



RESOURCE MANUAL



“At Revolution Bag, we are a closed-loop recycling company that makes high-quality can liners that exceed environmentally preferred requirements, **without costing more.**”

The Start of a Revolution

Revolution Bag starts with a supply of post-consumer agricultural plastics – a virtually endless quantity of consistent, high-quality raw materials for recycling provided by our sister company, Delta Plastics. This resource is coupled with patented washing and processing technology that enables us to take this post-consumer material, which would otherwise end up in a landfill, and produce a high-quality can liner at a competitive price.



THE REVOLUTIONARY DIFFERENCE

Closed recycling loop

- ✓ Production process in which the waste or by-product of one process or product is used in making another product
- ✓ Delta Plastics recycles its agricultural film into post-consumer resin, which is then used to manufacture Revolution Bag can liners

Quality

- ✓ Revolution Bag utilizes Delta Plastics PCRpro™, which is third-party certified as 100% post-consumer recycled LLDPE resin (PCR)
- ✓ Super Hexene LLDPE (the “best” when ranking good, better, best for LLDPE) is used when virgin resin is required for the blend
 - Many competitors use a lower cost Butene LLDPE resin, which is the “good”
- ✓ Sales tip: Focus on dry and wet load ratings - not film thickness - when determining the right mil/gauge

Sustainable supply stream

- ✓ Revolution Bag has an abundant and consistent supply of PCRpro™ from Delta Plastics

Third-party certifications for green claims

SCS (Scientific Certification Systems) - SCS Global Services is the certifier of choice for specific recycled content claims around the world

- ✓ Raw material (resin):
 - Delta Plastics PCRpro™ is certified by SCS as 100% post-consumer recycled resin (PCR)
- ✓ Finished goods (can liners):
 - HeRCules® Natural (N1 blend) can liners are certified by SCS as containing 97% PCR
 - HeRCules® Black (B1 blend) black can liners are certified by SCS as containing 94% PCR



THE REVOLUTIONARY DIFFERENCE

Third-party certifications for green claims (continued)

SCS (Scientific Certification Systems) continued

- ✓ Life Cycle Assessment (LCA):
 - LCA was commissioned to assess environmental impacts associated with all stages of a product's life, from cradle to grave (i.e., from raw material extraction through materials processing, manufacture, distribution, use, repair and maintenance, and disposal or recycling.)
 - Seven core impact areas identified in LCA:
 - Global climate change
 - Energy resource depletion
 - Fine particulate matter (soot)
 - Ground level ozone (smog)
 - Ocean acidification
 - Ocean warming
 - Regional acidification (acid rain)
 - LCA was performed to establish Revolution Bags':
 - Baseline environmental performance
 - Satisfy customer specifications
 - Build brand value backed by proven performance metrics
 - Create basis for an environmental impact calculator
 - To set Revolution Bag apart from other can liner manufacturers

ECOLOGO Certification - A third-party certification process where products are voluntarily tested and audited for reduced environmental impact

- ✓ ECOLOGO was acquired by Underwriters Laboratory (UL) in 2010 and focused on certifying products with a reduced environmental impact
 - UL is an American worldwide safety consulting and certification (3rd party) company
- ✓ Can liners must meet the requirements of the UL 126 standard to be ECOLOGO certified
 - UL 126 is the Standard for Sustainability for Plastic Film Products
- ✓ Revolution Bag's entire product offering and blends are ECOLOGO certified
 - All items and blends are listed on the UL website individually
 - A direct link to the listing is located on Revolution Bag's website
 - <https://spot.ulprospector.com/en/na/BuiltEnvironment/Suppliers/31957/Revolution-Bag/search?sug=1&st=1&srsid=2>

THE REVOLUTIONARY DIFFERENCE

Third-party certifications for green claims (continued)

ECOLOGO Certification (continued)

- ✓ We are the first and, to date, the only US manufacturer with can liners that are ECOLOGO certified
- ✓ ECOLOGO label
 - Helps manufacturers and consumers easily identify environmentally preferred products
 - In use for more than 20 years



- ✓ Bid specification recommended wording
 - When assisting with writing bid specifications with a sustainable requirement at the end-user, we suggest the following wording be added to the bid request
 - “All can liners should be ECOLOGO certified to the UL 126 Standard for Sustainability for Plastic Film Products”

Compliance information

- ✓ **EPA requirement** - Minimum requirement is 10%-100% post-consumer recycled resin (PCR) content in can liners.
 - Every can liner that Revolution Bag manufactures exceeds the EPA Comprehensive Procurement Guideline requirement
 - ECOLOGO certification validates and exceeds this claim as the standard (UL 126) requires a minimum of 20% PCR
- ✓ **LEED (USGBC) requirement** - There are two ways to meet the minimum requirement.
 - Every can liner that Revolution Bag manufactures exceeds the requirements for LEED (existing building)
 - Can liners must meet the EPA requirement of 10% post-consumer recycled resin (PCR) content, or
 - Can liners must be .7mil or thinner with or without PCR

THE REVOLUTIONARY DIFFERENCE

Compliance information (continued)

- ✓ **GSA (*General Services Administration*)** - Otherwise known as federal government purchasing
 - Environmentally Preferred Products (EPP)
 - Products have a lesser or reduced negative effect on human health and the environment when compared with competing products or services that serve the same purpose.
 - All Revolution Bag items qualify as EPP because we meet all EPA requirements.
 - Key Sustainable Products Initiative
 - Targeted initiative that focuses on small can liner (24"x33" and smaller) for federal buildings
 - Requires minimum of 20% PCR or meeting the UL 126 standard
 - All Revolution Bag items qualify as each is ECOLOGO certified

Right sizing

- ✓ Because LLDPE allows for stretch, Revolution Bag liners are able to fit tight on a receptacle like a shower cap.
 - HDPE cannot do this because there is no "east-west" stretch
 - Many times we see HDPE liners "tied" off to tighten around a receptacle

Right gauging

- ✓ All Revolution Bag stock items have been load tested for performance evaluation
- ✓ By using PCRpro™ + Super Hexene, it creates a strong material that makes it possible to right gauge
 - Right gauging offers the greatest impact as it is a total source removal of plastic vs. a partial diversion
 - Every 13 pounds of virgin plastic can liners uses a little over ½ lb. of oil and natural gas to produce
 - By eliminating the plastic through gauge reduction, we multiply the positive impact of Revolution Bag
 - The landfill reduction also positively impacts landfill capacity issues

Consistent pricing

- ✓ Because Revolution Bag produces the majority of its raw materials through its recycling process, it is shielded from market fluctuations of virgin LLDPE resin compared to other can liner manufacturers

THE COMPETITION

| Manufacturer | Product Line | Post-Consumer Recycled Resin content % | Resin Type | Stock Color Options | Gauge Range | 3rd Party Certification |
|---------------------------------|-----------------------------|--|------------|--------------------------------|----------------------------|-------------------------|
| AEP Industries (Webster) | EarthSense Commercial | 10% | LLDPE | Black | 0.65-2.0 mil | SCS |
| AEP Industries (Webster) | EarthSense Commercial Clear | 30% | LLDPE | Clear | 1.25-1.5 mil | SCS |
| Aluf Plastics | COEX Supertuff CXP | 9% | LLDPE | Black | 1.25-2.0 mil (equivalents) | SCS |
| Berry Plastics | Big City | 10% | LLDPE | Black | 1.0-2.7 mil | None found |
| Berry Plastics | Rhino-X PCW | 10% | HDPE | Natural | 12-16 micron | None found |
| Heritage Bag (Novolex) | LEEDing Edge | 10% | LLDPE | Black | 1.3 mil | None found |
| Heritage Bag (Novolex) | LEEDing Edge | 10% | HDPE | Natural | 16 micron | None found |
| Inteplast (Pitt) | Eco-Strong Plus | 10% | LLDPE | Black, Clear | 0.90-1.35 mil | None found |
| Inteplast (Pitt) | Eco-Strong Plus | 10% | HDPE | Natural | 10-16 micron | None found |
| Petoskey Plastics | GreenCore | up to 70% (not item specific) | LLDPE | Black, Clear, Blue | 0.40-1.25 mil | SCS (resin only) |
| Republic Bag (Sigma) | Enviro Bag 2.0 | 50% | LLDPE | Dark | .90-2.0 mil | None found |
| Revolution Bag | EcoMax | 30%-70% | LLDPE | Black, Nat, Blue, Green, White | 0.30-0.70 mil | ECOLOGO |
| Revolution Bag | HeRCules®- Natural | 94% | LLDPE | Natural | .90-1.75 mil | SCS & ECOLOGO |
| Revolution Bag | HeRCules®- Black | 91% | LLDPE | Black | .90-1.75 mil | SCS & ECOLOGO |
| Revolution Bag | LoadMaster- Natural | 35% | LLDPE | Natural | 0.85-1.10 mil | ECOLOGO |
| Revolution Bag | LoadMaster- Black | 70% | LLDPE | Black | 0.90-1.15 mil | ECOLOGO |
| Revolution Bag (Delta Plastics) | PCRpro™ (PCR resin used) | 100% | LLDPE | Black, Natural, Mix | N/A | SCS |
| Spectrum Bags | Go Green | 20% | LLDPE | Black | .35-2.0 mil | SCS |

REVOLUTION BAG FAMILY

EcoMax

- Full-line utility grade can liners
- 0.30 mil to 0.70 mil gauge range
- Natural, black, white, blue, and green stock color options
- PCRpro™ 30%-70% + Super Hexene
 - ✓ LW – light waste
 - targets 6-10 micron bags or thin LD (*low density*)
 - ✓ MR – medium refuse
 - targets 10-14 micron bags
 - ✓ HR – heavy refuse
 - targets 14-17 micron bags
 - ✓ XH – extra heavy
 - targets 17 + micron bags

EcoMax Select

- Optimal source reduction best fit for most common receptacles using EcoMax stock items
- Right fit sizes to eliminate wasted materials
- Recommended application guide
- 0.30 to 0.70 mil gauge range
- PCRpro™ 30%-70% + Super Hexene

Loadmaster

- Super-heavy weights
- .85 mil to 1.15 mil gauge range
- Natural or black color options
- PCRpro™ Black 70% + Super Hexene
 - ✓ Extra Heavy + (XPBK)
 - targets heavy black up to 1.3 mil or 20 + micron
 - ✓ Extra Tough (XTBK)
 - targets heavy black up to 1.7 mil
- PCRpro™ Natural 35% + Super Hexene
 - ✓ Extra Heavy + (XPN)
 - targets heavy clear/white up to 1.4mil
 - ✓ Extra Tough (XTN)
 - targets heavy clear/white up to 2.0mil

Hercules®

- Heavy recycled content
- .90-1.75 mil gauge range
- Black and natural color options
- PCRpro™ 94%-natural; 91%-black
- Target all heavy black/clear bags
- Right-gauge opportunity is 30%-40% thinner

REVOLUTION BAG BASICS



POST CONSUMER



GALLON CAPACITY
OR LENGTH



PRODUCT FAMILY
GAUGE STRENGTH



COLOR CODE

| | EcoMax | Loadmaster | HeRCules® |
|-------------|---------------------|-------------------|--------------------|
| Gauge Range | 0.30 mil – 0.70 mil | .85 mil -1.15 mil | .90 mil – 1.75 mil |
| Natural | X | X | X |
| Black | X | X | X |

| | EcoMax | Target |
|----|----------|-----------|
| LW | 0.30 mil | 6-10 mic |
| MR | 0.45 mil | 10-14 mic |
| HR | 0.59 mil | 14-17 mic |
| XH | 0.70 mil | 17+ mic |

| | Loadmaster | Target |
|------|------------|---------------|
| XPBK | 0.90 mil | up to 1.3 mil |
| XTBK | 1.15 mil | up to 1.7 mil |
| XPB | 0.85 mil | up to 1.4 mil |
| XTN | 1.10 mil | up to 2.0 mil |

| | HerCules® | Target |
|-----|-----------|-------------|
| 100 | 0.90 mil | Heavy Repro |
| 150 | 1.35 mil | Heavy Repro |
| 168 | 1.50 mil | Heavy Repro |
| 200 | 1.75 mil | Heavy Repro |

How to Measure a Receptacle

Round Receptacle

Width = circumference ÷ 2 or $\pi d \div 2$ (3.14 x diameter ÷ 2)

Length = height of receptacle + ½ diameter of bottom of the receptacle + 4"-6" for overhang

Square or Rectangle Receptacle

Width = total of all four sides ÷ 2

Length = height of receptacle + ½ the bottom diagonal of receptacle + 4"-6" for overhang

Microns to Mil Formula

To convert microns to mils, divide the micron by 25.4 to arrive at mil thickness

Ex: 16 microns ÷ 25.4 = 0.63 mil

Mils to Micron Formula

To convert mils to microns, multiply by 25.4 to arrive at micron thickness

Ex: .90 mil x 25.4 = 22.9 mic

Linear Low Density Case Weight Formula

Width x Length x Gauge (mils) ÷ 15
÷ 1000 x Case pack =
Net lbs. per case

High Density Case Weight Formula

Gauge (microns) ÷ 25,400 x Width x
Length x Case pack x 0.0686 =
Net lbs. per case

MANUFACTURING

Star Sealed Bags | Star-seal is the most common type of seal on the market. Designed without gussets, the star-seal eliminates gaps along the seal where leaks can occur. This allows the bag to more easily conform to the shape of the container and distributes refuse weight evenly inside the bag. Star-seal liners maximize the bag's carrying capacity and virtually eliminate leaks.

| | Width | Length | Gauge |
|---------|-------|--------|---------|
| minimum | 21" | 15" | 0.3 mil |
| maximum | 45" | 120" | 2.0 mil |

Flat Seal Bags | Flat seal is a two-dimensional bag with a bottom seal, much like a pillow case. Though flat seals are strong, they may have a tendency to leak wet trash from the corners. Also, they do not conform well to the shape of most trash receptacles.

| | Width | Length | Gauge |
|---------|-------|--------|-------|
| minimum | 30" | none | 1 mil |
| maximum | 44" | none | 6 mil |

Gusseted Bags | Gusseted bag is a flat-style bag manufactured with both sides tucked in to form gussets. Where indented, the bag is sealed through four layers of film while the middle of the bag has only two. This leads to a potentially weak bottom seal.

| | Width | Length | Gauge |
|---------|-------|--------|-------|
| minimum | 30" | none | 1 mil |
| maximum | 52" | none | 2 mil |

- * All custom bags require a minimum order of 2500 lbs and in full pallet increments.
- * Lead time for custom products is up to 3 weeks for delivery.
- * Lead time for stock products is up to 2 weeks for delivery.
- * Product pricing shall be price prevailing at time of shipment unless otherwise specified in writing as evidence by documentation signed by a Revolution Bag executive or appointed Revolution Bag administrator.
- * Revolution Bag reserves the right to change pricing at any time without notice, unless such right is specifically waived by written notification to the customer.
- * All custom non-stock product pricing shall be by special quotation.

PRODUCT STRUCTURE/PACKAGING

Product Structure

- Tubular no-slit seals
- Star sealed
- Coreless perforated rolls






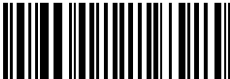
Dual Labels

- Corner label + front label
- Easy to identify in warehouse/storage

Packaging

- ✓ Corrugated carton containing recycled material
- ✓ Brown kraft
- ✓ Printed with soluble ink
- ✓ Prominently features ECOLOGO certification for LEED inspector



| | | | | | | | |
|---|-----------------|--|--|--|-----------------|--|--|
|  | |  | |  | |  | |
| Performance Standard in Lbs. | | PC39100BK | | Performance Standard in Lbs. | | PC39100BK | |
| Dry Load | Wet Load | 33 x 39 in. | | Dry Load | Wet Load | 33 x 39 in. | |
| 95 | 83 | Black | | 95 | 83 | Black | |
| Rolls/Case | 6 | 0.9 MIL / 22.86 MIC | | Rolls/Case | 6 | 0.9 MIL / 22.86 MIC | |
| Bags/Case | 150 |  | | Bags/Case | 150 |  | |
| lbs/Case - Net | 11.58 | 816228010239 | | lbs/Case - Net | 11.58 | 816228010239 | |
| Capacity - Gallons | 32-33 | <small>Exceeds the EPA comprehensive procurement guidelines for post-consumer recycle-content plastic trash bags</small> | | Capacity - Gallons | 32-33 | <small>Exceeds the EPA comprehensive procurement guidelines for post-consumer recycle-content plastic trash bags</small> | |

GLOSSARY OF TERMS

Can Liner Term used for garbage, trash or waste bags. They are used in industrial, institutional and medical applications.

Colors Can liners come in standard colors: natural, black, white, blue, and green. Custom colors are available. Revolution Bag is not able to match exact PMS numbers.

Film Strength Refers to the physical strength of the can liner. Some resins have a higher film strength than others.

Dart Drop ASTM D1709-09 test. Used to determine the resistance of a bag to local failure or puncturing of the film.

Tear ASTM D1922-09 test. A small cut is placed in the plastic sample and then the lab equipment measures the peak amount of force needed to completely tear apart the sample.

Tensile D882-09 test. Plastic is gripped and pulled apart. The value published is the peak amount of force while the sample separates. This test also measures the elongation.

Dry & Wet Load Capacity. How much dry and wet weight a can liner will hold respectfully at an established amount of time. This is an internally developed test as there is no official ASTM test method available.

Gauge Term used to describe thickness. LDPE and LLDPE can liners are measured by mil thickness and HMW-HDPE can liners are measured by micron thickness.

Mil (one thousandth of an inch) Term used in the measurement of LDPE and LLDPE can liners. One mil is .001". Can liners range between .35 – 4.0 mil

Micron (one thousandth of a millimeter) Term used in the measurement of HMW-HD can liners. 25.4 microns equals 1mil. 1,000 microns=1mm. HMW-DPE can liners are 6 – 24 microns.

Resin Short term for Polyethylene (PE) resin. The three types of PE resin are LDPE, LLDPE, and HMW-HDPE (see below). Other plastic resins include vinyl, polypropylene, polystyrene, PET, and nylon.

LDPE (Low Density Polyethylene) This resin was used with older can liner technology. Resin has good clarity but weak film strength. Today it is used primarily for food and utility bags.

LLDPE (Linear Low Density Polyethylene) This is the primary type of resin used in modern can liner manufacturing technology. Bags made from LLDPE film provide

excellent combination of film strength, puncture resistance and tear resistance.

HMW-HDPE (High Molecular Weight-High Density Polyethylene) Bags made from HMW-HDPE resin provide excellent film strength and puncture resistance, but less tear resistance than LLDPE.

Butene One of three types of LLDPE resin. Butene (good) has weaker film-strength properties than Hexene or Octene.

Hexene One of three types of LLDPE resin. Revolution Bag uses Super Hexene (best) in the manufacturing of can liners. Properties include high film strength and increased tear resistance.

Prime Resin Refers to the usage of high-quality "fresh from the reactor," resin. Can be post-industrial (scrap) or post-consumer (recycling). Property of resin is decreased each time it is reused.

Seal Term used to describe bottom of a can liner. The three types of seals are flat, gusseted, and star.

Flat Seal Straight seal along bottom of a can liner (looks like a pillow case). Though flat seals are strong, they may have a tendency to leak wet trash from the corners.

Gusset Seal A flat-style bag manufactured with both sides tucked in to form gussets. Has a tendency to leak wet trash from the center at gusset points where four layers of film meet two.

Star Seal This multilayered seal is full gusseted and then folded prior to sealing, allowing for the trash to be evenly distributed.

Top-Side Dispenser Box An innovative style of box that allows stacking in small spaces. It is just as easy to pull a can liner from the side as it is the top.

Individually Folded Can liners are separately folded then stacked on top of one another. This allows the end-user to pull liners out of the box with much more ease vs. bulk-folded bags.

Cored Rolls can liners are rolled together on corrugated cylinders (looks similar to a roll of paper towels). Can liners come inside a special box that dispenses them with ease.

Coreless Rolls Can liners are rolled in groups of 10-50 per roll. There are 4-10 rolls per case. Note: All liners at Revolution Bag are perforated on a coreless roll.

Post-Consumer Recycled (PCR) A material or finished product that has served its intended use and has been diverted or recovered from waste destined for disposal, having completed its life as a consumer item.