Quality Control

MATERIALS

Our adjustment rings are manufactured from 100 percent-recycled plastic. Raw material for processing into moldable plastic flake is selected and purchased based on the vendor's reputation for providing consistent containment-free feed stock. The predominant source product for our raw plastic is curbside collected, post-consumer, blow-molded milk jugs and detergent bottles. These products are initially manufactured from High Density Polyethylene as identified and verified to be compatible before integration into the process.

INITIAL SORTING

The vast majority of products manufactured from recycled materials are those used in packaging. As such, they will eventually end up in the solid waste stream again. Each time this material cycles through the process, some of it will end up in the landfill and some of it will deteriorate to an unacceptable level for reuse. Even the most successful recycling efforts (approximately 80% for the aluminum can industry) fall short of keeping 100% of their manufacturing materials out of our landfills.

THE RECYCLING PROCESS

The reclaimed material is first shredded to a uniform size and then goes through a series of wash cycles to clean and float off any labels or foreign materials. The cleaned plastic is then dried, sized to a moldable flake and all fines and dust are removed by aspiration. The reclaimed material is then stored in poly bags inside gaylord containers weighing approximately 750 pounds when filled. These containers are identified and logged by date, source, and reclaim line process parameters (line speed, wash and dry cycle times and water temperature). Any stored gaylord will only contain material of a similar melt flow index and density value. This material is now ready to be injection molded.

PROPERTY TESTING OF RECLAIMED PLASTIC

All feed stock will be tested on a procurement/production batch basis as necessary to verify the following property values:

PROPERTY	TEST METHOD	ACCEPTABLE VALUE
Melt Flow Index	ASTM D-1238	0.30 to 30.00 g/10 min.
Density	ASTM D-792	.84 to .98 g/cm^2
Tensile Strength, yield	ASTM D-638	2.0 to 5.0 10^3lb/in^2

Blending of various feed stock batches will be done to facilitate process improvements and economies. When blending is done, processing characteristics necessary to produce a quality part must be maintained. This will be verified by the static compressive testing done on the production parts.

TOOLING

All molding will be done on quality production type injection molding tooling. This tooling will be consistent with current manufacturing and safety standards. It will be designed to consistently produce a quality product capable of meeting and exceeding our established quality and performance standards.

THE INJECTION MOLDING PROCESS

The rings will be injection molded using good manufacturing practices. A Master Setup Sheet will be established for each part number. This sheet will identify the mold, the injection molding machine of preference and list all the machine processing parameters. It will also contain the following: setup information and operator instructions, palletizing instructions and loading information, size gauging and visual inspection requirements, along with any known quality alerts.

A Job Sheet will be maintained for each production run. This sheet will list:

- Part Identification Number
- Mold Identification Number
- Material Identification Number

- Injection Molding Machine Identification Number
- Date of Run, Operator Number, Shift Number
- Quantity Produced
- Machine Setup and any subsequent adjustments
- Start-up Quality Check (Verification that part meets specifications)
- In Process Quality Check (Verification that process is maintaining specifications)
- Last Shoot Inspection (Final Verification)
- Final record of All Machine Settings (Record of any changes in process from setup)
- How parts were palletized and stored

PALLETIZING AND STORAGE

The rings will be stacked on their specific pallets with the male tongue up on round product and down on square and rectangular product. The pallets will be designed to afford maximum support keeping the rings from deforming due to the natural tendency of plastic to creep. Stack height will be determined by the vertical clearance available inside the transportation trailer and additional clearance required to load the pallet. The ring stack will be secured to the pallet by not less than binding loops of 3/8" poly strap. An edge protector will be used to protect the tongue on the upper ring from distortion.

The palletized rings will be stored on a reasonably flat surface in such a manner as to prevent damage from handling or deformity and to afford easy access when loading a truck.

TRUCK LOADING AND SHIPMENTS

The palletized ring stacks will be carefully handled while moving and loading a truck. They will be positioned and secured to assure safe, damage-free transportation and safe, easy unloading.

MANUFACTURING SPECIFICATIONS AND TOLERANCE

The following tolerances and standards apply to all LADTECH adjustment rings:

FLATNESS

1..250 MAXIMUM allowable deviation from flat (dish or bow)
2..250 MAXIMUM allowable vertical ribbon effect (convolution) As measured around the outer edge with the part turned top down on a known flat surface
3..125 MAXIMUM allowable horizontal ribbon effect (bulging between ribs) As measured at the largest outside point and compared to the point where the outer wall intersects the rib sections

SIZE

1.+- .125 on diameter of length dimensions as shown on part control drawings
2.+- .063 on height dimensions as shown on part drawings for parts to 2" in height
3.+- .125 on height dimension as shown on part drawings for parts over 2" in height

COSMETIC

1.Part to be completely filled - on voided areas
2.No cracks or separations at knit lines
3.No cracks or tears from part ejection hang-ups
4.Ripples or sags on vertical walls to cover no more than 10% of the surface

DESPOSITION OF ANY PRODUCT NOT MEETING STANDARDS

Any rings found not meeting quality standards will be reground and reprocessed into quality product. The cause of this quality deviation will be identified and remedied immediately.

PRODUCT PERFORMANCE STANDARDS

The adjustment rings shall meet and exceed the static load requirements of ASSHTO Highway Bridge Specifications HS-25 (21,280 Pounds). The rings must withstand 1,000,000 plus full load cycles of 10 seconds or less duration. The rings must perform without failure to a minimum of 150 percent of these load values.

COMPLIANCE TESTING

1.Materials will be tested on a batch basis as necessary-Minimally once every 30 days.

2.Size, flatness and cosmetics verification will be done on a run basis and recorded.
3.Major performance certification will be done on a yearly basis by American Engineering Testing, Inc. or an equally qualified test facility.
4.4) Correlative performance verification will be done in-house by LADTECH personnel on a run basis and recorded.

CORRELATIVE QUALITY ASSURANCE TEST PROCEDURE AS FOLLOWS

1. Objective

1.1 The purpose of this procedure is to describe a quality assurance test method for HDPE Adjusting Rings. The method involves compression testing of single cell coupons cut from a standard ring.

1. Scope

2.1 Equipment for QA compression testing

2.2 Preparation of HDPE Adjusting Ring coupons

2.3 Test procedures and documentation

1. Equipment

3.1 Bandsaw or any other suitable cutting equipment for cutting the HDPE Adjusting Rings

3.2 Compression load frame; minimum 10 ton capacity

3.3 Calibrated load application equipment capable of applying load at a constant rate of 0.5 inches per minute.

3.4 Upper and lower platens, smooth and plane, capable of transferring even loading to coupon. The platens shall have plan dimensions greater than the coupon.

3.5 Dial indicators; minimum 1" travel; calibrated.

1. Preparation

4.1 The HDPE Adjusting Ring shall be cut as close to opposing sides of adjacent webs with out removing mass from those webs (see attached drawing).

4.2 A test sample shall include three (3) coupon specimens cut from a single ring at 120E spacing.

4.3 The specimens shall be free of burrs or fins. Top and bottom surfaces shall be parallel, within " tolerance.

1. Test Procedures

5.1 Insert HDPE Adjusting Ring coupon into the load apparatus and center it on the platen.

5.2 Bring platens into snug contact with coupon. Begin loading at 0.5 inches per minute.

5.3 Stop loadin when coupon can no longer take additional load while continuing to deform (peak load). Record peak load.

5.4 Repeat steps 5.1 to 5.4 for the remaining two specimens from the test sample.

5.5 Average the three test results to obtain the test sample failure load.

5.6 Optional:

5.6.1 Place two dial indicators in the loading apparatus on opposing sides of the coupon. Obtain zero readings of dial indicators before applying load.

5.6.2 Record dial indicator movement at 1000 pound increments up to peak load.

5.6.3 Average readings for each increment to obtain specimen deformation results.

5.6.4 Plot load vs. deformation data on an x-y chart.