
Committee of Experts on the Transport of Dangerous Goods and on the Globally Harmonized System of Classification and Labelling of Chemicals

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Item 6 (b) of the provisional agenda

Miscellaneous proposals for amendments to the Model Regulations on the Transport of Dangerous Goods: packagings

Provision of additional information on the use of recycled plastics material – expansion to all rigid plastics packagings – in support of ST/SG/AC.10/C.3/2019/51

Transmitted by the International Confederation of Plastics Packaging Manufacturers (ICPP) and the International Confederation of Container Reconditioners (ICCR)

Introduction

1. In keeping with the commitment (see ST/SG/AC.10/C.3/2019/51) to provide additional information on experience with the use of recycled plastics materials (recycled resins material), this paper summarizes experience with the use of recycled plastics in the manufacture of UN performance packagings of 1H1 and 1H2 types, as well as, additional pertinent information. A graphic at https://ee4.f99.godaddywp.com/wp-content/uploads/2017/07/lifecycle_infographic_rev.pdf illustrates how use of recycled plastic materials promotes sustainability.

Early steps considering use of recycled plastic resins in the United States of America

2. The plastic packaging manufacturing industry in the United States of America first began studying the use of recycled resins in the manufacture of dangerous goods packagings in 1982. A report on the early efforts may be found at <https://ee4.f99.godaddywp.com/wp-content/uploads/2016/10/PDI-Real-World-Test.pdf>. The first USA competent authority approval was granted in 1992.

3. USA industry later coordinated its efforts with the USA competent authority and additional competent authority approvals allowing the manufacture of 1H1 and 1H2 drums from recycled resins were issued in the USA in 1997. Under successive approvals, use of recycled resins from the grinding down of previously used plastic dangerous goods packagings has been authorized.

1997 USA competent authority approvals

4. The initial approvals took a cautious approach through additional safeguards going well beyond those required for drums made of virgin resins. It was recognized that as the safety and reliability of the practice of using recycled resins was proven, less stringent controls could be required. Important elements of the initial approvals, which took into

account and exceeded UN control provisions in the definition of recycled plastics material (see 1.2.1), included:

- (a) the source of recycled resins was limited, for example, to used drums and IBCs of known transport history;
- (b) sources had to be verified and records kept of the source of the plastic packaging used and the loadings;
- (c) no resin from packagings having contained Division 6.1 materials was allowed;
- (d) no resin from packagings previously used to transport hazardous waste was allowed;
- (e) only resins prepared (including cleaning) and evaluated under a quality assurance program could be used;
- (f) the size of recycled resin batches was limited to not more than 250,000 pounds (113,000 kg);
- (g) testing was required of each resin batch for melt flow index (by ASTM D-1238 at 21.6 kg and 190°C), so that:
 - (i) resin with an HLMI of L.T. 4 had to be within + 1.5 grams per 10 minutes;
 - (ii) resin with an HLMI G.T. 4 but L.T. 8 had to be within + 2.0 grams per 10 minutes;
 - (iii) resin with an HMLI G.T. 8 but 12 or less had to be within 2.5 grams per 10 minutes;
- (h) density testing was required of each resin batch (by ASTM D-1505 or D-792) to ensure a value within a range of $.960 + 0.02$;
- (i) testing was required of each batch to ensure tensile strength within prescribed limits;
- (j) UN performance testing of packagings was required once per mold per shift;
- (k) each drum required marking of "REC" for identification in the event of an incident;
- (l) each drum required marking of "NOT FOR FOOD OR DRINK"; and
- (m) use was limited to packing group II and III materials.

5. Under the original approvals, by 2004, three companies had made approximately 1 million 55-gallon and 30-gallon tight head and open head drums using approximately 10,000,000 pounds with recycled resin material.

2007 competent authority approvals

6. Based on the excellent results of drums manufactured under the original approvals, the U.S. competent authority subsequently issued revised approvals in 2007 that maintained the original provisions except that they relaxed the requirement for UN performance packaging testing frequency from once for every batch to at least once every thirty days and the requirement for tensile testing was removed.

7. Under revised approvals, from June 2011 to August 2015, over 4 million recycled content plastic drums were manufactured and certified for transport of dangerous goods. During this time, recycled content plastics drums were successfully used in the transport of

dangerous goods with no reported incidents. Testing under the approvals and use in transporting dangerous goods consistently demonstrated the safety and reliability of drums manufactured from recycled resins.

8. Holders of the approvals over a 4.25 year period from June 1, 2011 through August 31, 2015 completed 2,393 Melt Flow Tests and 2,393 Density tests on approximately 80,000,000 pounds of the recycled plastics materials. The results are shown in aggregate below. All (i.e., 100%) of those tests found recycled resins produced according to sorting requirements were in compliance with the resin specifications under the approvals, as follows:

Melt index

HLMI Range	<4	4-8	8-12
Tests Results	0	2322	71

*All testing was performed in accordance with ASTM D-1238 at 21.6 kg and 190°C

Density

Density Range	0.960 ± 0.020
Tests Results	2393

*All testing was performed in accordance with ASTM D-1505, Standard Test Method for Density of Plastics by Density-Gradient Technique; or ASTM D 792, Standard Test Method for Density and Specific Gravity (Relative Density) of Plastics by Displacement

2016 USA competent authority approvals

9. Because of the demonstrated safety and reliability record, U.S. Competent Authority approvals were again revised in 2016. Under the new approvals, the retest frequency was revised to be consistent with that of drums made from virgin resins (i.e., UN design type performance retesting once every year based on U.S. requirements). In addition, given the high degree of consistency in the measured properties of recycled resins, testing under the approvals is now limited to melt flow index testing of every resin batch, but producers of recycled resins will test for density and other parameters pertinent to the processing.

Multilayer drums; 2008 USA competent authority approvals

10. In 2008, additional approvals were issued to authorize the use of recycled resin material for the inside (middle) layers of multilayer drums. The drums are marked 1H1W and 1H2W. The sorting, record keeping, special provisions, testing, quality system requirements are the same as that for monolayer drums discussed above. Since there is no product contact with recycled resin, there are no requirements for the “REC” or “NOT FOR FOOD AND DRINK” marks.

Recycled resin usage rates

11. Currently in the USA over 7 million kilograms of recycled resin material is used annually for closed head drums, open head drums and non-UN applications for jerrycans, pails, bottles, and jugs and IBC components (pallets, label plates, and corner protectors).

12. Annual consumption of recycled resin material for the production of industrial and dangerous goods packaging in the European Union compiled to more than 10 million kilograms in the year 2018. Compared to the absolute tonnage of recycled resin used 5 years

ago, 2018 figure represents strong and continuous growth (> 110 %) over the years. Recycled resins are used for the production of drums, medical waste bins (box or jerrycan), and non-UN IBCs. Where used for production of dangerous goods packaging, recycled resins in vast majority are generated in line with criteria defined in ISO 16103:2005.

13. During the period from 2016 until today (October 2019) more than 2.1 million plastic drums approved for the transport of dangerous goods have been manufactured. Plastic drums produced include open head drums (1H2) in the volume range from 30 l – 220 l approved for solids and tight head drums at 220 l approved for liquids as well. Approvals applied include monolayer and multilayer – 2-layer with recycled content in outer layer or 3-layer setup with recycled content in middle layer only - setups. Referring jerricans (3H1) up to 5 l volume for no UN application over 300.000 pcs has been manufactured in 2019.

14. In addition to plastic drums, jerricans and IBC-Component, the European industry started to evaluate use of recycled resins for production of inner receptacles for C-IBC (31HA1) in the beginning of the year 2018. Currently restricted to non-UN applications only, the production of inner receptacles – typically as 2-layer with recycled content in outer layer and an inner layer of 100% virgin resin- amounts to 90.000 pieces until today (October 2019). Furthermore, in the last 5 years, more than 70 million kilograms of recycled resin has been used in the production of IBC components in the EU.

15. To demonstrate the technical capability of the recycled material used, a composite IBC (31HA1), with an inner receptacle made using from 100% recycled material, successful has been tested for packaging group II, Density 1.6 in accordance to chapter 6.5 of the UN Model Regulations. The tests were performed by TÜV Rheinland Industrie Service GmbH and are documented within test report 190256 dated by 12.11.2019.

16. There are no known incidents with industrial packaging and composite IBC produced from recycled resin and/or including recycled content during the previous mentioned periods.

Recycled Resin Production Rates

17. According to statistics published by the Reusable Industrial Packaging Association (RIPA) that represents 71 reconditioning facilities in North America, there are over 2 million plastics drums scrapped and over 1.8 million IBC inner receptacles scrapped per year. This equates to an estimated 18 million kg of "drum" resin and 28.8 million kg of "IBC" resin per year in the North America alone. Allowance of recycled resin in IBC inner receptacles would be an important outlet and sustainability improvement for this resin.

Conclusion

18. Proper qualification and testing of resin material is essential to successfully producing UN1H1 and UN1H2 plastic drums from both virgin and recycled resins. Experience demonstrates drums made from recycled resin materials sturdily and consistently hold up to all required UN performance tests. As such, use of recycled resins derived from controlled sources and tested to ensure resin properties has proven that a packaging testing frequency consistent with that for virgin resin packagings is justified. Careful control of recycled resin quality, extensive testing, and use of packagings in the dangerous goods transport environment has validated the use of recycled plastics resins in the manufacture of dangerous goods packagings. Through controls as may be defined in a quality assurance program, a level of performance consistent with that of packagings made from virgin resins may be ensured.