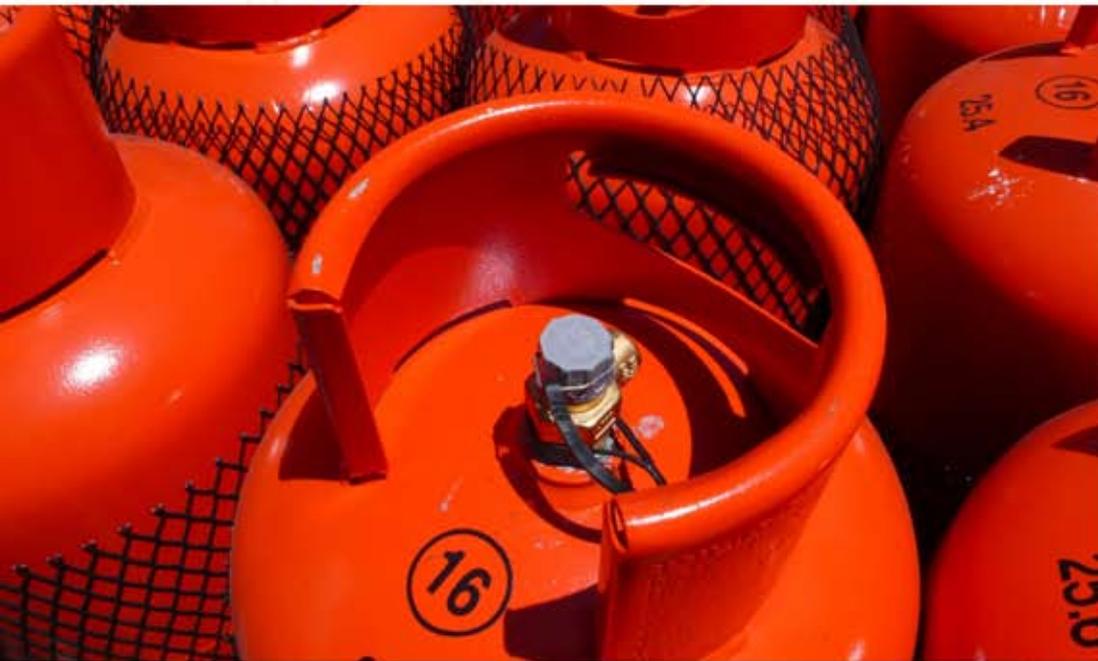


# Report on the Testing and Requalification of LPG Cylinders



GOOD INDUSTRY PRACTICES

## The World LPG Association

The World LPG Association was established in 1987 in Dublin, Ireland, under the initial name of The World LPG Forum.

The World LPG unites the broad interests of the vast worldwide LPG industry in one organisation. It was granted Category II Consultative Status with the United Nations Economic and Social Council in 1989.

The World LPG Association exists to provide representation of LPG use through leadership of the industry worldwide.

## Acknowledgements

The World LPG Association (WLPGA) would like to acknowledge the direction provided for this project by the following members of the WLPGA Global Cylinder Network (GCN) steering committee:

Mr Benbekhaled - Chairman	Salamgaz, Morocco
Mr Michael Kelly	WLPGA, France
Mr Nikos Xydas	WLPGA, France
Mr Armando Viçoso	Repsol, Spain
Mr Irto Petrus Ginting	Pertamina, Indonesia
Mr Ali Kizilkaya	Aygaz, Turkey
Mr Makoto Arahata	LPG Centre, Japan
Mr Dayo Adeshina	Strategic Energy, Nigeria
Mr Blaise Edja	Oryx Energy, Switzerland
Mr Niels K. Frederiksen	Hexagon Ragasco, Denmark
Ms Miriam Cavagna	Cavagna, Italy
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Mr Eric Batise	Siraga, France
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Mr Suyash Gupta	Indian Autogas LPG Coalition, India

Thanks are also given to the focal points in each of the fifteen countries who gathered the data, completed the surveys and submitted the results; together with other colleagues who gave valuable advice.

David Tyler of the WLPGA drafted this report under the guidance of Michael Kelly and Nikos Xydas of the WLPGA, and Mr Abdelkader Benbekhaled of Salamgaz & Chairman of the WLPGA Global Cylinder Network Group (GCN).

**Report on the  
Testing and Requalification of LPG Cylinders**

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## Chapter One

# Background and Purpose

The World LPG Association's (WLPGA) Global Cylinder Network (GCN) group held a meeting in Seoul on Wednesday 28<sup>th</sup> January 2015 and endorsed a project to investigate the testing and requalification of LPG cylinders around the world and prepare this report summarising the results.

It was agreed to select fifteen countries, which represented a good cross section of the global LPG cylinder markets, and through a survey, seek data and information about the LPG cylinder re-qualification processes in each country.

This report contains the full results of those surveys, summarises the feedback and makes comments on the information.

The objective of this report is to compare the cylinder requalification processes in each of the fifteen countries and provide information that might lead to improvements.

It is hoped this report will be useful in determining how the life of a LPG cylinder might be prolonged in a cost effective way while at the same time retaining vigorous attention to the safety and appearance of the asset.

Correct requalification of LPG cylinders is important because:

- There is a direct impact on the safety and integrity of the cylinder
- It is a significant operational and financial burden on the business
- It has a direct and visible impact on the cylinder appearance ...
- ... affecting the image and brand of LPG
- It has an impact on the perception/image for policy makers and authorities
- It has an impact on the perception for consumers, and can influence market growth
- It ensures the end-user's peace of mind regarding safety

LPG is transported in liquid form by maintaining the product under moderate pressure in a cylinder. Generally the cylinder is made of steel but more recently composite cylinders have been introduced into the industry.

Cylinders are filled and distributed through the distribution channel to the consumer by a variety of means and although they are designed for robust treatment they incur wear and tear, and sometimes damage.

Apart from the need for maintaining a safe container, it is good business practice to ensure this asset is well cared for as a LPG cylinder generally costs more than the LPG it contains.

It is estimated there are about one and a half billion LPG cylinders in circulation all over the world providing a valuable modern energy to millions of people and businesses.

The cost of these cylinders, together with their valve, will vary according to size but will typically be between US\$10 and US\$100 each.

Every time empty LPG cylinders are returned to the filling plant they are subjected to a series of vigorous visual checks and observations to ensure they are fit for filling and re-use.

In addition, at periodic intervals, cylinders are removed from the filling line and given a much more rigorous check to ensure fitness for purpose.

This often involves removal – and sometimes replacement – of the valve, a thorough internal and external inspection, a hydraulic test, and other checks.

This cylinder ‘requalification’ is a time consuming and costly process and the frequency and nature of re-qualifying LPG cylinders varies from country to country.

The requalification of LPG cylinders is a government requirement in most of the countries included in this report.

Correct requalification is essential to maintain a safe, growing and sustainable LPG business.

The purpose of this report is to assess the current global position regarding the testing and requalification of LPG cylinders by looking at a sample of fifteen different countries that represent different markets and different conditions. This will be the first phase.

The results not only identify the period of initial requalification, and subsequent requalification, they also discuss the question of valve replacement, the mandatory scrapping of cylinders and how this is done to ensure they are never allowed to re-enter the LPG market.

Details of standards, codes of practice and processes applied are also included.

Cylinder population numbers and cycle times (how frequently a cylinder is refilled) are included where available.

Also the type of paint finish used on a cylinder is included. This is done to provide some information as to what level of corrosion protection the cylinder has in order to protect it from the environment in which it is operating.

One of the main objectives of this report is to compare how the fifteen selected countries tackle the issue of cylinder requalification and to share those results to see if there are lessons to be learnt.

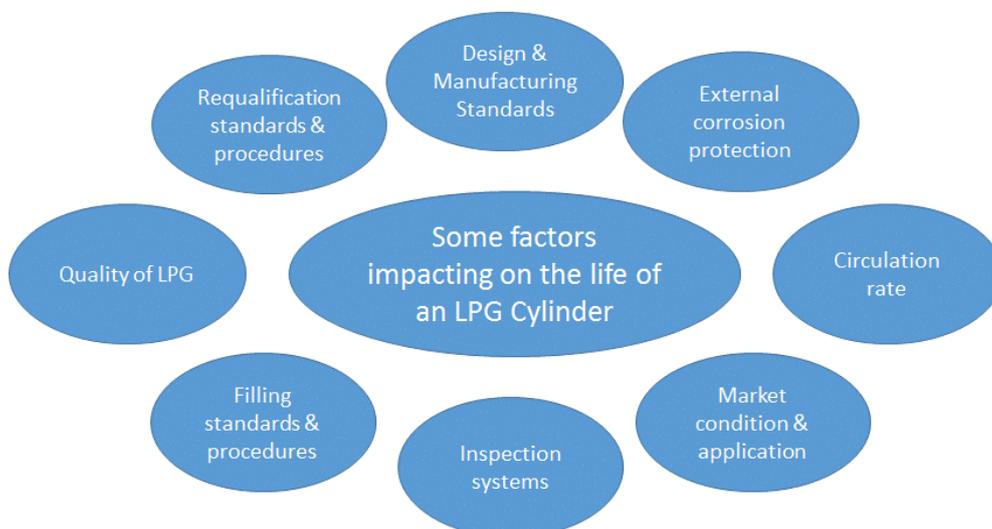
The requalification period cannot be looked at in isolation as there are many other factors to consider when reviewing whether a cylinder has reached the end of its useful life.



Manual handling of LPG cylinders can lead to both damage and personnel injury



The use of forklift trucks to handle cylinders not only reduces the risk of impact damage it reduces the risk of personnel injuries



The life of a LPG cylinder is influenced by several parameters

The life of a cylinder is influenced by several parameters:

- Quality of the cylinder, design and manufacturing standard and certification, including external protection against corrosion
- State/condition of the market, cylinder circulation rate and use or application
- Cylinder distribution and marketing model, ownership of cylinders and control of the supply chain
- Inspection systems between requalification periods (mainly before, during and after filling)
- Cylinder filling standards and practices
- Quality of LPG and the quality assurance processes
- Cylinder requalification standards and practices in the country (including repair and renewal of external protection against corrosion)
- Customer's behaviour regarding the handling and use of cylinders that are under their control

This report could be used as a tool for companies, and countries, to examine their current requirements and processes for requalifying LPG cylinders and review them against some of these mitigating measures that might be applied to protect and improve the life of the cylinder in circulation.

Those improvements might in turn create an argument for a more cost effective way of ensuring that LPG cylinders remain longer in circulation in a fit and safe state, maximising the asset value of the business.



## Chapter Two

### Summary

- The contents of this report provides information for all countries to review their cylinder management and requalification procedures and reduce costs.
- This could lead to making a case for extending the requalification periods without jeopardising the safety of the business.
- The fifteen countries selected by the steering committee for this report had an estimated 1bn LPG cylinders in circulation, around two thirds of the estimated total global cylinder population.
- The cost of LPG cylinders depends on size but is typically in the range of US\$10-100/each.
- The environment for LPG cylinders in circulation is different for each country.
- The estimated cost for requalifying the cylinders in all fifteen countries was nearly US\$1bn/year over a thirty year period.
- Each country reported a different method, and requalification period, for cylinders - ranging from one year to fifteen years.
- Some countries have a finite age limit for cylinders, and once they reach that period they are withdrawn from the market and scrapped.
- Other countries do not, and keep the cylinder in circulation as long as it meets the requalification requirements.
- Some countries repair valves when the cylinder is requalified, other countries replace them.
- Most countries adopt a strict process for scrapping cylinders to ensure they are never reused.
- There are likely to be opportunities for improving the cylinder design, manufacturing standards, maintenance and handling procedures in most countries in order to extend the life of the cylinder asset.



## Chapter Three

### The Countries

Fifteen countries were selected for this report (including four countries that had been subjected to a review in an earlier study – Japan, Brazil, Turkey and Morocco).

The countries were selected to represent a cross section of markets, climatic conditions, cylinder sizes and designs, applications and cultures.

The fifteen countries invited to participate were:



Their full survey results are included in the following respective APPENDICES at the back of this report:

Australia	APPENDIX One	Japan	APPENDIX Six	Sri Lanka	APPENDIX Eleven
Brazil	APPENDIX Two	Mexico	APPENDIX Seven	Taiwan	APPENDIX Twelve
Cote d'Ivoire	APPENDIX Three	Morocco	APPENDIX Eight	Turkey	APPENDIX Thirteen
India	APPENDIX Four	Philippines	APPENDIX Nine	UK	APPENDIX Fourteen
Indonesia	APPENDIX Five	South Africa	APPENDIX Ten	USA	APPENDIX Fifteen

The project involved gathering current information on:

- (i) The testing and requalification of LPG cylinders (both steel and composite)
- (ii) The standards and procedures used to perform (i) above
- (iii) Any finite time limits applied on the life of LPG cylinders in use together with disposal procedures

Where possible, the manufacturing standards and recommended surface coating requirements for cylinders have also been included.

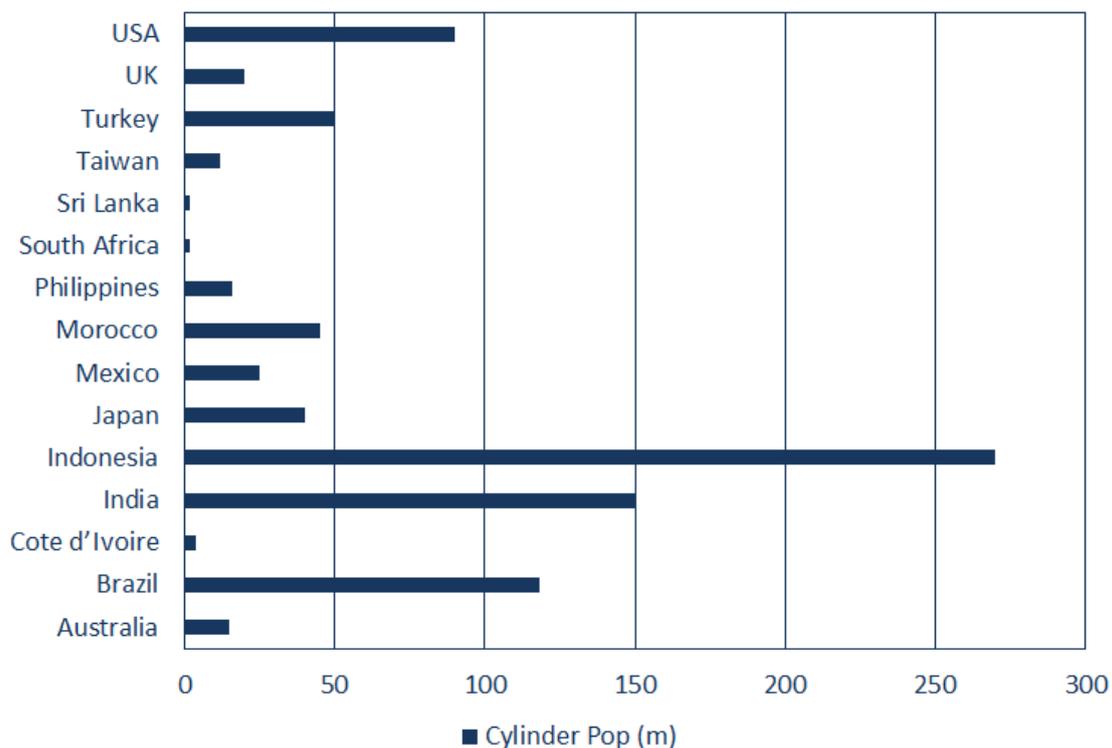
Any recommendations regarding the cylinder valve manufacturing standards have also been included together with any valve replacement periods and reconditioning procedures for the valve, if they exist.

Not every country was in a position to report their total cylinder populations for commercial reasons and, for those countries, estimates have been made.

A summary of the total estimated LPG cylinder population for each country is shown in the chart opposite.

As a result of Indonesia's successful kerosene to LPG conversion programme, affecting over 50m households with a 3kg cylinder, the cylinder population in Indonesia, at 270m, is the largest reported of all fifteen countries selected.

Using the latest information from the *2014 WLPGA Global Statistical Review*, published by *Argus Media*, it was possible to include a historic review of the LPG demand in each country over the past 20 years and also include an analysis showing where the LPG demand was by sector and by volume for the latest period available (2013). These have been included in each of the country summaries in the appendices.



For commercial reasons it was not possible to obtain accurate cylinder populations from every country and so best estimates have been included in those cases.

## Chapter Four

# Methodology

This report is based on a desk top study. A survey questionnaire was developed, agreed and circulated to WLPGA member focal points in each country.

The country focal points were then asked to respond to this survey questionnaire. The information received back from each country is attached in APPENDICES A – O.

A summary of the feedback received has been included in the main report under SECTION 8.0

The timetable for the report is shown in the chart opposite, with the final version being available for the GCN meeting in September 2015.

Activity	Feb	Mar	Apr	May	June	July	Aug	Sept
Confirm 15 countries under review								
Review historic studies								
Develop and agree questionnaire								
Issue questionnaire								
Gather information								
Contact cylinder/valve manufacturers								
Report interim results to GCN								
Analyse data								
Prepare draft report								
Finalise report with steering committee								
Issue report								

An interim report was presented to the GCN committee in Berlin in May



# Some General Information

LPG is one of those products where the packaging – which is generally a steel or composite cylinder when LPG is delivered in small quantities – is more expensive than the contents.

The WLPGA have published a *Guide to Good Industry Practices for LPG Cylinder Management* which contains some valuable general information about LPG cylinder maintenance, repair and requalification. (Refer to Section 7.0 of the above *Guide to Good Industry Practices for LPG Cylinder Management*)

It is strongly recommended to read the *Guide to Good Industry Practices for LPG Cylinder Management*, in conjunction with this report, if a review of requalification procedures is being undertaken.

A LPG cylinder has to be designed to withstand pressure, be robust enough to withstand the daily handling in the distribution channel, be subjected to extremes of temperature and other weather conditions, and yet still be presentable to the consumer.

Most steel LPG cylinders are constructed in two or three pieces and are of welded construction.

The basic design has changed little since its introduction in the 1940's although steel technology has allowed the cylinder to be made from lighter alloys enabling a lower tare weight.

The introduction and addition of plastic into the steel cylinder design has encouraged a more modern look for steel cylinders.

Plastic handles makes the carrying of steel cylinders easier.



Composite cylinders are more resistant to corrosion, lighter in weight and allow the contents to be seen through a translucent body

Composite cylinders takes that modern look a step further and provides a significant reduction in tare weight as well as providing corrosion protection and allowing consumers to see the level of the contents.

Although they are still quite new to the LPG industry the number of composite cylinders in circulation worldwide is estimated to be between 12m and 14m.

It is not only good practice from a safety point of view, but ensuring the cylinder is in a presentable, fit for purpose condition is also important to protect the brand, and maintain the value asset, of the company.

The opportunity to prolong the life of an LPG cylinder makes good business sense.

If the cylinder has been condemned, or has been deemed to have reached the end of its useful life through a mandatory life expectancy, it is essential that it is never allowed to re-emerge into the LPG market.

Either in the country of use or in any other country that might be tempted to use it.

The subject of disposing of condemned LPG cylinders is included in this report in order to prevent the illicit re-use of scrapped LPG cylinders.



Refer to Section 7 of the above guide for information on LPG cylinder maintenance, repair and requalification



The use of plastic with steel on LPG cylinders has been a more recent development



# Cylinder Filling Procedures

Cylinder filling procedures include a regular visual check to verify that cylinders are in a fit state to continue being in service. This check should be carried out by a competent person prior to the actual filling process on every occasion the cylinder is returned to the filling plant.

Cylinders may be rejected as being unfit for filling for a number of reasons, e.g. the cylinder is not to an acceptable standard (i.e. unacceptable damage, unrecognised owner, inadequate pressure rating, dimensionally unsuitable for the filling process, unsuitable valve, date of expiry of hydraulic test, etc.).

Cylinders which are not designed to be filled at the plant should be segregated and appropriately redirected or disposed of.

Third party cylinders should be returned to their owners and cylinders of unknown origin and ownership should be safely scrapped.

Cylinders must be removed from service for formal requalification when they demonstrate damage beyond the rejection limits. This may be before the recommended requalification period.

The process for this requalification, and the recommended period between when this is done, varies across the world.



# Managing Cylinders

Regardless of the guidelines and recommendations for requalification, the following general criteria follows good practice when managing LPG cylinders:

- The cylinders are designed, manufactured and tested to internationally recognised standards
- There is a system of external protection against corrosion, which is being maintained
- The cylinders are being filled in accordance with the criteria contained in an internationally recognised standard
- The cylinders are filled with LPG of a quality in accordance with a specification/standard acceptable to a competent body, such that internal corrosion is not caused
- The cylinders are under the control of the filling plant responsible for their distribution, filling and maintenance
- There is an adequate system of storage, handling and distribution that mitigates against damage in service



The application of a zinc metallised paint under the final paint finish will prevent this aggressive corrosion

Further information on this can be found in the *WLPGA Guide to Good Industry Practices for LPG Cylinder Management*.



## Chapter Eight

# Feedback from the Fifteen Countries

Feedback from the survey questionnaire was received from all countries and these are attached in the APPENDIX for each country.

Also included is a brief historic LPG demand profile for each country, over the past twenty years, using data taken from the WLPGA *Global Statistical Reviews*.

The total cylinder population in all fifteen countries was estimated to be almost 1bn.

The total estimated cost for requalification of LPG cylinders across all fifteen countries over a 30 year period, using the information provided and estimates, is nearly US\$1bn/year.

There were concerns from some countries regarding the confidentiality of some of the information - cylinder populations for example - and in those cases estimates have been provided.

Only one country (South Africa) did not have an industry position on requalification and in this case the individual companies operating in South Africa apply their own individual procedures.

Six countries reported corrosion as the main cause for scrapping cylinders (Brazil, Indonesia, The Philippines, Sri Lanka, Taiwan and the UK).

Two countries reported shroud or foot-ring damage as the main cause for scrapping cylinders (Australia and Cote d'Ivoire) indicating possible challenges in cylinder handling.

Two countries report mandatory scrapping as the main reason for disposal (Indonesia and Morocco).

Japan has a more rigorous requalification procedure when the cylinder reaches 20 years of age with period reducing to every two years. The impact of this is to encourage scrapping around that time to avoid the increased costs of requalification.

Composite cylinders have just been approved in Japan. Current policy is to requalify them every 3 years until they are 15 years old and then they will be withdrawn from the market.

Not all the information was provided. For example cylinder scrapping procedures were not available from every country.

### 8.1 Standards and Procedures Used

The steel cylinder is normally either a two piece or three piece vessel of welded construction manufactured to either local or recognised international codes.

Composite cylinders are not available in some of the countries but where there is information available it has been included.

The design code for cylinders across the survey group included recognised international codes as well as local country codes.



A hydraulic test shown above is normally included in the requalification procedures

## 8.2 Testing and Requalification of LPG Cylinders

The initial requalification period varied in the sample from twelve months (Mexico) to fifteen years (UK). Subsequent requalification then took place between two and ten years.

In South Africa there is no industry position yet on cylinder requalification but each company follows its own internal procedures.

A summary of the initial, and subsequent, periods for requalification for each of the fifteen countries is shown in the following chart.

	INITIAL AND SUBSEQUENT REQUALIFICATION (YEARS)																													
	1	2	3	4	5	6	7	8	9	10				15				20				25				30				
Australia																														
Brazil																														
Cote d'Ivoire																														
India																														
Indonesia																														
Japan																														
Mexico	Once the certification is obtained it is not necessary to recertificate them; withdrawn after 5 years																													
Morocco																														
Philippines																														
South Africa	There are no country requirements; each company follows its own procedures																													
Sri Lanka																														
Taiwan																														
Turkey																														
UK																														
USA																														

## 8.3 Time Limits Applied to the Life of LPG Cylinders

Some countries are obliged to scrap their cylinders after a mandatory period regardless of condition. Other countries with no age limits have evidence of cylinders in circulation that are in excess of 40 years old.

In Mexico cylinders are withdrawn after 5 years, in Taiwan 30 years and in Morocco 40 years.

One interesting observation was made in Japan where once the cylinder reaches the age of 20 years it then has to be re-qualified every two years thereafter. The cost of requalification then becomes significantly higher for the older cylinders.

The effect of this might encourage early disposal of second hand cylinders that are approaching 20 years old to avoid increased operating costs.

The risk is that these might be exported to other countries – where the import of second hand cylinders is not disallowed - in a usable, and qualified, state where they may not be subjected to the same level of scrutiny in the future.



The report also included industrial /commercial three piece cylinders such as the Japanese ones shown here

## 8.4 Disposal Procedures

Cylinders considered unsuitable for further service must be gas freed and destroyed using a procedure that will ensure that the cylinder is not subsequently repaired and used again as a pressure vessel.

Occasionally evidence appears of scrapped cylinders from one country being illicitly exported to another country where they are then put back into the market.

The risk of an incident with the cylinder is high in these circumstances because not only is the cylinder 'out of test' but the likelihood of it being properly requalified is probably low.

Cylinders that have deemed to be at the end of their working life, or that have failed the requalification test, need to be condemned in such a way they can never be used again.

Typical methods of destruction are:

- Crushing by mechanical means
- Punching large irregular holes in both the top and bottom parts of the cylinder body to prevent illicit reconstruction.

[**note:** Domestic cylinders which have been re-made using the 'good' halves of condemned cylinders present a serious risk as they would certainly not have been heat treated after welding]

- Piercing holes, at least 50 mm diameter, in the container in at least three places (simply drilling holes does not meet this requirement as they can be easily repaired)
- Removing the top and bottom, and vertically cutting the body (the practice in Cote D'Ivoire) shown opposite



*This eliminates the risk of cylinders being re-used*



*Scrapped cylinders in Cote d'Ivoire*

## 8.5 Surface Coating Requirements

The use of a zinc metallised based corrosion protective finish prior to the final painting of the cylinder is good practice but is not applied in every country surveyed. There is strong evidence linking the use of a zinc based corrosion protective base with a prolonged cylinder life.

India has very prescriptive advice. The application of a 37 micron (minimum) zinc coating should be followed by a coat of zinc chromate primer and another coat of super synthetic enamel paint. The total thickness of primer and enamel paint to be a minimum 30 microns. The total combined thickness should be minimum 67 microns. The colour and finish of the paint coating of steel cylinders is often linked to the brand in the country and synthetic enamel and powder coating are both commonly used.

Spray booths with water arresters were common ways to apply the finished coat.

## 8.6 Cylinder Valve Standards, Replacement Periods and Repair

Valves are fitted into a threaded bung, or boss, in the top of LPG cylinders.

Sealants, or PTFE tape, are normally used to achieve a gas tight condition. The over use of PTFE tape can cause stress on the brass valve through overtightening. This is the reason why internal standards of some companies prohibit the use of PTFE.

The degree of accuracy of the matching threads of valve and bung is critical for a gas tight fit. Some cylinder valve manufacturers' deal with this by manufacturing and supplying the bung to the cylinder manufacturer for the initial build to ensure a good match with the valve.

This may not be the case when valves from other manufacturers are used to replace the original valve.

Most/all countries replace, rather than repair, valves if they become damage or are replaced during the requalification procedure.

This avoids confusion and potential liability in the event of an incident with the valve in service.

If an incident occurs with the valve, and the repairing of valves is common, the question will inevitably be asked by the valve manufacturer; '...has the valve been repaired or was it supplied by us like that...?'



*Hand wheel valve fitted to a cylinder together with a plastic seal to protect the valve thread and prevent accidental opening*

Not all countries replace the valve when the cylinder is requalified. Some countries re-use the valve if it is still fit for purpose, others have a mandatory replacement policy on requalification.

Mandatory valve replacement at the requalification date increases the cost but might achieve savings later if the cylinder valve has to be replaced before the next requalification period is due and the cylinder has to be withdrawn prematurely.

In Japan the requalification for the cylinder is 5 years whereas the valve is replaced every 6 years. This frequently results in earlier valve replacement at the cylinder requalification time.

## **8.7 Survey results**

Full details of the survey results from each country have been included in the following appendices.

A short summary showing the highlights from each survey is shown at the top of each appendix, for each country.

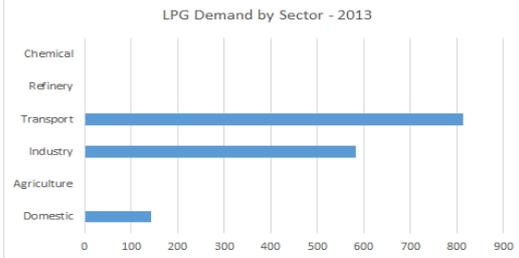
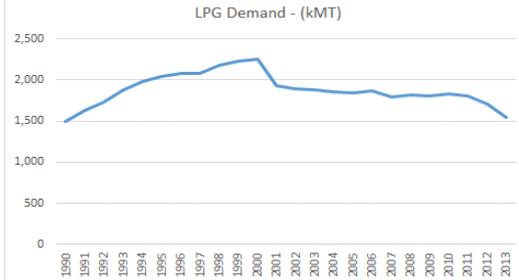
In order to get an indication of the size and type of LPG market in each country, a chart showing the historic LPG consumption over the last 20 years is also included, together with a split of demand by sector (in 2013) which has been extracted from the *WLPGA Global Statistical Reviews*.

The full survey in excel has been copied into each appendix.

# Australia



- Mature market - mainly Autogas
- 9kg exchange programme for domestic
- POL used extensively across cylinder business
- AS 2030 used for design etc.
- Cylinder population over 5m (probably <10m)
- 10 years requalification for steel cylinders
- 5 years for Composites
- Valves generally replaced when requalifying
- Scrapping of cylinders mainly due to corrosion/dents



Background to this survey - Apart from gathering information on the requalification of LPG cylinders, the survey also seeks to include any statutory requirements for the mandatory withdrawal of cylinders from the market based on age, together with disposal procedures. Where possible, the manufacturing standards and recommended surface coating requirements for cylinders will be included. Any requirements regarding the cylinder valve manufacturing standards will also be included together with any valve replacement periods and reconditioning procedures for the valve, if they exist.

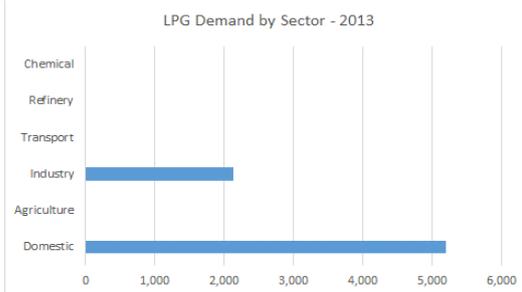
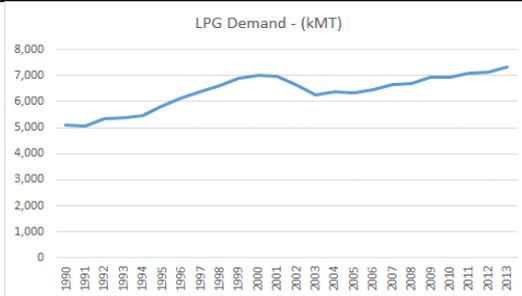
COUNTRY	Australia		NAME & CONTACT DETAILS	Gas Energy Australia +61 2 6376 3105				
What is the cylinder design code (e.g. ISO, DOT, local code, etc.)	Design Standard is AS 2030 - This Standard series specifies the requirements for the design, verification and manufacture of all gas cylinders for the storage and transport of compressed, dissolved and liquefied gases, of water capacity ranging from 0.3 kg to 3000 kg. AS 2030.2 sets out additional requirements for compressed dissolved acetylene. NOTE: Designation AS 2030.3 is currently not in use. AS 2030.4 sets out additional requirements for closed cryogenic receptacles (formerly called insulated welded cylinders). AS 2030.5 sets out additional requirements for the filling, inspection and testing of refillable gas cylinders, except cylinders for dissolved acetylene and closed cryogenic receptacles.							
What is the cylinder requalification code (e.g. DOT, local code, etc.)?	AS 2030.5 sets out additional requirements for the filling, inspection and testing of refillable gas cylinders							
Describe the paint finish?	Coating requirements are described in AS 2469 section 11 these vary from galvanising to base level prime and paint.							
What is the initial requalification period for a cylinder (years)?	There is a requirement for cylinders to be tested prior to first use covered by AS 2030 series. The subsequent re-qualification test and subsequent are the same (10yrs & then every 10 years)	Does the valve get reconditioned?	YES (US\$)	NO	How are cylinders scrapped?			
What is the subsequent requalification period for a cylinder (years)?	All covered under 2030.5 - no difference between initial re-qualification and subsequent requalification	Welded Steel LPG Cylinders with removable valve 10 years external 10 years internal	Welded Steel LPG Cylinders (except for SCBA and SCUBA) (A) Dry non-toxic, non-corrosive compressed and liquefied gases, dry natural gas or methane, (including mixtures containing <math>\leq 5\%</math> CO <sub>2</sub> ) 10 years external 10 years internal	SCUBA/RECYCLED cylinders (except for SCBA and SCUBA) (A) LP Gas cylinders - Composite cylinders with non-metallic liners or without liners	Refer to AS 2030.5 for the required tests and any testing or notes associated with the cylinder type			
What is the approx. cost of requalification a cylinder (US\$)?		Are cylinders scrapped based on age?	Yes (years)	No				
Is the valve always replaced when the cylinder is requalified?	YES (US\$)	NO	See note 4					
What is the cylinder size profile in the market?	How many active cylinders are there in the market of this size? Note 2 & 3	What is the typical cylinder turn-around time (i.e. refills per year)?	What is the cylinder scrapping rate per year for this cylinder size?	How many cylinders are scrapped during requalification?	How many cylinders are scrapped during routine inspection?	What valve type is fitted to the cylinder (e.g. PSL, 22mm compact etc.)?	Is a PIV fitted? Note 4	What is the valve design code/standard?
<math>< 3</math> litres (less than 2.5 kg) Note 1	42,435	Steel				POL	AS 2473.2	
3 litres to <math>\le 18</math> litres (2.5 kg - 18 kg)	4,150,248	Steel				POL	AS 2473.2	
18 litres to <math>\le 28</math> litres (18kg - 28kg)	275,544	Steel				POL	AS 2473.2	
above 28 litres (greater than 28 kg)	2,019,751	Steel				POL	AS 2473.2	
What are the main reasons for scrapping cylinders?	As a % of total scrapped cylinders (in a typical year) Note 5							
a. Corrosion	30%							
b. Dents	20%							
c. Welding defects i.e. pinhole	1%							
d. Bung or necking defects	1%							
e. Collar/footing defects	48% Note, the majority of these defects relate to fork cylinders. These are dropped constantly as they're removed from the forklift for replacement.							
f. Mandatory Scrapping	no mandatory scrapping or 'other'. Cylinders are only removed from service when defects are identified.							
g. Others (please specify)	no mandatory scrapping or 'other'. Cylinders are only removed from service when defects are identified.							
Other Notes								
Note 1 - There is a disposable canister market in the lower end of the Canister size profile and it is nearly impossible to estimate the volume in this market place								
Note 2 - The figures in relation to market size do not include privately owned cylinders, the 9kg and 18kg categories reflect the cylinder exchange market and the 45kg category is reflective of the domestic and small commercial area.								
Note 3 - There is a significant decanting market which fills privately owned cylinders. It is impossible to estimate the volume of cylinders in this market as they are imported by a wide variety of retailers direct to the public (e.g. hardware and outdoor living stores) through to camping and recreation outlets								
Note 4 - In relation to valves, there is no specified re-certification period, the criteria contained within the AS 2030 series simply states that the valve has to function properly including the PIV. In practice the economics of re-testing don't stack up so valves are replaced when re-tested, or should a valve fail.								
Note 5 - No industry figures were available, however the figures were provided by one member and should be mostly reflective of the industry but should be used for guidance only								

07 February 2015

Brazil



- Growing market - mainly Domestic
- NBR 8460/8865 used for design etc.
- Cylinder population around 120m
- Cylinder exchange programme in place
- 15 years requalification for steel cylinders ...
- ... then every 10 years
- Valves (NBR 8614) repaired if possible
- No PRV fitted to small cylinders
- Costs approximately US\$7 to requalify cylinder
- Corrosion is main cause of scrapping cylinders



Background to this survey - Apart from gathering information on the requalification of LPG cylinders, the survey also seeks to include any statutory requirements for the mandatory withdrawal of cylinders from the market based on age, together with disposal procedures. Where possible, the manufacturing standards and recommended surface coating requirements for cylinders will be included. Any recommendations regarding the cylinder valve manufacturing standards will also be included together with any valve replacement periods and reconditioning procedures for the valve, if they exist.

COUNTRY	BRASIL	NAME & CONTACT DETAILS	JONATHAN SAUL BENCHIMOL
What is the cylinder design code (e.g. ISO, DOT, local code, etc.)?	NBR 8460		
What is the cylinder requalification code (e.g. DOT, local code, etc.)?	NBR 8865		
Companies are free to choose the paint finish. The most common method is to sand blast the cylinder and then apply a primer finish to protect the cylinder against corrosion and then apply a top coat. The standard says that the paint must withstand 30 hours of saltspray cabin test. Therefore a plate is tested every certain amounts of cylinders painted.			
What is the initial requalification period for a cylinder (years)?	15 years	Does the valve get reconditioned?	YES (US\$) 1 NO
What is the subsequent requalification period for a cylinder (years)?	10 years	How are cylinders scrapped?	the cylinders must have a few holes punched into it and then pressed
What is the approx cost of requalifying a cylinder (US\$)?	7	Are cylinders scrapped based on age?	Yes (years) No
Is the valve always replaced when the cylinder is requalified?	YES (US\$) NO		

What is the cylinder size profile in the market?	How many active cylinders are there in the market of this size?	What is the cylinder material? (steel, composite, etc.)?	What is the typical cylinder turn-around time (i.e. refills per year)?	What is the cylinder scrapping rate per year for this cylinder size?	How many cylinders are scrapped during requalification?	How many cylinders are scrapped during routine inspection?	What valve type is fitted to the cylinder (e.g. POL, 22mm compact etc)?	Is a PRV fitted?	What is the valve design code/standard?
<5 litres	4,680,000	steel	4	1%	30,000	0%	3/8" NGT	no prv	NBR 8614
5 litres to < 16 litres	1,220,000	steel	4	1%	5,000	0%	3/4"-14 NGT	no prv	NBR 8614
el		steel	4	1%		0%		no prv	NBR 8614
26 litres to < 52 litres	110,000,000	steel	4	5%	790,000	0%	3/4"-14 NGT	no prv	NBR 8614
above 52 litres	1,800,000	steel	12	5%	1,100	0%	3/4"-14 NGT	there are prv	NBR 13794

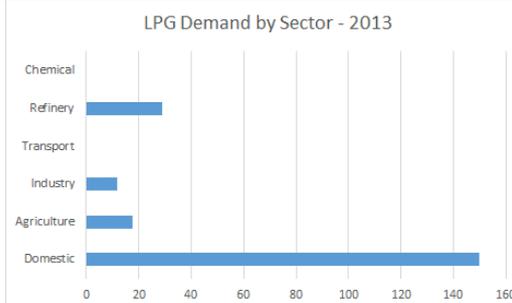
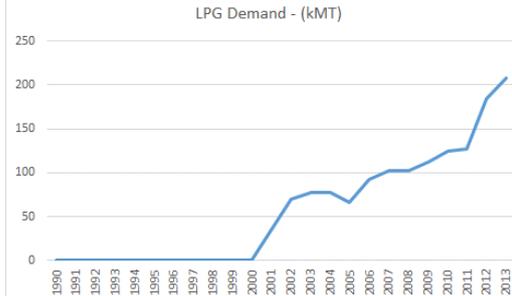
What are the main reasons for scrapping cylinders?	As a % of total scrapped cylinders (in a typical year)
a. Corrosion	98.0%
b. Dents	1.5%
c. Welding defects i.e. pinhole	0.10%
d. Bung or neckring defects	0.10%
e. Collar/footring defects	0.10%
f. Mandatory Scrappage	0.10%
g. Others (please specify)	0.10%

**Other Notes**  
In Brasil all cylinders are branded and every cylinder is under the cylinder exchange mechanism. This means the company have special care for its cylinders. A visual inspection is performed at every filling process and visual approval defines if the cylinder is filled or not. At every cycle the cylinder is painted to avoid corrosion. The cylinder in brasil is built with thicker steel to withold the " brasilaian reality " therefore the minimum thickness is 2,65 mm. The new cylinder at the manufacturing process is randomly tested at the factory and must withstand a minimum of 86 kgf/cm2, and the usual working pressure at normal condition is around 6 kgf/cm2. The first requalification is with 15 years and after that every 10 years. In an unbranded market that everyone fills each other cylinders and with no standard construction standard for cylinders even 5 years can be too long...it is a matter on how the industry is designed by the regulators and the industry players.

DT February 2015

## Cote d'Ivoire

- Fast growing market
- Dominated by domestic demand
- ISO 22991 used for design etc.
- Cylinder population approx. 3.5m
- 5 years requalification for cylinders ...
- ...then every 5 years
- Zinc metallisation commonly used
- No valve reconditioning done
- Effective scrapping policy
- Scrapping of cylinders is mainly due to collar and foot ring damage



Background to this survey - Apart from gathering information on the requalification of LPG cylinders, the survey also seeks to include any statutory requirements for the mandatory withdrawal of cylinders from the market based on age, together with disposal procedures. Where possible, the manufacturing standards and recommended surface coating requirements for cylinders will be included. Any recommendations regarding the cylinder valve manufacturing standards will also be included together with any valve replacement periods and reconditioning procedures for the valve, if they exist.

COUNTRY	Côte d'Ivoire	NAME & CONTACT DETAILS	Fanny Mory - fanny22mory@yahoo.fr
What is the cylinder design code (e.g. ISO, DOT, local code, etc.)?	ISO 22991:2004		
What is the cylinder requalification code (e.g. DOT, local code, etc.)?	ISO 22991:2004		
Describe the paint finish?	Zinc metal spray coating layer 40 micron - Liquid coating: 1 layer primer + 1 layer finish gloss paint: 20 micron mini per layer.		
What is the initial requalification period for a cylinder (years)?	5 years	Does the valve get reconditioned?	YES (US\$) No
What is the subsequent requalification period for a cylinder (years)?	5 years	How are cylinders scrapped?	Cylinders are cut into different pieces.
What is the approx cost of requalifying a cylinder (US\$)?	Capacity < 30 litres : US\$3 Capacity > 30 litres: US\$6	Are cylinders scrapped based on age?	Yes (years) All cylinders manufactured before 1960 No
Is the valve always replaced when the cylinder is requalified?	YES (US\$) Camping valve: US\$1.35 Hand wheel valve French Type: US\$3.93 NO		

What is the cylinder size profile in the market?	How many active cylinders are there in the market of this size?	What is the cylinder material? (steel, composite, etc.)?	What is the typical cylinder turn-around time (i.e. refills per year)?	What is the cylinder scrapping rate per year for this cylinder size?	How many cylinders are scrapped during requalification?	How many cylinders are scrapped during routine inspection?	What valve type is fitted to the cylinder (e.g. POL, 22mm compact etc)?	Is a PRV fitted?	What is the valve design code/standard?
<5 litres	0								
5 litres to < 16 litres	2,254,046	Steel	5.1	Information not available for the whole industry	Information not available for the whole industry	Information not available for the whole industry	Camping Valve V20	No	EN 13152
16 litres to < 26 litres	1,165,611	Steel	3.9	Ditto	Ditto	Ditto	Hand wheel Valve French Type	No	EN 13153
26 litres to < 52 litres	9,340	Steel	2.5	Ditto	Ditto	Ditto	Hand wheel Valve French Type	No	EN 13153
above 52 litres	92,672	Steel	6.5	Ditto	Ditto	Ditto	Hand wheel Valve French Type	No	EN 13153

What are the main reasons for scrapping cylinders?	As a % of total scrapped cylinders (in a typical year)
a. Corrosion	20
b. Dents	25
c. Welding defects i.e. pinhole	
d. Bung or neckring defects	
e. Collar/footring defects	50
f. Mandatory Scrapping	
g. Others (unsuccessful to hydraulic)	5

Remark: as information are not available for the time being at the industry level, these figures concern Oryx Gaz Côte

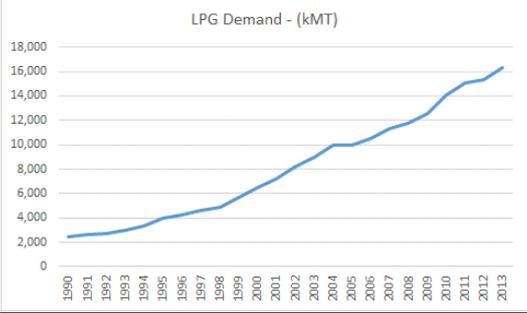
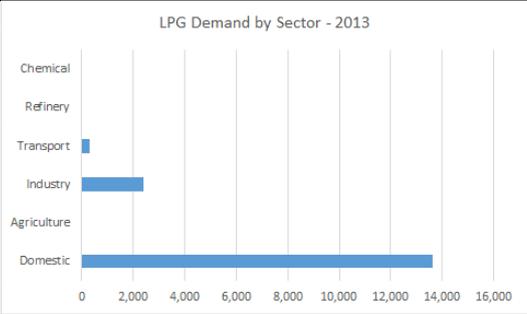
Other Notes  
Remark: The above approximative costs of requalifying a cylinder concern only external visual inspection for signs of corrosion or other damage and hydraulic testing. They don't include the costs of replacement of valve, shot blasting and repainting of the cylinders.  
Below are pictures of some scrapped cylinders



India



- Large growing market - mainly Domestic
- IS 3196 and IS 13258 used for design
- Cylinder population approx. 150m
- 10 years requalification for cylinders ...
- ... then every 5 years
- Valves are not generally replaced
- No valve reconditioning done
- Cylinder requalification costs approx. US\$1 (excl. valve)
- Scrapping of cylinders mainly due to body leak (45%)

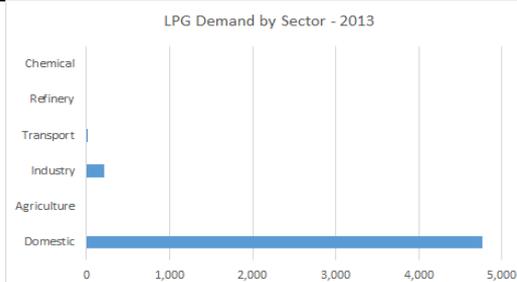
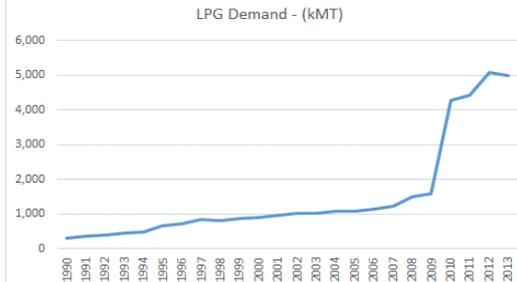
**Background to this survey - Apart from gathering information on the requalification of LPG cylinders, the survey also seeks to include any statutory requirements for the mandatory withdrawal of cylinders from the market based on age, together with disposal procedures. Where possible, the manufacturing standards and recommended surface coating requirements for cylinders will be included. Any recommendations regarding the cylinder valve manufacturing standards will also be included together with any valve replacement periods and reconditioning procedures for the valve, if they exist.**

COUNTRY	India	NAME & CONTACT DETAILS	J P Pandey, jppandey@indianoil.in, +91-7506448604						
What is the cylinder design code (e.g. ISO, DOT, local code, etc.)	IS-3196								
What is the cylinder requalification code (e.g. DOT, local code, etc.)?	IS-13258								
Describe the paint finish?	<p>Paint finish to be ensured as per IS-2932. One coat of BIS-2074 (latest) Zinc Chromate primer approved by BIS and shall be of Brushing consistency and suitable for spraying. The colour of primer should be of Red Oxide. After cylinders have been coated with primer, the cylinders shall be left in air for drying. The drying time shall be as per paint manufacturer/supplier's recommendations. One coat of Synthetic Enamel Paint of Signal Red color BIS 5 (latest) shade 537 approved by BIS. The paint shall be of brushing consistency and suitable for application by spraying. Both the layers i.e. of paint and the primer should be minimum thickness of 30 microns. Both primer coating and signal red coating paint shall be applied on the external surface of the cylinder by using a suitable pneumatic spraying gun in a fabricated painting booth having provision for water curtain draft and rotating arrangement of cylinders. While applying the primer coating and final painting, care should be taken to ensure that the shadow zones such as surfaces under foot ring, VP ring etc are properly coated. Sufficient drying time should be provided after finish painting. The assessment of thickness of coat of primer and paint surface shall be done in line with IS 3196 Part 1 which states that zinc to be sprayed (metallizing) so as to have a zinc coating thickness of 37 microns minimum.</p> <p>This to be followed by a coat of Zinc Chromate primer and another coat of super synthetic enamel paint. The total thickness of primer and enamel paint to be minimum 30 microns. The total combined thickness of Zinc coating + Zinc Chromate primer + Enamel paint to be minimum 67 microns.</p>								
What is the initial requalification period for a cylinder (years)?	10	Does the valve get reconditioned?	YES (US\$)	NO					
What is the subsequent requalification period for a cylinder (years)?	5			NO					
What is the approx cost of requalifying a cylinder (US\$)?	1	Are cylinders scrapped based on age?	Yes (years)	No					
Is the valve always replaced when the cylinder is requalified?	YES (US\$)			NO					
How are cylinders scrapped?	Cylinders are degassed and their body pressed in partially planar shape using a hydraulic press								
What is the cylinder size profile in the market?	How many active cylinders are there in the market of this size?	What is the cylinder material? (steel, composite, etc.)?	What is the typical cylinder turn-around time (i.e. refills per year)?	What is the cylinder scrapping rate per year for this cylinder size?	How many cylinders are scrapped during requalification?	How many cylinders are scrapped during routine inspection?	What valve type is fitted to the cylinder (e.g. POL, 22mm compact etc)?	Is a PRV fitted?	What is the valve design code/standard?
<5 litres	N/A								
5 litres to <16 litres	0.23 million	low carbon steel	12	0,01%	0,05%	0,01%	Self closing valve	NO	IS-8737
16 litres to <26 litres	N/A								
26 litres to <52 litres	149.9 million	low carbon steel	6	0,15%	0,50%	0,05%	Self closing valve	NO	IS-8737
above 52 litres	0.6 million	low carbon steel	8	0,05%	0,05%	0,01%	Self closing valve	NO	IS-8737
What are the main reasons for scrapping cylinders?	As a % of total scrapped cylinders (in a typical year)								
a. Corrosion	15								
b. Dents	30								
c. Welding defects i.e. pinhole	5								
d. Bung or necking defects	15								
e. Collar/footring defects	0								
f. Mandatory Scrappage	0								
g. Others (please specify)	45	Body leak							
<p><b>Other Notes</b></p> <p>1. Statutory testing stations are established as per approval from competent Government authority of India, PESO.                  2. Many IOCL LPG Plants are also having inhouse ST&amp;P (statutory testing &amp; painting) facility. 3. The data is only towards requalification and does not include repair by replacing footring and stay plate 4. ST&amp;P of LPG cylinders refers to the statutory testing that is done as per Petroleum &amp; Explosives Safety Organisation (an Indian Statutory Body) guidelines in which cylinders are segregated by visual inspection for testing, degassed by filling with water, cleaned &amp; hydro tested, pneumatically tested after fitting back of valve and then OK cylinders repainted &amp; re-stenciled with weight &amp; instructions.</p>									

DT February 2015

Indonesia

- Fast growing market following kerosene campaign
- 3kg cylinders supply over 90% of market
- SNI 1452 : 2011 used for cylinder design
- ISO 10464 used for requalification
- Cylinder population over 250m
- Mostly local manufactured
- 4 years requalification for steel cylinders
- No reconditioning of valve
- Poor handling of cylinders causes damage
- ‘...thrown like coconuts...’



Background to this survey - Apart from gathering information on the requalification of LPG cylinders, the survey also seeks to include any statutory requirements for the mandatory withdrawal of cylinders from the market based on age, together with disposal procedures. Where possible, the manufacturing standards and recommended surface coating requirements for cylinders will be included. Any recommendations regarding the cylinder valve manufacturing standards will also be included together with any valve replacement periods and reconditioning procedures for the valve, if they exist.

<b>COUNTRY</b>	Indonesia	<b>NAME &amp; CONTACT DETAILS</b>	Allaq Alimatus Syariat - Jr. Officer Material Procurement Domestic Gas PT Pertamina
What is the cylinder design code (e.g. ISO, DOT, local code, etc.)	SNI 1452 : 2011 (SNI: Standard Nasional Indonesia) Indonesia National Standard		
What is the cylinder requalification code (e.g. DOT, local code, etc.)?	ISO 10464:2004, Gas Cylinders Inspection and Testing		
Describe the paint finish?	Double Coating Painting with Oven Drying contains melamine resin and epoxy tester for primary coat also alkyd melamine for finishing (top coat).		
What is the initial requalification period for a cylinder (years)?	R 1 - 4	Does the valve get reconditioned?	YES (US\$) NO NO
What is the subsequent requalification period for a cylinder (years)?	every 4 - 5 years	How are cylinders scrapped?	Administration: Evaluation, selection and giving certificate on cylinders to be scrapped.  Technical/operationally: the cylinders is emptied and then cut in two, horizontally and/or vertically in order to make sure it is not reused.
What is the approx cost of requalifying a cylinder (US\$)?	approx. Rp. 11.000 - 13.000 for a single cylinder	Are cylinders scrapped based on age?	Yes (years) No 25 years for capacity > 3 kg and 20 years for capacity = 3 kg Some are scrapped before the age, depends on the cylinder condition
Is the valve always replaced when the cylinder is requalified?	YES (US\$) NO when there is no leak and technically it is still functioning, but it would have to be replaced on the first retest period on 5 years.		

What is the cylinder size profile in the market?	How many active cylinders are there in the market of this size?	What is the cylinder material? (steel, composite, etc.)?	What is the typical cylinder turn-around time (i.e. refills per year)?	What is the cylinder scrappage rate per year for this cylinder size?	How many cylinders are scrapped during requalification?	How many cylinders are scrapped during routine inspection?	What valve type is fitted to the cylinder (e.g. PCL, 22mm compact etc)?	Is a PRV fitted?	What is the valve design code/standard?
<5 litres									
5 litres to < 16 litres	around 100 - 200 million	SG 255			approx. 8%		single spindle, NGT 1/2"	Yes	SNI 1591 : 2008
16 litres to < 26 litres	around 20 - 40 million	SG 255			approx. 5%		double spindle, NGT 3/4"	Yes	SNI 1591 : 2008
26 litres to < 52 litres	around 10 - 30 million	SG 255			approx. 5%		handwheel, NGT 3/4"	Yes	SNI 1591 : 2008
above 52 litres									

What are the main reasons for scrapping cylinders?	As a % of total scrapped cylinders (in a typical year)
a. Corrosion	5%
b. Dents	1%
c. Welding defects i.e. pinhole	2%
d. Bung or necking defects	1%
e. Collar/footring defects	2%
f. Mandatory Scrappage	5%
g. Others (please specify)	

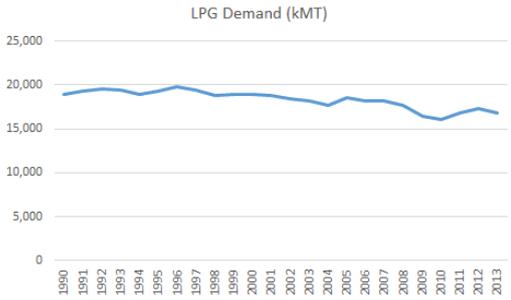
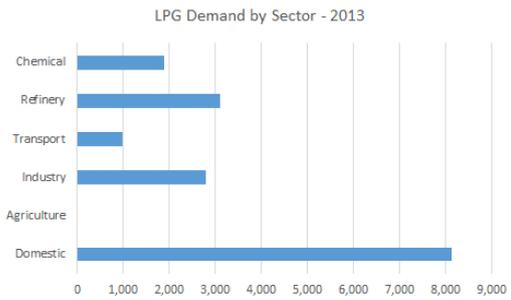
Other Notes

DT February 2015

## Japan



- Mature market - mainly Domestic
- Japanese standards used for design etc.
- Cylinder population approx. 40m
- 5 years requalification for steel cylinders ...
- ... then every 5 yrs < 20 yrs (then every 2 yrs)
- Use of composites only just approved
- 3 years for composite cylinders ...
- ... then every 3 years < 15 years (withdrawn)
- Valves are repaired if possible
- Few cylinders scrapped during life time

**Background to this survey - Apart from gathering information on the requalification of LPG cylinders, the survey also seeks to include any statutory requirements for the mandatory withdrawal of cylinders from the market based on age, together with disposal procedures. Where possible, the manufacturing standards and recommended surface coating requirements for cylinders will be included. Any recommendations regarding the cylinder valve manufacturing standards will also be included together with any valve replacement periods and reconditioning procedures for the valve, if they exist.**

<b>COUNTRY</b>	JAPAN		<b>NAME &amp; CONTACT DETAILS</b>	MAKOTO ARAHATA kqmb019@ybb.ne.jp						
What is the cylinder design code (e.g. ISO, DOT, local code, etc.)?	(Japanese Standards) High Pressure Gas Law, The Container Safety Regulations									
What is the cylinder requalification code (e.g. DOT, local code, etc.)?	The Container Safety Regulations									
Describe the paint finish?	Hydrogen for example, the outersurface of the container should be painted in red. Oxygen in black, Carbon di-oxide in Green, Chlorine in yellow, Ammonia in white, Acetylene in brown. Except for the above, color of cylinders are not regulated basically as far as the surface of the cylinder is painted less than 50% when the cylinder is painted in one of the above colors.									
What is the initial requalification period for a cylinder (years)?	5 years for 20kg or more, 6 years for less 20kg	Does the valve get reconditioned?	YES (US\$) 7 USD, but not fixed	NO	How are cylinders scrapped?					
What is the subsequent requalification period for a cylinder (years)?	After 20 years for all cylinders, every 2 years.	Are cylinders scrapped based on age?	Yes (years) Yes, 20 years is an indication	No	pressing cylinders flat, cutting into two or making at least 3 holes with 5mm diameter,					
What is the approx cost of requalifying a cylinder (US\$)?	abt.20USD for 20kg cylinder but for 50kg, 25% higher	Is the valve always replaced when the cylinder is requalified?	YES (US\$) 7USD/valve	NO						
What is the cylinder size profile in the market?	How many active cylinders are there in the market of this size?	What is the typical cylinder material? (steel, composite, etc.)?	What is the typical cylinder turn-around time (i.e. refills per year)?	What is the cylinder scrappage rate per year for this cylinder size?	How many cylinders are scrapped during requalification?	How many cylinders are scrapped during routine inspection?	What valve type is fitted to the cylinder (e.g. POL, 22mm compact etc)?	Is a PRV fitted?	What is the valve design code/standard?	
<5 litres	2millions	steel	unknown	1.8 millions recently	unknown	unknown	POL except for clip on valves with cylinders of 10kg less.	yes	KHK S0126	
5 litres to <16 litres		steel	unknown		unknown	unknown	unknown	yes	KHK S0126	
16 litres to <26 litres		steel	unknown		unknown	unknown	unknown	yes	KHK S0126	
26 litres to <52 litres		16millions	steel		once a month	unknown	unknown	POL	yes	KHK S0126
above 52 litres		22 millions	steel		once a month	unknown	unknown	POL	yes	KHK S0126

**Other Notes**

We have the following LPG cylinders:  
 50kg 50%  
 30kg 5%  
 20kg 40%  
 10kg, 8kg, 5kg, 2kg 5% Note the above information refers to steel cylinders. For composite cylinders there is a different practice:  
 Composite cylinders will now be allowed to be used in Japan and have a different mandatory condition for requalification  
 - The initial requalification period is 3 years and the subsequent requalification period is every 3 years  
 - The composite cylinders shall not be used after 15 years

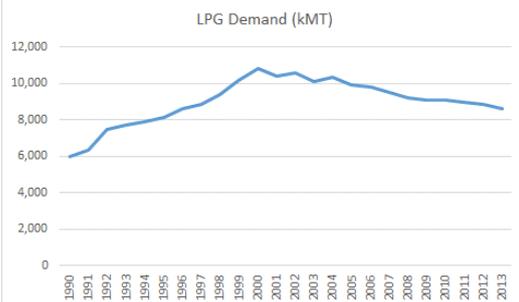
What are the main reasons for scrapping cylinders?	As a % of total scrapped cylinders (in a typical year)
a. Corrosion	almost non
b. Dents	almost non
c. Welding defects i.e. pinhole	almost non
d. Bung or necking defects	almost non
e. Collar/footring defects	almost non
f. Mandatory Scrappage	almost non
g. Others (please specify)	20years, almost 100%

DT February 2015

## Mexico

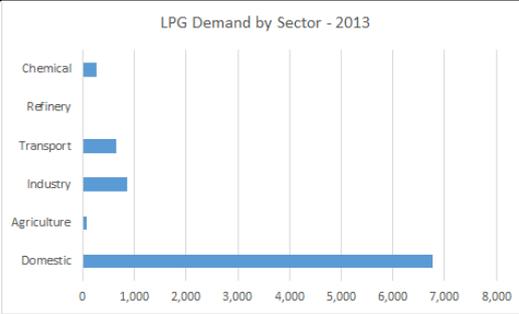


- Mature market – Domestic demand dominates
- NOM-008-SESH/SCFI-2010 used for design etc.
- Cylinder population approx. 25m
- 1 year requalification for steel cylinders
- No further requirement to requalify but ...
- ... typically 5-10% are repaired every year
- Reliant on inspection regime before every refill
- Cylinders withdrawn after 5 years



LPG Demand (kMT)

Year	Demand (kMT)
1990	6,000
1991	6,500
1992	7,000
1993	7,500
1994	8,000
1995	8,500
1996	9,000
1997	9,500
1998	10,000
1999	10,500
2000	11,000
2001	10,500
2002	10,000
2003	10,500
2004	10,000
2005	10,000
2006	10,000
2007	10,000
2008	9,500
2009	9,000
2010	9,000
2011	9,000
2012	9,000
2013	9,000



LPG Demand by Sector - 2013

Sector	Demand (kMT)
Chemical	~100
Refinery	~100
Transport	~1,000
Industry	~1,000
Agriculture	~100
Domestic	~7,000

**Background to this survey - Apart from gathering information on the requalification of LPG cylinders, the survey also seeks to include any statutory requirements for the mandatory withdrawal of cylinders from the market based on age, together with disposal procedures. Where possible, the manufacturing standards and recommended surface coating requirements for cylinders will be included. Any recommendations regarding the cylinder valve manufacturing standards will also be included together with any valve replacement periods and reconditioning procedures for the valve, if they exist.**

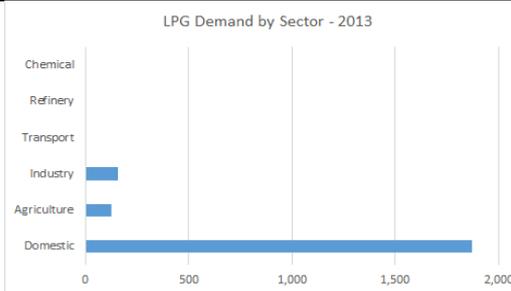
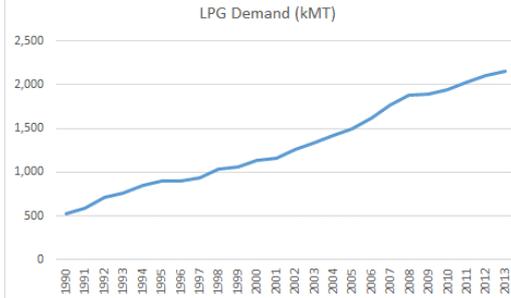
<b>COUNTRY</b>	MEXICO	<b>NAME &amp; CONTACT DETAILS</b>	Luis Landeros Martinez luis.landeros@adg.org.mx
What is the cylinder design code (e.g. ISO, DOT, local code, etc.)	NOM-008-SESH/SCFI-2010		
What is the cylinder requalification code (e.g. DOT, local code, etc.)?	NOM-008-SESH/SCFI-2010		
Describe the paint finish?	Paint layer, polyester bakeable powder. Electrostatically applied. 50 to 200 microns of thickness, covering the cylinder support base and the interior of the protection collar. In this way, the cylinder minimum resistance to UV light and salt corrosion is 350 hours.		
What is the initial requalification period for a cylinder (years)?	Each 30 days	Does the valve get reconditioned?	YES (US\$) <input type="checkbox"/> NO <input type="checkbox"/> Needs to be conf.
What is the subsequent requalification period for a cylinder (years)?	Each 30 days	How are cylinders scrapped?	Compressed Gas Cylinder Procedure by punching top and bottom, after confirming the cylinder is empty of gas and not pressurized.
What is the approx cost of requalifying a cylinder (US\$)?	The cost of th hydrostatic test needs to be conf.	Are cylinders scrapped based on age?	Yes (years) <input type="checkbox"/> No <input type="checkbox"/> 5 years
Is the valve always replaced when the cylinder is requalified?	YES (US\$) <input type="checkbox"/> NO <input type="checkbox"/>		
What is the cylinder size profile in the market?	How many active cylinders are there in the market of this size?	What is the cylinder material? (steel, composite, etc.)?	What is the typical cylinder turn-around time (i.e. refills per year)?
<5 litres			
5 litres to < 15 litres			
16 litres to < 26 litres			
26 litres to < 52 litres			
above 52 litres	24,500,000		
What are the main reasons for scrapping cylinders?	As a % of total scrapped cylinders (in a typical year)	<b>Other Notes</b>	
a. Corrosion		First, we would like to understand what you mean by "requalification" in order to provide you with more accurate and useful information. 1. By "requalification" you may refer to the certification process after the cylinder is produced, and to periodical mandatory recertifications so cylinders can remain active in the market. In this case, the official standard of cylinder production NOM-008-SESH/SCFI-2010, Cylinders to contain LP Gas states there are 2 ways to certificate cylinders: a) Periodical verifications to manufacturers. The validation is six months. b) The National System to Ensure Quality in Production Processes. The validation is one year. Once the certification is obtained, the cylinders can be used to contain and transport LP gas. There is not necessary to recertificate them. It is important to note that the 30 days I mentioned in the survey refer to the approximate time the cylinder is refilled by the distributor. At this stage, they perform a visual revision prior to fill it and in the middle of the filling process itself. If the cylinder seems to be at imminent risk or actually leaking or outflowing, the cylinder is recalled to be repaired or scrapped. 2. By "requalification" you may also refer to repair the cylinder when it is damaged. This is a non-regulated activity undertaken by distributors and cylinder repairers. The ball-park figure of repaired cylinders would be around 5-10% per year, out of the 15 million cylinders in national market. Regarding to the replacement of cylinders, it is important to notice the fact that, in 2011, the Ministry of Energy created FIRAGAS, a private trusteeship for the replenishment of assets of LPG distribution industry. Nowadays, FIRAGAS involves 90% of mexican LPG distributors and with its help, within the last three years 3.5 million cylinders have been replaced all over the country. (note DT replied and waiting on response)	
b. Dents			
c. Welding defects i.e. pinhole			
d. Bung or necking defects			
e. Collar/footing defects			
f. Mandatory Scrappage			
g. Others (please specify)			

DT February 2015

Morocco



- Steadily growing market - mainly Domestic
- Local codes used for design etc
- Cylinder population approx. 45m
- 10 years requalification for steel cylinders ...
- ... then every 10 years
- High rates of rejection during requalification
- Bung and neck ring failures account for 30%
- Valves are not repaired in Morocco
- Cylinders are withdrawn from the market after 40 years



Background to this survey - Apart from gathering information on the requalification of LPG cylinders, the survey also seeks to include any statutory requirements for the mandatory withdrawal of cylinders from the market based on age, together with disposal procedures. Where possible, the manufacturing standards and recommended surface coating requirements for cylinders will be included. Any recommendations regarding the cylinder valve manufacturing standards will also be included together with any valve replacement periods and reconditioning procedures for the valve, if they exist.

COUNTRY	MOROCCO	NAME & CONTACT DETAILS	a.benbekhaled@salamgaz.ma						
What is the cylinder design code (e.g. ISO, DOT, local code, etc.)?	Local Code								
What is the cylinder requalification code (e.g. DOT, local code, etc.)?	Local Code : - Dahir du 18 Joumada 11374 ( 12 Janvier 1955 ) portant reglement sur les appareils a pression de gaz - Arrêté du Ministère de l'Energie et des Mines N° 941-07 du 11 mai 2007								
Describe the paint finish?	Shot Blasting, Metallizing and lacquered Glycerophthalic with 2 coats painting								
What is the initial requalification period for a cylinder (years)?	10 years	Does the valve get reconditioned?	YES (US\$) <input type="checkbox"/>	NO <input checked="" type="checkbox"/>					
What is the subsequent requalification period for a cylinder (years)?	10 years	How are cylinders scrapped?	Crushing and breaking bottles with hydraulic press						
What is the approx cost of requalifying a cylinder (US\$)?	3	Are cylinders scrapped based on age?	Yes (years) <input type="checkbox"/>	No <input type="checkbox"/>					
Is the valve always replaced when the cylinder is requalified?	YES (US\$) <input type="checkbox"/>		40 years						
	NO <input checked="" type="checkbox"/>								
What is the cylinder size profile in the market?	How many active cylinders are there in the market of this size?	What is the cylinder material? (steel, composite, etc.)?	What is the typical cylinder turn-around time (i.e. refills per year)?	What is the cylinder scrappage rate per year for this cylinder size?	How many cylinders are scrapped during requalification?	How many cylinders are scrapped during routine inspection?	What valve type is fitted to the cylinder (e.g. POL, 22mm compact etc)?	Is a PRV fitted?	What is the valve design code/standard?
<5 litres		STEEL (BS2 - Norme NF A 36-211)					22 mm	Non	Norme Marocaine NM 14.2.002
5 litres to <16 litres	21,200,000		6	0.20%	26.10%	0.10%			
16 litres to <26 litres									
26 litres to <52 litres	23,100,000		6	0.10%	73.60%	0.10%			
above 52 litres	90,000		2	0.10%	0.30%	0.10%	Standard GPLEN 13153		
Other Notes									
What are the main reasons for scrapping cylinders?	As a % of total scrapped cylinders (in a typical year)								
a. Corrosion	10%								
b. Dents									
c. Welding defects i.e. pinhole	10%								
d. Bung or neckring defects	30%								
e. Collar/footering defects									
f. Mandatory Scrappage	50%								
g. Others (please specify)									

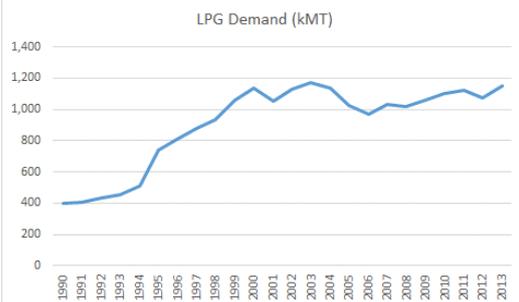
DT February 2015

# Appendix Nine

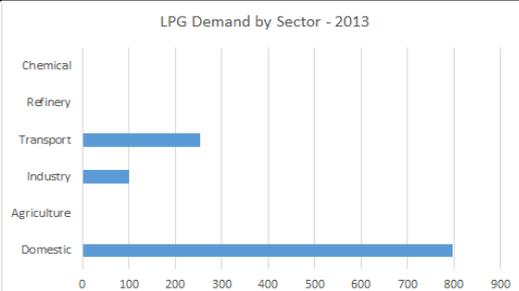
## Philippines



- Growth slowing - mainly Domestic
- Variety of valves used (POL, camping, compact)
- PNS 03-1-2014 used for cylinder design etc
- Cylinder population approx. 16m
- 10 years requalification for steel cylinders ...
- ... then every 5 years
- Some companies scrap after 10 years
- Scrapping of cylinders mainly due to corrosion
- Destruction of cylinders is by crushing or cutting into small pieces



LPG Demand (kMT)



LPG Demand by Sector - 2013

**Background to this survey - Apart from gathering information on the requalification of LPG cylinders, the survey also seeks to include any statutory requirements for the mandatory withdrawal of cylinders from the market based on age, together with disposal procedures. Where possible, the manufacturing standards and recommended surface coating requirements for cylinders will be included. Any recommendations regarding the cylinder valve manufacturing standards will also be included together with any valve replacement periods and reconditioning procedures for the valve, if they exist.**

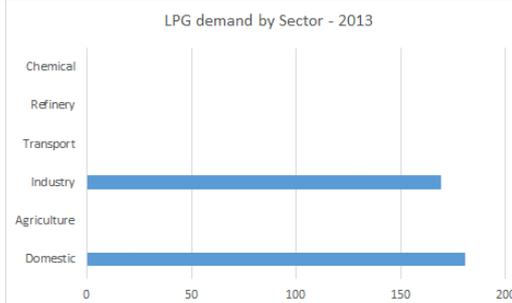
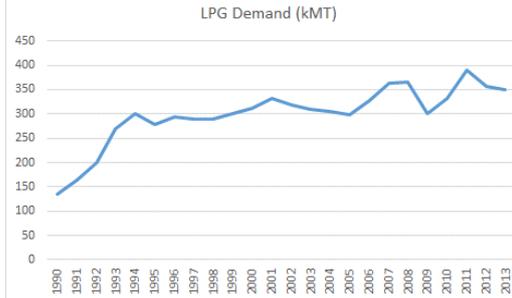
COUNTRY	PHILIPPINES	NAME & CONTACT DETAILS	MERCEDITA G. PASTRANA						
What is the cylinder design code (e.g. ISO, DOT, local code, etc.)	PNS 03 -1-2014								
What is the cylinder requalification code (e.g. DOT, local code, etc.)?	PNS 03-2-2014								
Describe the typical paint finish of cylinders?	HIGH BUILD EPOXY PAINT								
What is the initial requalification period for a cylinder (years)?	10								
What is the subsequent requalification period for a cylinder (years)?	5								
What is the approx cost of requalifying a cylinder (US\$)?	3.00								
Is the valve always replaced when the cylinder is requalified?	YES (US\$)	NO							
Does the valve get reconditioned?	YES (US\$)	NO							
What is the cylinder size profile in the market?	How many active cylinders are there in the market of this size?	How many of these cylinders are requalified each year?	What is the cylinder material? (steel, composite, etc.)?	What is the typical cylinder turn-around time (i.e. refills per year) for this cylinder size?	What is the cylinder scrappage rate per year for this cylinder size?	How many cylinders are scrapped during requalification?	How many cylinders are scrapped during routine inspection?	What valve type is fitted to the cylinder (e.g. POL, 22mm compact etc)?	What is the valve design code/standard?
2.7kg.	1.2 m	0.2m	steel	10	10%	5%	5%	camping valve	EN std
3kg to <9kg	0.2m	0.02m	steel	9	5%	3%	2%	pol valve	EN Std
9kg to <15kg	14.0m	1.8m	steel	8	15%	10%	5%	snap , bayonet, pol	EN Std
15kg to <22 kg	0.2m	0.012m	steel	5	5%	3%	2%	pol valve	UL
22 kg and above (incl 45/50kg)	0.4m	0.02m	steel	7	5%	4%	1%	pol valve	UL
Total	16m	2.052			5-10%	10%	10%		
Is there a mandatory scrappage of cylinders based on age?	Yes (years)	No							
	10 yrs for some companies	No generally							
What are the main reasons for scrapping cylinders?	As a % of total scrapped cylinders (in a typical year)	How are the cylinders scrapped?	By crushing using hydraulic press or cutting into small pcs.						
a. Corrosion	70%								
b. Dents	15%								
c. Welding defects i.e. pinhole	5%								
d. Bung or neckring defects	5%								
e. Collar/footring defects	5%								
f. Mandatory Scrappage	0								
g. Others (please specify)	0								

DT 19/02/15

# South Africa



- Steady but slowing growth
- Split between Industry and Domestic
- Cylinder population probably around 2m (est.)
- No industry regulations exist for requalification
- Major players 'following own policies'
- Cylinders checked when valves are replaced



Background to this survey - Apart from gathering information on the requalification of LPG cylinders, the survey also seeks to include any statutory requirements for the mandatory withdrawal of cylinders from the market based on age, together with disposal procedures. Where possible, the manufacturing standards and recommended surface coating requirements for cylinders will be included. Any recommendations regarding the cylinder valve manufacturing standards will also be included together with any valve replacement periods and reconditioning procedures for the valve, if they exist.

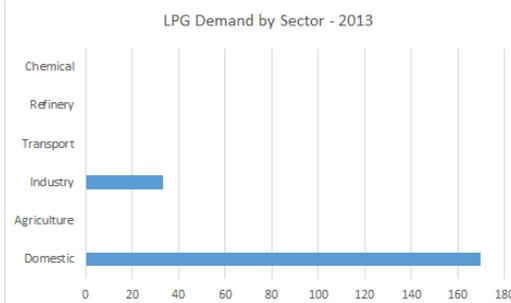
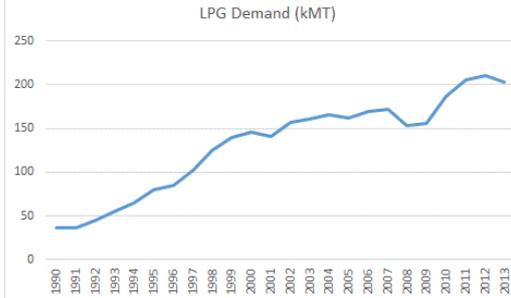
COUNTRY		South Africa	NAME & CONTACT DETAILS		SALPGSA				
What is the cylinder design code (e.g. ISO, DOT, local code, etc.)?									
What is the cylinder requalification code (e.g. DOT, local code, etc.)?									
Describe the paint finish?									
What is the initial requalification period for a cylinder (years)?	This is left to the companies		Does the valve get reconditioned?	YES (US\$)	NO	How are cylinders scrapped?			
What is the subsequent requalification period for a cylinder (years)?	This is left to the companies								
What is the approx cost of requalifying a cylinder (US\$)?			Are cylinders scrapped based on age?	Yes (years)	No				
Is the valve always replaced when the cylinder is requalified?	YES (US\$)	NO							
What is the cylinder size profile in the market?	How many active cylinders are there in the market of this size?	What is the cylinder material? (steel, composite, etc.)?	What is the typical cylinder turn-around time (i.e. refills per year)?	What is the cylinder scrappage rate per year for this cylinder size?	How many cylinders are scrapped during requalification?	How many cylinders are scrapped during routine inspection?	What valve type is fitted to the cylinder (e.g. PCL, 22mm compact etc)?	Is a PRV fitted?	What is the valve design code/standard?
<5 litres									
5 litres to < 16 litres									
16 litres to < 26 litres									
26 litres to < 52 litres									
above 52 litres									
What are the main reasons for scrapping cylinders?		As a % of total scrapped cylinders (in a typical year)	Other Notes						
a. Corrosion			...After exhaustive enquiries into this I have finally had it confirmed that there is no specified time limit within which LPGas cylinders have to be checked/tested. Most cylinder types have set time periods as can be seen from the table attached. However, LPGas cylinders are exempt – as can be seen in Note B. We have been advised that the individual (commercial) cylinder owning companies (Afrox, Totalgaz, Oryx Energies etc.) do have their own cylinder maintenance regimes which are probably quite similar (to each other). However, we are not aware of what these are. Some companies do check and test their cylinders as and when they have to replace the cylinder valves and recently it was agreed that Pressure Relief Valves have to be checked and replaced on a regular basis but that there would be a 'grace' period of 10 years before this would be fully instituted. More than that I have been unable to ascertain. Apologies that the information is so limited but that is where our industry is at present...						
b. Dents									
c. Welding defects i.e. pinhole									
d. Bung or neckring defects									
e. Collar/footring defects									
f. Mandatory Scrappage									
g. Others (please specify)									

DT February 2015

Sri Lanka



- Growing market - mainly Domestic
- 22mm Compact valve used (to EN13152)
- ISO 4706 & SLS 1178 used for cylinder design etc.
- Cylinder population approx. 2m
- Zinc metallisation applied to cylinders
- 10 years requalification for steel cylinders ...
- ... then every 10 years
- Cylinders not scrapped on age but weight loss
- Valves are not reconditioned
- Scrapping of cylinders mainly due to corrosion/dents (80%)
- Crushed and holes punched through



Background to this survey - Apart from gathering information on the requalification of LPG cylinders, the survey also seeks to include any statutory requirements for the mandatory withdrawal of cylinders from the market based on age, together with disposal procedures. Where possible, the manufacturing standards and recommended surface coating requirements for cylinders will be included. Any recommendations regarding the cylinder valve manufacturing standards will also be included together with any valve replacement periods and reconditioning procedures for the valve, if they exist.

COUNTRY		Sri Lanka		NAME & CONTACT DETAILS		A.G Mylvaganam (Myles)			
What is the cylinder design code (e.g. ISO, DOT, local code, etc.)?		ISO 4706 & SLS 1178 (Sri Lanka Standard) Mandatory For Import Of Cylinders To Sri Lanka.							
What is the cylinder requalification code (e.g. DOT, local code, etc.)?		DOT							
Describe the paint finish?		Grit Blasted To SA 2 1/2, Thereafter Zinc Coated 40Microns. Area Foot Ring Zinc Coated To 100Microns. Final Paint Finish Powder Painted to 40Microns							
What is the initial requalification period for a cylinder (years)?	10 years	Does the valve get reconditioned?	YES (US\$) NA	NO NO	How are cylinders scrapped?	Valve removed and thereafter Cylinder is Crushed With Hydraulic Press and Punched Through			
What is the subsequent requalification period for a cylinder (years)?	10 years	Are cylinders scrapped based on age?	Yes (years)	No NO					
What is the approx cost of requalifying a cylinder (US\$)?	US\$ 2.50								
Is the valve always replaced when the cylinder is requalified?	YES (US\$) NO NO								
What is the cylinder size profile in the market?	How many active cylinders are there in the market of this size?	What is the cylinder material? (steel, composite, etc.)?	What is the typical cylinder turn-around time (i.e. refills per year)?	What is the cylinder scrappage rate per year for this cylinder size?	How many cylinders are scrapped during requalification?	How many cylinders are scrapped during routine inspection?	What valve type is fitted to the cylinder (e.g. POL, 22mm compact etc)?	Is a PRV fitted?	What is the valve design code/standard?
<5 litres									
5 litres to < 16 litres									
16 litres to < 28 litres									
28 litres to < 52 litres	2,000,000	Steel		Approx 0.8 to 1%	Approx 1.5%	Less than 1%	20mm Compact	Yes	EN 13152
above 52 litres	90,000	Steel		Approx 1%	Approx 1.3%	Less than 1%	20mm Compact	Yes	EN 13152

What are the main reasons for scrapping cylinders?	As a % of total scrapped cylinders (in a typical year)
a. Corrosion	60%
b. Dents	20%
c. Welding defects i.e. pinhole	0%
d. Bung or neckring defects	0%
e. Collar/footring defects	10%
f. Mandatory Scrappage	6%
g. Others (please specify)	2%

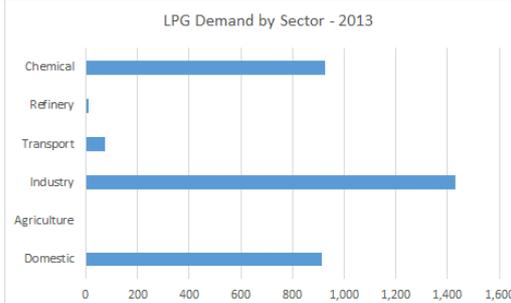
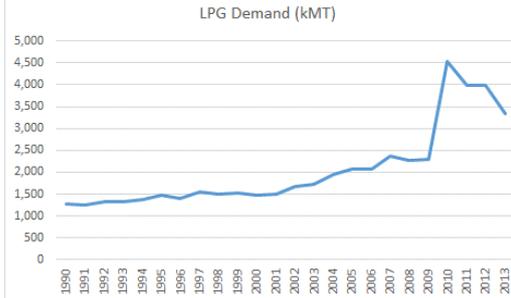
Other Notes  
Cylinders are scrapped based on weight loss

DT February 2015

Taiwan



- Growing market – demand across all sectors
- POL used extensively across cylinder business
- Local codes used for design etc
- Cylinder population over 12m
- 5 years requalification for steel cylinders ...
- ... then 4 yrs, 3 yrs, 2 yrs
- Cost of requalifying around US\$12-15
- Cylinders scrapped when they reach 30 years
- Valves are not reconditioned in Taiwan
- Scrapping of cylinders mainly due to corrosion (80%)



Background to this survey - Apart from gathering information on the requalification of LPG cylinders, the survey also seeks to include any statutory requirements for the mandatory withdrawal of cylinders from the market based on age, together with disposal procedures. Where possible, the manufacturing standards and recommended surface coating requirements for cylinders will be included. Any recommendations regarding the cylinder valve manufacturing standards will also be included together with any valve replacement periods and reconditioning procedures for the valve, if they exist.

COUNTRY	Taiwan	NAME & CONTACT DETAILS	Mr.Henry Tsai Email: Henry@mygas.com.tw
What is the cylinder design code (e.g. ISO, DOT, local code, etc.)?	N.F.A. Cylinder Construction Design Code (Taiwan Local Code)		
What is the cylinder requalification code (e.g. DOT, local code, etc.)?	NFA (TW Local code)		
Describe the paint finish?	Currently all steel cylinder(s) must finished with grey color, no specified type of paint required, nor the Zinc metalisation.		
What is the initial requalification period for a cylinder (years)?	5 years	Does the valve get reconditioned?	YES (US\$) NO
What is the subsequent requalification period for a cylinder (years)?	4 years **	How are cylinders scrapped?	All disqualified cylinders during the requalification process, will subject to be scrapped by the requalification agency directly. The owner of cylinder will not able to retrieved the actual scrapped.
What is the approx cost of requalifying a cylinder (US\$)?	USD 12 ~ 15/ ea	Are cylinders scrapped based on age?	Yes (years) No 30 yrs
Is the valve always replaced when the cylinder is requalified?	YES (US\$) NO 5/ ea		

What is the cylinder size profile in the market?	How many active cylinders are there in the market of this size?	What is the cylinder material? (steel, composite, etc.)?	What is the typical cylinder turn-around time (i.e. refills per year)?	What is the cylinder scrappage rate per year for this cylinder size?	How many cylinders are scrapped during requalification?	How many cylinders are scrapped during routine inspection?	What valve type is fitted to the cylinder (e.g. POL, 22mm compact etc)?	Is a PRV fitted?	What is the valve design code/standard?
<5 litres	N/A	N/A					N/A	N/A	N/A
5 litres to < 16 litres 4kg	1769282	steel	4	8%	113234	n/a	POL	yes	CNS1324
16 litres to < 26 litres 10kg	104793	steel	5	2%	6707	n/a	POL	yes	CNS1324
26 litres to < 52 litres 20kg	9270026	steel	7	85%	593282	n/a	POL	yes	CNS1324
above 52 litres 50kg	530621	steel	6	5%	33960	n/a	POL	yes	CNS1324

What are the main reasons for scrapping cylinders?	As a % of total scrapped cylinders (in a typical year)
a. Corrosion	78
b. Dents	1
c. Welding defects i.e. pinhole	5
d. Bung or necking defects	1
e. Collar/footing defects	10
f. Mandatory Scrappage	5
g. Others (please specify)	

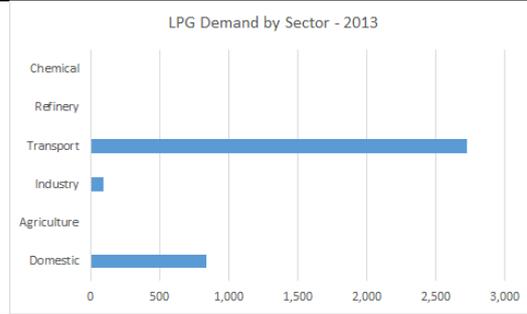
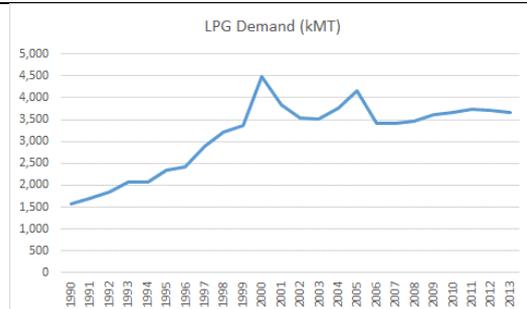
Other Notes  
\*\* After initial qualification for 5 years, then follow that will be 4, 3, 2 years.

DT February 2015

## Turkey



- Mature market - mainly Autogas
- Variety of valves used across cylinder business
- EN 1440 (TS EN 1440) used for cylinder design etc.
- Cylinder population over 50m
- 10 years requalification for steel cylinders ...
- ...then every 10 years
- No scrapping based on age
- Valves generally replaced when requalifying
- No reconditioning of valves in Turkey
- Scrapping of cylinders mainly due to dents (80%)



Background to this survey - Apart from gathering information on the requalification of LPG cylinders, the survey also seeks to include any statutory requirements for the mandatory withdrawal of cylinders from the market based on age, together with disposal procedures. Where possible, the manufacturing standards and recommended surface coating requirements for cylinders will be included. Any recommendations regarding the cylinder valve manufacturing standards will also be included together with any valve replacement periods and reconditioning procedures for the valve, if they exist.

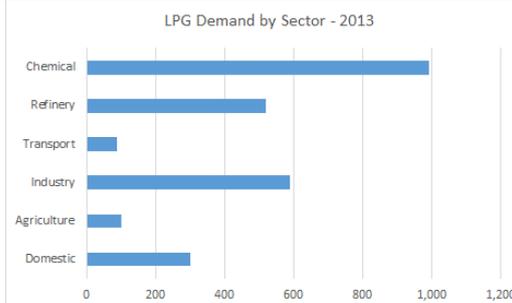
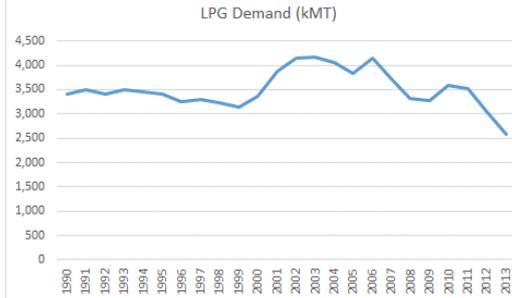
COUNTRY: TURKEY		NAME & CONTACT DETAILS: ALI KIZILKAYA	
What is the cylinder design code (e.g. ISO, DOT, local code, etc.)?		It varies: TS EN 1442, EN 13322, EN 14140, ISO 4706, ISO 22991, BS 5045, DOT 4BA, DOT 4BW, and local specifications	
What is the cylinder requalification code (e.g. DOT, local code, etc.)?		EN 1440 (TS EN 1440)	
Describe the paint finish?		Zinc coating provides a continuous, impervious metallic barrier that does not allow moisture to contact the steel. So, it provides the most effective way of protecting steel against corrosion. Shot blasting cleans the surface, increases the surface area and provides a profile into which the surface will key for coating materials.	
What is the initial requalification period for a cylinder (years)?	10	Does the valve get reconditioned?	YES (US\$) / NO
What is the subsequent requalification period for a cylinder (years)?	10	How are cylinders scrapped?	EN 1439 / TS EN 1439
What is the approx cost of requalifying a cylinder (US\$)?	US\$	Are cylinders scrapped based on age?	Yes (years) / No
Is the valve always replaced when the cylinder is requalified?	YES (US\$) / NO	5-40US\$	
What is the cylinder size profile in the market?	How many active cylinders are there in the market of this size?	What is the cylinder material?	What is the typical cylinder turn-around time (i.e. refills per year)?
<5 litres (4,95L)		welded steel	
5 litres to <16 litres		welded steel	
16 litres to <26 litres		welded steel	
26 litres to <52 litres (26,2L)		welded steel	
above 52 litres (26L & 108L)		welded steel	
Nearly 50 million cylinders being in market			
What are the main reasons for scrapping cylinders?	As a % of total scrapped cylinders (in a typical year)*	Other Notes	
a. Corrosion	1	Design data can be permanently marked on the valve boss, upper body part, footing or shroud. LPG safety messages are attached to plates, stickers or sleeves to the cylinder surface. Companies usually have their brand name embossed on the cylinder. Key filling activities include: emptying dealer vehicles, separation of salvage/CRU (cylinder renewal unit), washing, dyeing, filling of cylinders, control of tare, removal of and dealing with cylinders' throat tyre, control of leakage, capping, the installation of the cylinders to the distributors' vehicles, the testing process to the cylinders. LPG cylinders supplied from filling plant are stored in dealer depots and delivered to customers with light commercial vehicles. Each time the dealers visit customers, the empty cylinders are simply exchanged for full ones. The empty cylinders collected from customers stored in dealer depots until they return to filling plant. Although there wasn't any huge negative impact affecting cylinders, their life is depreciated in each step where the cylinders are handled. In Turkey, LPG cylinders are single-handedly sold by licenced dealers in designated territories and in rare cases direct sales to public are made by the company sub-branches. Time span of cylinders in sales process varies according to dealer choice of transportation/storage, size and area of use of cylinders in addition to consumer use and habits. In average, a residential cylinder is used in a 2 months period. Return time of other types of cylinders (small size, commercial, industrial and cylinders for forklift trucks) differ considerably due to extensive area of use therefore no accurate estimation can be given. In addition to active cylinders, idle cylinders should also be taken into account. At each arrival of cylinders to our facilities, test dates, salvage control and whether the repair needs are checked. After the controls, salvage cylinders are sent salvage facility, cylinders which need test are placed between testing cylinders, and cylinders which need repair are sent to the CRU. After the controls, safe cylinders are presented to the filling line and are subjected to washing and dyeing processes. An LPG cylinder must be designed in conformity with the requirements of the design standard considering usage of it. Cylinder body thickness and bursting pressure must not be less than the calculated values which defined in design standard. Another point to take into account is that cylinder components such as valve guard and footing should be user friendly and do not have sharp corner. LPG cylinders must be design and selected considering suitability for use. The cylinders from 34 litres to 120 litres are favoured by industrial users as home users prefer between 5 litres and 27,2 litres. Hydrostatic test are made in filling plants.	
b. Dents	80		
c. Welding defects (i.e. pinhole)	1		
d. Bung or necking defects	1		
e. Collar/footing defects	2		
f. Mandatory Scrapping	5		
g. Other (please specify)	10		
* It gives some idea about LPG market - it is not a certain number			
DT February 2015			

# Appendix Fourteen

## United Kingdom



- Mature market in decline
- EN1442; 2006 + A1:2008 used for design etc.
- Various valves used across cylinder business
- Cylinder population approx. 20m
- 15 years requalification for steel cylinders
- 10 years for Composites
- ... then repeating over same periods
- There is no scrappage based on age in the UK
- Valves are not repaired
- Scrapping of cylinders mainly due to corrosion



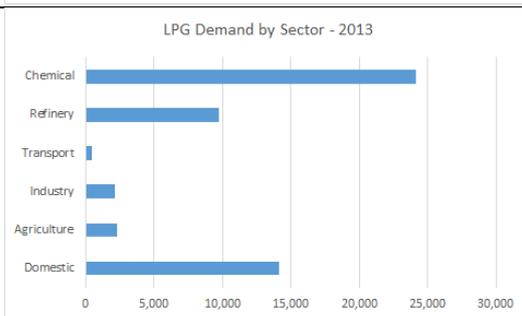
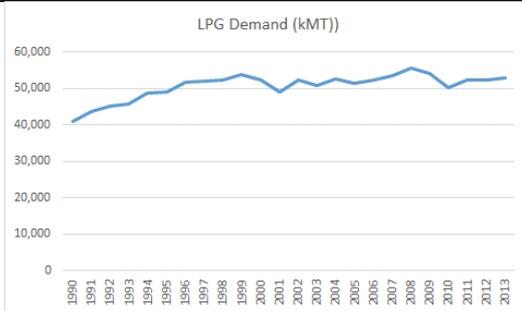
Background to this survey - Apart from gathering information on the requalification of LPG cylinders, the survey also seeks to include any statutory requirements for the mandatory withdrawal of cylinders from the market based on age, together with disposal procedures. Where possible, the manufacturing standards and recommended surface coating requirements for cylinders will be included. Any recommendations regarding the cylinder valve manufacturing standards will also be included together with any valve replacement periods and reconditioning procedures for the valve, if they exist.

COUNTRY	UK	NAME & CONTACT DETAILS	Richard Hakeem - UKLPG																						
What is the cylinder design code (e.g. ISO, DOT, local code, etc.)?	Cylinders are manufactured to EN1442; 2006 + A1:2008																								
What is the cylinder requalification code (e.g. DOT, local code, etc.)?	EN1440;2008+A1:2012																								
Describe the paint finish?	Zinc sprayed and then powder Coated or coated with two pack epoxy paint																								
What is the initial requalification period for a cylinder (years)?	15 years for steel and 10 years for compo	Does the valve get reconditioned?	YES (US\$) NO no																						
What is the subsequent requalification period for a cylinder (years)?	as above	How are cylinders scrapped?	In accordance with BS EN 12816:2010																						
What is the approx cost of requalifying a cylinder (US\$)?		Are cylinders scrapped based on age?	Yes (years) No no																						
Is the valve always replaced when the cylinder is requalified?	YES (US\$) NO YES (US\$)																								
What is the cylinder size profile in the market?	How many active cylinders are there in the market of this size?	What is the cylinder material? (steel, composite, etc.)?	What is the typical cylinder turn-around time (i.e. refills per year)?	What is the cylinder scrappage rate per year for this cylinder size?	How many cylinders are scrapped during requalification?	How many cylinders are scrapped during routine inspection?	What valve type is fitted to the cylinder (e.g. POL, 22mm compact etc)?	Is a PRV fitted?	What is the valve design code/standard?																
<5 litres		N/A					N/A	N/A	UKLPG COP15 part1/2 & BS EN 14129																
5 litres to < 16 litres	2 Million	Steel and Composite					20/21mm Butane / UK POL	yes	UKLPG COP15 part1/2 & BS EN 14129																
16 litres to < 26 litres	3 Million	Steel and Composite					Propane POL 5/8 LH	yes	UKLPG COP15 part1/2 & BS EN 14129																
26 litres to < 52 litres	15 Million	Steel					Propane POL 5/8 LH / ACME FLT	yes	UKLPG COP15 part1/2 & BS EN 14129																
above 52 litres		Steel					Propane POL 5/8 LH	yes	UKLPG COP15 part1/2 & BS EN 14129																
<table border="1"> <tr> <td>What are the main reasons for scrapping cylinders?</td> <td>As a % of total scrapped cylinders (in a typical year)</td> </tr> <tr> <td>a. Corrosion</td> <td>85%</td> </tr> <tr> <td>b. Dents</td> <td>3</td> </tr> <tr> <td>c. Welding defects i.e. pinhole</td> <td>&lt;1%</td> </tr> <tr> <td>d. Bung or necking defects</td> <td></td> </tr> <tr> <td>e. Collar/footring defects</td> <td></td> </tr> <tr> <td>f. Mandatory Scrappage</td> <td></td> </tr> <tr> <td>g. Others (please specify)</td> <td></td> </tr> </table>										What are the main reasons for scrapping cylinders?	As a % of total scrapped cylinders (in a typical year)	a. Corrosion	85%	b. Dents	3	c. Welding defects i.e. pinhole	<1%	d. Bung or necking defects		e. Collar/footring defects		f. Mandatory Scrappage		g. Others (please specify)	
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e. Collar/footring defects																									
f. Mandatory Scrappage																									
g. Others (please specify)																									
<p>DT February 2015</p> <p><b>Other Notes</b> It was difficult to obtain information on scrappage rate per cylinder size as these stats are not collated collectively. Companies were not willing to share cost of requalification as they deemed this commercially sensitive.</p>																									

## United States



- Mature market - mainly Chemicals/Domestic
- DOT used for cylinder design etc.
- Cylinder population over 90m
- 12 years requalification for steel cylinders
- ... then it varies (e.g. visual 5 yrs, hydro 7 yrs)
- Valves are not repaired in the USA
- Information difficult to obtain



Background to this survey - Apart from gathering information on the requalification of LPG cylinders, the survey also seeks to include any statutory requirements for the mandatory withdrawal of cylinders from the market based on age, together with disposal procedures. Where possible, the manufacturing standards and recommended surface coating requirements for cylinders will be included. Any recommendations regarding the cylinder valve manufacturing standards will also be included together with any valve replacement periods and reconditioning procedures for the valve, if they exist.

COUNTRY		United States		NAME & CONTACT DETAILS		Bruce Swiecicki, NPGA, bswiecicki@npga.org			
What is the cylinder design code (e.g. ISO, DOT, local code, etc.)?									
DOT									
What is the cylinder requalification code (e.g. DOT, local code, etc.)?									
DOT									
Describe the paint finish?									
Any light, reflecting color is permitted. Most are painted white.									
What is the initial requalification period for a cylinder (years)?		12		Does the valve get reconditioned?		YES (US\$) NO			
				No, but it may be replaced.					
What is the subsequent requalification period for a cylinder (years)?		Varies based on type of requalification. Visual is 5 years, proof pressure hydro is 7 years and volumetric expansion hydro is 12 years.							
What is the approx cost of requalifying a cylinder (US\$)?		Not known.		Are cylinders scrapped based on age?		Yes (years) No			
Is the valve always replaced when the cylinder is requalified?		YES (US\$) NO							
What is the cylinder size profile in the market?	How many active cylinders are there in the market of this size?	What is the cylinder material? (steel, composite, etc.)?	What is the typical cylinder turn-around time (i.e. refills per year)?	What is the cylinder scrappage rate per year for this cylinder size?	How many cylinders are scrapped during requalification?	How many cylinders are scrapped during routine inspection?	What valve type is fitted to the cylinder (e.g. POL, 22mm compact etc)?	Is a PRV fitted?	What is the valve design code/standard?
<5 litres	Information not known	Information not known	Information not known	Information not known	Information not known	Information not known	Information not known	Information not known	Information not known
5 litres to < 16 litres	Information not known	Information not known	Information not known	Information not known	Information not known	Information not known	Information not known	Information not known	Information not known
16 litres to < 26 litres	Information not known	Information not known	Information not known	Information not known	Information not known	Information not known	Information not known	Information not known	Information not known
26 litres to < 52 litres	Information not known	Information not known	Information not known	Information not known	Information not known	Information not known	Information not known	Information not known	Information not known
above 52 litres	Information not known	Information not known	Information not known	Information not known	Information not known	Information not known	Information not known	Information not known	Information not known
Other Notes									
The information requested on this survey would require lots of time to research and compile. Many companies would probably not divulge the number of cylinders they service because that is considered to be proprietary information.									
What are the main reasons for scrapping cylinders?		As a % of total scrapped cylinders (in a typical year)							
a. Corrosion		Not known							
b. Dents		Not known							
c. Welding defects i.e. pinhole		Not known							
d. Bung or necking defects		Not known							
e. Collar/footring defects		Not known							
f. Mandatory Scrappage		Not known							
g. Others (please specify)		Not known							

DT February 2015



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182 avenue Charles de Gaulle, 92200 Neuilly-sur-Seine, France

Tel: +33 1 78 99 13 30

[association@wlpga.org](mailto:association@wlpga.org)

[www.wlpga.org](http://www.wlpga.org)

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