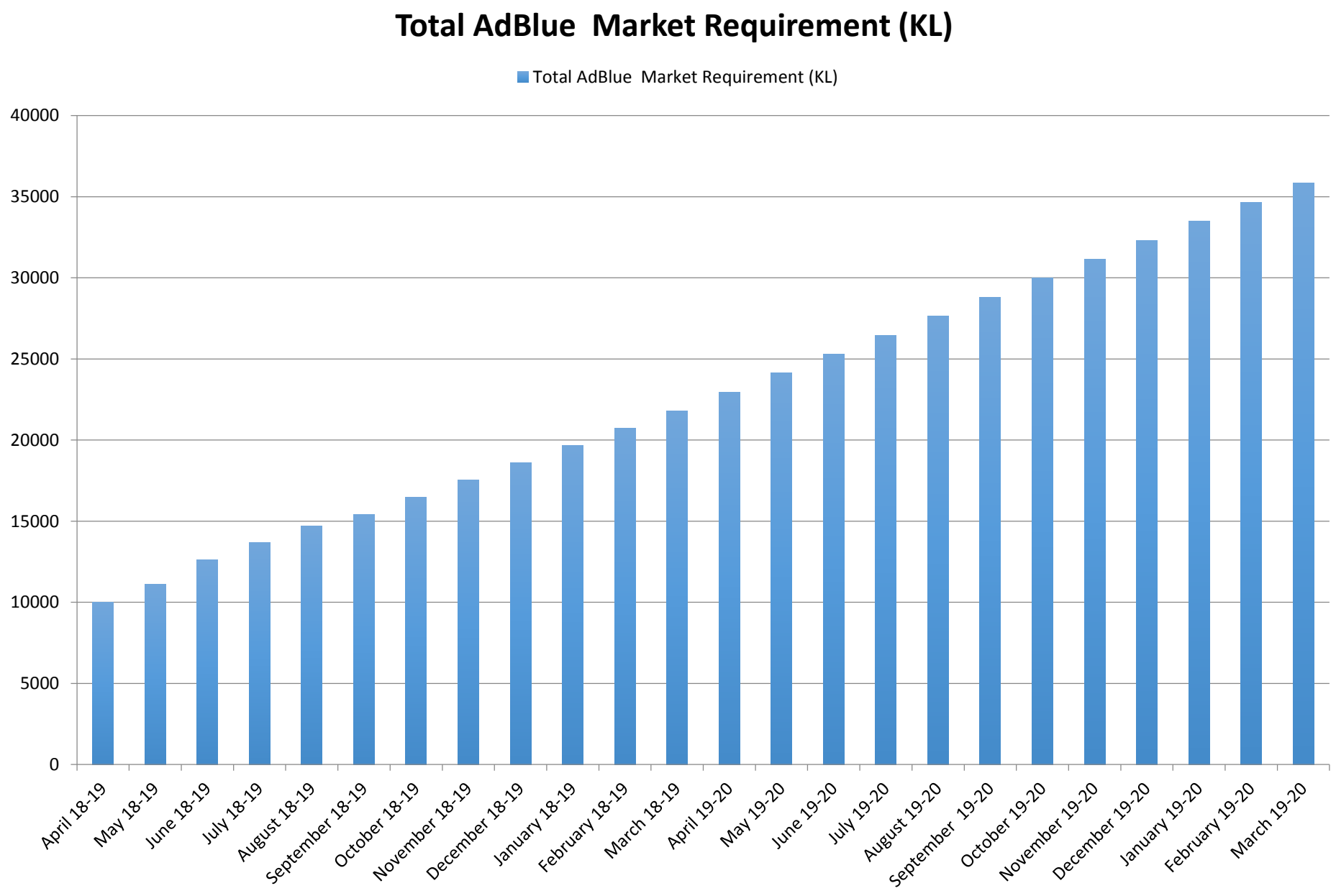
- Pumps are available for Barrel and IBC dispensing system
- ISO 22241:3 standard defines handling, storing and transportation standards for AUS 32
- These pumps meet the above standard and can help in reducing contamination at the filling/refilling point

Motorized barrel dispensing solution

IBC Dispensing system

Manual barrel dispensing system

AdBlue Projection



Future of AdBlue Dispensing System

Bulk Transport of AdBlue

Dispensing equipment at large consumers

Dispensing units at fuel retail outlets

India: Current Scenario

- 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

Market Samples

VELVEX AdBlue by NPL KRUSE NPL BlueSky Automotive

Product Name		AUS 32/DEF/AdBlue					Date:	26/06/18
				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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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 NH3	To Determines its shelf life
Biuret	Poison to catalyst
Aldehyde	Form Deposits
Insoluble Matter	Causing Injector Clog
Phosphate (PO4)	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

- The 1st Conformity Assessment Program took place in 2014-2015
- Products from 42 different companies were selected, but only 9 were verified
- Companies having off-spec products were fined
- Penalties described in Article 8 of Law 9933/99 are:
  - I – warning
  - II – fine
  - III – ban
  - IV – seizure
  - V – destruction
  - VI – license suspension
  - VII – license cancellation

Incorrect AUS 32 damaging the SCR system

Source: Integer

Quality Control Results - 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 *(Fosfate)*	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/m³	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

Source: Integer

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

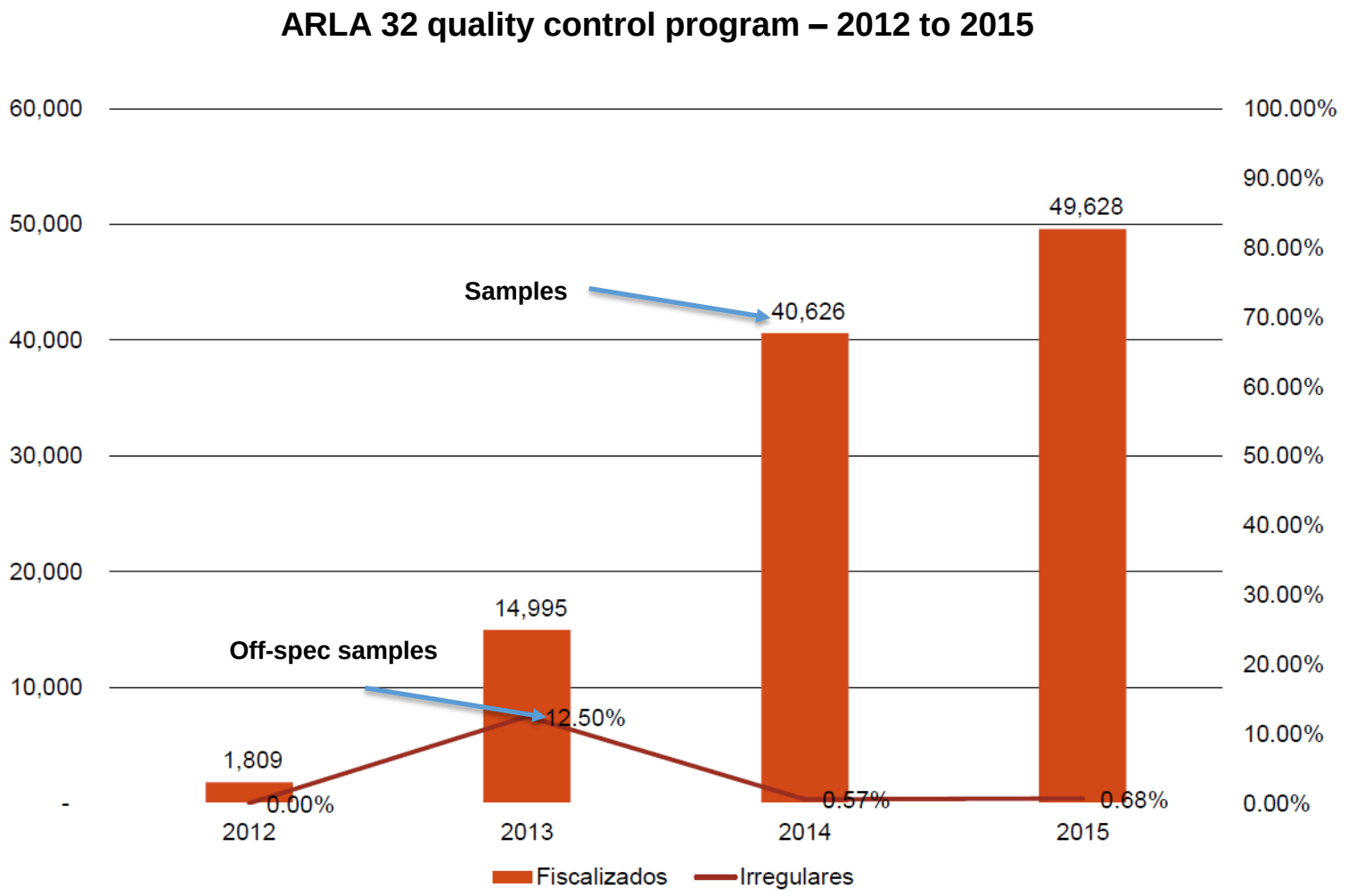
- For ARLA 32 (Brazilian for AdBlue), it has tied up with 4 accredited Certification Bodies, and 2 accredited laboratories.

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

Quality Control Program – Brazil



Source: Integer

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

Source: Integer

Lessons to be learnt - China

- April 2015, the Internal Combustion Engine Industry Association set up a certification system for AdBlue. The certificate is called CGT.

- CGT has its own testing procedure on AdBlue quality, quality assurance system, production process, material quality testing laboratory, material sampling, product validation, environmental protection laws and regulations, and other extra points.

- The CGT certification authorizes enterprises to use the trademark. In order to obtain the CGT certification and use the trademark CGT on the packaging, enterprise must clear the audit.

- CGT certificate is valid for three years.

- The CGT certification has its own certification standards.

Source: Integer

VDA licensed AdBlue

- 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

VDA | Verband der Automobilindustrie

Way Forward

- 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

The pioneer of AdBlue manufacturing in India

VELVEX® AdBlue® by NPL | KRUSE AUTOMOTIVE

NPL BlueSky Automotive

Technical JV between Nandan Petrochem and KRUSE Automotive GmbH, Germany

Established in 2011

Technical Collaboration with KRUSE Automotive GmbH, Germany

VDA approved

Approved by major OEMs in India

Plant Equipped with German Technology

Thank You