



## Economic and Social Council

Distr.: General  
2 July 2015

Original: English

---

### Economic Commission for Europe

#### Inland Transport Committee

#### Working Party on the Transport of Dangerous Goods

#### Joint Meeting of the RID Committee of Experts and the Working Party on the Transport of Dangerous Goods

Geneva, 15-25 September 2015

Item 3 (a) of the provisional agenda

#### Proposals for amendment to RID/ADR/ADN: pending issues

### **Periodic inspection and test of some transportable refillable LPG steel cylinders**

**Transmitted by the European Liquefied Petroleum Gas Association  
(AEGPL) on behalf of the informal working group on alternative  
methods for periodic inspections<sup>1, 2</sup>**

---

<sup>1</sup> In accordance with the programme of work of the Inland Transport Committee for 2014–2015 (ECE/TRANS/240, para. 100, ECE/TRANS/2014/23, cluster 9, para.9.2).

<sup>2</sup> Circulated by the Intergovernmental Organisation for International Carriage by Rail (OTIF) under the symbol OTIF/RID/RC/2015/48.

*Summary*

- Executive summary:** This submission is the outcome of work of the “Working Group on Alternative Methods for Periodic Inspections ». It requests to introduce into RID/ADR:
- A general provision describing the requirements to create and propose an alternative method for periodic inspection of pressure receptacles.
  - The possibility of using a specific procedure for periodic inspection and testing of over-moulded liquefied petroleum gas (LPG) cylinders.
- Action to be taken:** To add a new sub-section 6.2.3.5.3
- To add a definition in 1.2.1, a special provision in 3.3.1 and a sub-section 6.2.3.5.4.
- To add EN16728 reference in table in sub-section 6.2.4.2 and to remove the exclusion of annex G for EN 1439:2008 in the table in item 11) of packing instruction P200.
- Related documents:** ECE/TRANS/WP.15/AC.1/138 and informal document INF.23 submitted at the spring 2015 session;
- ECE/TRANS/WP.15/AC.1/2014/48;
- Informal documents INF.5 and INF.52 submitted at the autumn 2014 session;
- ECE/TRANS/WP.15/AC.1/2014/31 and informal document INF.4 submitted at the spring 2014 session;
- Informal document INF.50 submitted by AEGPL and informal document INF.45 submitted by Germany at the autumn 2013 session;
- ECE/TRANS/WP.15/AC.1/2013/43 and its informal document INF. 6 submitted at the autumn 2013 session;
- Informal document INF.39 submitted at the spring 2013 session;
- ECE/TRANS/WP.15/AC.1/2013/16;
- Multilateral agreement M247;
- prEN16728, LPG equipment and accessories - Transportable refillable LPG cylinders other than welded and brazed steel cylinders: periodic inspection;
- EN 1440:2008 + A1:2012, LPG equipment and accessories. Periodic inspection of transportable refillable LPG cylinders.

## General

1. Over-moulded cylinders have a coated welded steel inner pressure receptacle over-moulded with a non-porous material, which is fully bonded to the pressure receptacle and whose integrity ensures the integrity of the metallic inner pressure receptacle. They are designed for carriage of LPG (UN1011, UN1965, UN1969 and UN1975). Due to their specific design, the pressure test and the external check of the pressure receptacle, required by RID/ADR in 6.2.1.6 a) and d) for the periodic inspection, are not applicable. An alternative way of inspecting the cylinders has been developed.

2. This subject has been already discussed during several previous sessions of the Joint Meeting, and general information has already been given in the previous working document ECE/TRANS/WP.15/AC.1/2014/48. At the autumn 2014 session of the Joint Meeting, it was decided to create a working group on alternative methods for periodic inspection.

3. The mandate given to the group was: “to examine alternative methods for the periodic inspection that guaranteed a safety level equivalent to that for the methods in 6.2.1.6.1 of RID/ADR on the basis of test results and risk assessment and to explore the possibility of a method combining tests for each cylinder individually and tests by sampling and statistical evaluation. The group would work in the first instance on the case of over-moulded LPG cylinders, and further on other cases.”.

4. As agreed, a first session took place in Paris on the 7 and 8 January 2015, in physical presence of Austria, France, Germany, Switzerland and AEGPL, but as well in virtual presence by conference call of Belgium and Spain.

5. During the session, AEGPL introduced the step by step study and the risk assessment that lead to the alternative method for over-moulded cylinders (OMCs), and the working group worked on a first wording for a proposal of amendment. Some pending points like for example database, ownership and random sampling were still remaining.

6. Parallel to that, the representative of Germany presented an updated draft proposal of informal document INF.11 of the autumn 2014 session on a general rule dealing with requirements for creation of an alternative method for Periodic Inspection, but due to a lack of time this proposal had not been discussed.

(see also informal document INF.23 from spring 2015 session).

7. During its spring 2015 session, the Joint Meeting agreed about the need to continue the work, and it has been proposed to develop proposal about OMCs and proposal about a general provision in parallel.

8. A second session took place on the 9 and 10 June in Paris (hosted by the Comité Français du Butane et du Propane (CFBP)) with the physical attendance of representatives from Germany (10 June only), Poland, Sweden, Switzerland and AEGPL, with partial attendance of Spain in a phone conference (10 June, 9.30 am).

9. The above meeting started with a short recall of the subject by the Chairman with the indications from the Joint Meeting at its spring 2015 session, and the objectives and schedule of actions towards the autumn session of the Joint Meeting.

10. During the meeting, by progressing along the common writing of the two proposals, the following specific observations were made:

(a) **Sweden:** As a matter of equality, and the fact that an equal level of safety has to be demonstrated before a method based on sampling and statistical analysis can be accepted, Sweden could see no reason to limit the scope of the general rule to cylinders for which the inherent properties of the design type prevent the successful performance of a

test required in 6.2.1.6.1. Sweden therefore proposed that the informal working group should include any type of cylinder in the general rule.

The Chairman recalled that the general provision objective is not to address specific alternatives types of cylinders or periodic controls methods, but to set the minimum requirements to be fulfilled for such alternatives to be considered next by the joint meeting. By experience, the whole process is a step by step process, requiring sufficient return on operating experience (REX), operating procedures quality, tests results, risk analysis, equivalent safety level assessment, etc. In any case in view of ADR 2017, the tight schedule would only permit to progress according to the current mandate.

After further discussions, it has been agreed by the informal working group that once the general provision and the OMC provisions would be finished and agreed by the Joint Meeting, ideally in autumn 2015, a mandate to continue the informal working group's efforts towards specific other demands would be asked to the Joint Meeting. Sweden would however welcome a discussion on this topic already at the autumn 2015 session of the Joint Meeting.

**(b) Spain:** The representative of Spain recalled the position already expressed in the previous meetings of the informal working group that, in principle, Spain is against sampling and statistical analysis for periodic controls for cylinders, unless there was proves that it gives an equivalent safety level as individual testing. The general provision was completed then by the informal working group to introduce an additional requirement for an independent assessment on the equivalent safety level, with both statistical and pressure receptacles expertise, to be conducted on any specific demand to the Joint Meeting.

The other observations from the representative of Spain related to impact of change of process to the annual grouping of population, and clearer link between ownership and documentation in case of change of owner have been taken into account.

However, after the meeting, Spain expressed that they would like to have first a general discussion at the Joint Meeting about the equivalent level of safety, with both statistical and pressure receptacles expertise, before introducing provisions on sampling into RID/ADR.

Spain feels also that the agreement of the competent authority of the country of use would be fundamental, since there could be serious safety implications in case of use of a sampling method.

11. The OMC specific provisions has then been reviewed by the informal working group on the basis of the document prepared by the informal working group in January, and some improvements since. The content is overall agreed by the participants, with the requirement to further improve the document with a cross check of the structure of the content to best fit with the general clause structure. Spain expressed again the need to be convinced about the safety equivalent level of a statistical method.

12. Germany presented different elements of the statistical analysis results prepared by the Federal Institute for Materials Research and Testing (BAM) based on the OMC destructive tests results to date (more than 15 years of regular destructive tests). Additional work and analysis on the maximum standard deviation and distribution choice would have to be progressed to consolidate and complete a possible safety equivalent level assessment.

13. Dates of the referenced ISO standards for statistics have to be added in the specific provision about OMC.

## **Proposal 1 – General Provision**

14. Add a new sub-section 6.2.3.5.3 to read as follows:

“6.2.3.5.3 *General rules for the substitution of a periodic inspection method required in 6.2.3.5.1*

This subsection applies to pressure receptacles designed and manufactured in accordance with standards referred in 6.2.4.1 or a technical code in accordance with 6.2.5, and for which the inherent properties of the design type prevent the successful performance of a test required in 6.2.1.6.1 (a) to (e) or a meaningful interpretation of test results as criteria of safety.

For such pressure receptacles, one or more of the individual periodic inspection methods shall be replaced by an alternative test method, if this procedure is specified in the relevant paragraph of 6.2.3 and is detailed in a special provision or in a referenced standard. This alternative method shall state clearly which test according to 6.2.1.6.1 a) to e) shall be substituted.

6.2.3.5.3.1 *Destructive testing and statistical assessment as alternative method*

If none of the accepted methods for non-destructive testing of each pressure receptacle to replace the tests as per 6.2.1.6.1 (a) to (e), is appropriate to assess the safety of individual pressure receptacles, an alternative method, using destructive testing and statistical evaluation, shall be developed, providing an equivalent level of safety.

It shall be based on the following elements:

- Random sampling of a quantified population of pressure receptacles
- Procedure for destructive testing,
- Procedure for statistical evaluation of test results,

Specification of rejection criteria, determination of the periodicity for retest checks, alternative test method, substituting inspection method(s), and the following elements shall be fulfilled.

(a) *Grouping of a population of a design type for statistical purpose*

The population of a pressure receptacle design type, considered for statistical assessment, shall be separated in clearly defined groups of population. Each group is limited to the population of a dedicated year of production per manufacturer of this design type, owned/operated by one company. In case of modification of the design, material or production process, a new group of population has to be considered. Deviating from this, the grouping of the annual production can be organized by more than one owner/operator under the following conditions:

- The share of duties and responsibilities shall be regulated in a contract; and this contract includes also each involved filling centre.
- The filling centres shall work under the supervision of at least one of the owners or operators,
- In case of change of ownership, the concerned population shall be transferred to the new owner with its design, manufacture, inspection and operational documentation and its full database.

(b) *Traceability*

Measures shall be taken to ensure traceability of each pressure receptacle to its group of population and its production batch. The owner shall collect all relevant data on filling, retesting and maintenance, correlation to a group of

population, selection for sampling and other issues in a database. Regular updates of data shall be organised by the owner.

The owner shall give access to the database. All filling centres and inspection bodies shall have relevant access for the check of individual pressure receptacles concerning their relationship to rejected groups of populations. The complete set of data shall be offered to the competent authority on request. Before filling or periodic inspection of a pressure receptacle, the database system shall automatically cross check the data of the relevant group of population concerning upcoming measures. In case of no access to the database, related pressure receptacles shall not be offered for service.

(c) Sampling for statistical assessment

From each group of population, a determined amount of individuals shall be sampled randomly to create a lot for destructive testing. The sampling procedure shall ensure that the lot is representative of its own group of population, and be representative for each owner. The minimum size of a lot has to be determined.

(d) Test method for destructive testing

The procedure(s) for destructive testing has to be detailed clearly, to ensure a high reproducibility of test conditions. All results of testing have to be monitored, collected independently from its value and made available for the whole life time of a group of population.

(e) Statistical evaluation of test results

The procedure for statistical evaluation of test results shall be described in a clear and understandable manner. It shall provide data on the requested reliability level, the minimum unilateral confidence level of a sample and the value of the rejection criteria for the relevant test. For determination of the requested reliability level the potential consequences of an in-service failure of the pressure receptacle design type shall be considered. All test results of destructive tests in accordance with (e) and in no case less than minimum amount of pressure receptacles, determined in (d) for sampling, shall be evaluated for the relevant group of population.

(f) Measures in case of not satisfying requirements

If the statistical assessment of test results representing a group of population shows insufficient properties, the affected group of population shall not be offered for filling or use and shall be taken out of service.

Further technical analysis about the reasons of failure can be undertaken. If an X(a) body, in accordance with 6.2.3.6.1, can demonstrate that clearly defined parts of the group of population are not affected by the detected reason for not meeting the statistical requirements, the competent authority or its delegate may permit further use of not affected parts of the group of population.

(g) Filling center

Filling centres for filling of pressure receptacles according to 6.2.3.5.3 shall apply a documented quality system to ensure that all the provisions of paragraph (7) of packing instruction P200 and the requirements and responsibilities of the alternative retest method as applicable are fulfilled and correctly applied. The quality system, according to the ISO 9000 (series) or

equivalent, shall be certified by an accredited independent body recognized by the competent authority.

(h) Assessment of the method

The safety level of this alternative statistical method shall be validated by an independent institute, experienced in statistics and pressure receptacles. This expert opinion shall assess the distribution function and shall take into account possible modifications caused by service degradation.

The alternative statistical method shall ensure a safety level not lower than the one resulting from the retest method to be substituted.”.

## Introduction to Proposal 2

15. The proposed method described in Proposal 2 has been build up step by step, based upon 17 years of return of experience of one currently commercialized OMC.

16. With this example, destructive tests have been performed after 3 years in service and thereafter every 5 years, on more than 17000 OMCs to date.

- Current results of adhesion destructive tests and peeling destructive tests are well above minimum requirements. It demonstrates that the over-moulded case keeps its protection properties (external corrosion, impact, drops) along time.

- Current results of rupture destructive tests (rupture pressure, volumetric expansion) are above minimum requirements. It demonstrates that over-moulded cylinders keep their mechanical properties along time.

17. These minimum requirements have been built step by step:

- After different preliminary studies on impacts of defects (corrosion, leak, adhesion,...) with dedicated independent experts recognized by the French Authority.

- Based on more than 40 years of regular annual rupture tests on traditional steel cylinders (13kg) performed to statistically assess the mechanical properties of such cylinders along time, according to the 15 years periodic inspection extension agreed at the time by the French Authority.

18. Such minimum technical requirements are currently being introduced in related standards for design and manufacturing and in related standards for periodic inspection, which is participating to the preservation of the level of safety for these over-moulded cylinders.

## Proposal 2 – Special provisions about OMC

19. Add the following definition in 1.2.1:

“*Over-moulded cylinder* means a cylinder intended for the carriage of LPG of a water capacity not exceeding 13 litres made of a coated steel inner cylinder with an over-moulded protective case made from cellular plastic, which is non removable and bonded to the outer surface of the steel cylinder wall;”.

20. Insert “6XY” in column (6) of the Dangerous Goods list for the entries for UN numbers 1011, 1075, 1965, 1969 and 1978.

21. Add the following specification about periodic inspection for over-moulded cylinders in a new sub-section 6.2.3.5.4 to read as follows:

“6.2.3.5.4 Over-moulded cylinders shall be subject to periodic inspection and tests in accordance with the special provision 6XY of Chapter 3.3.”.

22. Insert the following special provision in 3.3.1:

“6XY This entry applies to periodic inspection of over-moulded cylinders as defined in 1.2.1.

Over-moulded cylinders shall be subject to periodic inspection in accordance to the alternative method described below, by fulfilment of all requirements of the present special provision.

Alternative Method:

- The requirements of 6.2.1.6.1 b), c) and e) shall be fulfilled for each over-moulded cylinder.

- Tests of 6.2.1.6.1 a) and d) shall be respectively replaced by the destructive tests described in paragraph (e).

(a) General

Over-moulded cylinders shall be produced serially and based on steel cylinders in accordance with prEN1442:2014, EN14140:2015 or annex I, parts 1 to 3 to Council Directive 84/527/EEC. The design of the over-moulding shall prevent water penetrating to the inner steel cylinder. The conversion of the base steel cylinder to an over-moulded cylinder shall conform to the relevant requirements of prEN1442:2014 and EN14140:2015.

Over-moulded cylinders shall be equipped with self-closing valves.

Before filling, each over-moulded cylinder shall be submitted to a visual external prefill inspection by a competent operator. If during this inspection, the outer surface of an over-moulded cylinder is not free from material gouges, cuts or cracks that may harm the protection against corrosion of the inner steel pressure receptacle as defined in EN1439:2008 annex G, the over-moulded cylinder shall be removed from service.

(b) Grouping for statistical purpose

A production group of over-moulded cylinders is defined as the production of cylinders from a single over-moulding company using inner cylinders manufactured by one manufacturer within one calendar year, composed of cylinders with the same design, material and production process.

(c) Traceability

Inner steel cylinders marking in accordance to 6.2.3.9 shall be repeated on the over-moulding. In addition, each over-moulded cylinder shall be fitted, with an individual resilient electronic identification device. The detailed characteristics of the over-moulded cylinders are recorded in an information technology database. The database shall enable:

- To make available the specific technical characteristics of the cylinders (incl. a clear identification of the batch of the steel cylinder production and of the production batch of the over-moulding, and the day of over-moulding) to competent authorities, inspection bodies or filling centres;

- To identify the cylinder by linking the serial number and the electronic device to the database;



- To check past and upcoming measures (filling, retesting, withdrawal, sampling and others);
- Recording of date and place of performed measures.

The test results shall be recorded and kept available by the owner of the over-moulded cylinders for the entire life of the group.

(d) Sampling for statistical assessment

The sampling shall be random, representative for each possible owner. The minimum size of each sample per production group shall be in accordance with the table of paragraph (f).

(e) Test Method for destructive testing

The test of 6.2.1.6.1 a) shall be replaced by a visual external inspection of each over-moulded cylinder and shall be completed by the following procedures:

- Destructive adhesion tests (according to EN 1442 and EN14140:2014) and peeling tests (according to EN ISO 4628-3:2005) shall be performed to check that there is no risk of external corrosion on the receptacle wall and the cellular plastic case keeps its adhesive properties over time. Each of these tests shall be performed on a sample per production group.

The test of 6.2.1.6.1 d) shall be replaced by the following procedures:

- The hydraulic pressure test of 6.2.1.6.1 (d) shall be substituted by a burst test (according to EN 1442 and EN 14140:2014) on a sample per production group.

Destructive adhesion tests, peeling tests and burst tests, according to the above procedures, shall be done after 3 years in service and thereafter every 5 years.

(f) Statistical evaluation of tests results - Method

The procedure for statistical evaluation is described in the following table and its related comments:

Test interval (years)	Test type	Standard	Rejection criteria	Batch sampling level	Test results
After 3 years in service	Burst test	EN 1442	Burst pressure (*) < 70 bar in propane service or 50 bar in butane service	$3\sqrt[3]{Q}$ or $Q/200$ whichever is lower, and with a minimum of 20 per batch (Q)	If any test fails, repeat tests replacing Q with monthly production q of representative sub-batches
			Volumetric expansion (*) < 15 or 9 % (**)		
	Peeling and corrosion	EN ISO 4628-3:2004	Max corrosion grade: Ri2	Q/1 000	
Adhesion of Polyurethane	ISO 2859-1 EN 1442 EN 14140:2014	Adhesion value > 0.5 N/mm <sup>2</sup>	See ISO 2859-1 applied to Q/1000		
Every 5 years thereafter	Burst test	EN 1442	Burst pressure (*) < 70 bar in propane service or 50 bar in butane service	$6\sqrt[3]{Q}$ or $Q/100$ whichever is lower, and with a minimum of 40 per batch (Q)	
			Volumetric expansion (*) < 13, 12 or 9% (**)		
	Peeling and corrosion	EN ISO 4628-3:2004	Max corrosion grade: Ri2	Q/1 000	
	Adhesion of Polyurethane	ISO 2859-1	Adhesion value > 0.5 N/mm <sup>2</sup>	See ISO 2859-1 applied to Q/1000	
<p>Q Represents the production group.</p> <p>q Represents a continuous over-moulded cylinder batch.</p>					

(\*) For each of the two groups of figures (burst pressure and volumetric expansion), the “right” unilateral statistical tolerance interval shall be calculated for a confidence level of 95% and a fraction of population equal to 99%. The calculation is made in accordance with the standard ISO 16269-6:2005 admitting, for each of the OMC inspection lots, the normality of the population and considering that the variance is unknown.

Tests results of each sample shall be checked concerning their character of distribution function. If the distribution of tests results does not follow a normal distribution, the relevant distribution shall be used to make the calculation, and this additional complement shall be validated by an independent institute, according to sub-section (h) of 6.2.3.5.3.1.

The tolerance interval with coverage  $p$  at confidence level  $1 - \alpha$  has lower limit  $xL$  defined by this formula:

$$xL = x - k3(n;p;1-\alpha) \times s$$

with

$x$  : sample mean;

$s$  : sample standard deviation;

$k3$ : tabulated factor function of  $n$ ,  $p$  and  $1-\alpha$ ;

NOTE : This value can be read from the Table D.4 given in Annex D of ISO 16269-6:2005.

$p$  : proportion of the population selected for the tolerance interval (99%);

$1 - \alpha$  : confidence level (95%);

$n$  : sample size.

(\*\*) - For the cylinders manufactured according to Directive 84/527/EEC [8], the volumetric expansion cannot be lower than:

(a) 15% for the tests done 3 years after manufacturing;

(b) 13% for the tests done 8 years after manufacturing;

(c) 12% for the tests done every 5 years thereafter ;

- For the cylinders manufactured according to Directive 1999/36/EC[9] or Directive 2010/35/EU[10] and according to EN 1442, the volumetric expansion cannot be lower than 9%;

- For the cylinders manufactured according to Directive 1999/36/EC [9] or Directive 2010/35/EU [10] according to EN 14140, it is necessary to have at least 8 years of experience related to the cylinder type to determine the criteria for the volumetric expansion.

(g) Measures in case of not satisfying requirements

If a result of the burst test, peeling test or adhesion test does not comply with the criteria detailed in the previous table, potentially affected production batches of over-moulded cylinders shall not be offered for transport and use. In agreement with the competent authority, its delegates or the body which issued the design approval, additional tests might be performed to determine the root cause of the failure and the affected period of the steel cylinder production or of the production of the over-moulding. Over-moulded cylinders not produced in the affected period may be offered for filling again.

(h) Filling centre requirements

The owner shall demonstrate to the satisfaction of the competent authority that the over-moulded cylinders are only filled in filling centres applying a documented quality system to ensure that all the provisions of paragraph (7)

of packaging instruction P200 are fulfilled and that the requirements of EN1439:2008 are correctly applied. Each filling centre shall have:

- The appropriate means to identify the over-moulded cylinders through the electronic identification device;
- Availability of the relevant information;
- The capacity to update the relevant information.

The owner shall provide documentary evidence to the competent authority that the filling centre complies with these requirements and that the quality system, according to the ISO 9000 (series) or equivalent, is certified by an accredited independent body recognized by the competent authority.”.

23. Remove the exclusion of sub-section 3.5 and of annex G for EN 1439:2008 in the table in point 11 in P200.

24. Add a reference to prEN16728:2014 in the table in sub-section 6.2.4.2

## Justification

25. As a replacement for periodic inspection requirements of 6.2.1.6.1 a) (done every 10 or 15 years), the proposal offers to:

- Performing an external visual inspection before each filling, on each OMC;
- Performing destructive Adhesion Tests and destructive Peeling Tests on samples, back from customers, after 3 years in service and thereafter every 5 years.

26. In addition to the specific OMC design and manufacturing requirements and properties (increased resistance to corrosion, impacts and drops), the periodic inspection proposal offers, compared to an ordinary steel cylinder, less risks of external corrosion, therefore less risk of leakage.

27. Furthermore, these additional controls on the protective case do provide regular quantified return of experience on material ageing and permit to follow up the performance of such cylinders, all along their life.

28. Dealing with the individual hydraulic pressure test required in 6.2.1.6.1 d), done every 10 or 15 years, which provides a qualitative result on each cylinder, the proposal offers to replace it by a destructive rupture test repeated after 3 years in service and thereafter every 5 years.

29. This method requires and provides:

- Technical quantitative performance assessment of the mechanical and structural integrity of the inner receptacle, for each production group, from their manufacturing and during their lifetime.
- No risks of remaining water due to pressure tests (main sources of internal corrosion)

30. This quantified return of experience on material properties and ageing permit to follow up the performance of such cylinders, all along their life.

31. In case of an unsuccessful periodic inspection, the proposal requires 100% reliable segregation of potential defective cylinders using an electronic identification device and a database. This has to be done automatically at the filling plant when the cylinders are returned from customers,

32. The risks analysis performed on the proposal, compared to standard periodic controls on ordinary steel cylinders, the availability of regular quantitative technical data which permits to proactively withdraw potential defective cylinders in advance, are elements that contribute to the equivalence of safety level, which had already been accepted by the French Authority. Complementary assessment, according to the paragraph (h) of the proposed general provision, is in progress.

33. In conclusion, by increasing requirements on the design, manufacturing, dedicated operating procedures, exhaustive traceability means and a mix of increased regular individual visual inspection and destructive tests by sampling, compared to standard periodic controls on ordinary steel cylinders, such over-moulded cylinders, and the proposed progressive (agreed step by step with the French competent authorities) inspection scheme, offer an equivalent safety level along their lifetime, although not individually pressure testes every 10 or 15 years

34. In addition, the OMC inspection scheme provides quantitative evidences which permit to decide in advance about the end of life of any group of production.

---