

## **Polyethylene Storage and Handling Guide**

### **Introduction**

EQUATE is a global producer of petrochemicals and the second largest producer of Ethylene Glycol in the world, providing reliable products and solutions that serve as the basis to everyday consumable products and participate in sustaining a better world. The Company prides itself as the partner of choice to global customers and is an active member of the community in which it supports stakeholders to attain their objectives. Leading by example in best business practices, EQUATE's investments in operational excellence and sustainable development have earned it internationally recognized achievements. The Company has adopted its Sustainability Strategy focusing on 16 strategic initiatives that it aims to achieve by the year 2025. These initiatives are divided into building a sustainable work and operational environment, innovating for a renewable and sustainable energy industry, and positively impacting the environment and local communities. EQUATE's successful partnership benefits from the advantages of combining innovation and industrial expertise with competent human resources, technological breakthroughs, rich feedstock and valuable infrastructure.

Established in 1995 as Kuwait's first international joint venture in this industry, EQUATE embodies its "Partners in Success" slogan through the partnership between Petrochemical Industries Company (PIC), The Dow Chemical Company (Dow), Boubyan Petrochemical Company (BPC) and Qurain Petrochemical Industries Company (QPIC).

### **SECTION 1: Polyethylene Storage & Handling Guide**

This Polyethylene Storage and Handling Guide is published to help customers safely handle EQUATE polyethylene resin and prevent contamination during unloading operations. The recommendations and procedures covered in the guide, where applicable, should be carefully followed.

### **SECTION 2: EQUATE Polyethylene Products and Packaging & Shipping Formats**

- EQUATE manufactures High Density Polyethylene (HDPE) and Linear Low-Density Polyethylene (LLDPE). Various grades are offered for Industrial use to produce films, pipes and molded products.
- All PE grades are supplied in pellet form. Bulk density of each grade is different due to variation in mass density and pellet shape. The average bulk density is about 550Kg/m<sup>3</sup>. LLDPE grades differ in their conveying rates due to presence or absence of slippery attributes.

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- EQUATE employs a dense phase system for conveying and transportation within its manufacturing facilities that minimizes dust contamination. However, negligible amount of dust and streamers can be present.
- EQUATE Polyethylene Palletized Products loaded in containers or trucks are loaded through designed warehousing system by using Electric forklifts , so all Palletized products are recommended to be unloaded with similar mechanism. Products unloaded by other means shall disrupt Pallet's stability and cause product damage.
- HDPE products can be pyramid stacked by using indoor storage facility , where LLDPE products shall be only allowed single stacking.
- EQUATE polyethylene LLDPE and HDPE grades are supplied in 25 Kg plastic bags or Bulk in the following packing and shipping formats:

<b>Packaging Format</b>	<b>Number of Bags</b>	<b>Net Weight, MT</b>
8- layer pallet	40	1.0
11- layer pallet	55	1.375

<b>Shipping Format</b>	<b>Pallet Format</b>	<b>Number of Pallets</b>	<b>Number of Loose Bags</b>	<b>Total Number of Bags</b>	<b>Net Weight, MT</b>
20 FT container	-	-	670	670	16.75
40 FT container	11 layers	18	Zero	990	24.75
Overland Truck	11 layers	18	Zero	990	24.75
Overland Truck	11 layers	20	Zero	1100	27.5
20FT Sea Bulk container	-	-	-	-	16.5 to 20

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### SECTION 3: Description of Palletized Packing

- Palletized Packaging units available in two types , Wooden Pallets or Plastic Pallets.
- Each palletized packaging unit consists of a wooden pallet base conforming to the International Phytosanitary Measure **ISPM 15** of International Plant Protection Convention (IPPC) branded with the seal of compliance.
- Each palletized packaging unit consist of five bags in each layer of either 8 or 11.
- Finally, a stretch hood providing maximum stability during transportation and protection of bags from external agents (rain, dust, etc) unitizes the assembly.

### SECTION 4: Sea Bulk Container Packaging

- Bulk shipments are provided in polypropylene woven liners fitted in to standard 20ft box containers. The liner has multiple ports (spouts) for unloading & loading. It is secured into the container with strap loops inserted into metal bars. The net weight of the polyethylene varies from 16.5MT to 20.0MT depending on the bulk density of the grade.
- The material is delivered on a standard container chassis for customers who have their own lifting/tilting equipment or specially built tilting frames for customers without the necessary equipment.

### SECTION 5: Potential Hazards of Polyethylene

#### **Streamers**

- Streamers are filaments of resin generated by friction of resin pellets and inner wall of pneumatic conveying pipes. Streamer can pose a safety hazard as well create feed and product quality problems. Streamers can plug filters, feeders, silo outlets, and reduce resin flow.



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### **Fines & Dust**

- Small amount of fines and dust particles are always present in pelleted polyethylene resins. Regrind, dry colorants and additives in powder form can also bring in hazardous dust particles. Such dust particles dispersed in air can form explosive dust cloud. Many colorants and additives are finer than polyethylene dust particles and thus more prone to dust explosion.
- Fines and dust also present inhalation hazard if dispersed in the work- place. The amount of dust in the work environment is regulated by standards such as OSHA 1, 910. 1000.

### **Static Electricity**

- Movement of polyethylene pellets generates static charge on their surface. The total electrical energy stored in a mass of polyethylene in a bin or silo can be quite large. However, high resistivity of polyethylene<sup>o</sup> resin prevents discharging of large surface areas by a single spark. However, an ungrounded metal piece of conveying equipment can present significant hazard as it can get charged from the polyethylene resin to a voltage high enough to jump an air gap to ground, discharging entire metal surface in a single spark.

## **SECTION 6: Control of Hazards**

### **Resin Handling Systems**

- **Avoid excessive air velocity and loading rate and consider the following for your system:**
  - Use pipes with treated internal walls.
  - Minimize number of bends.
  - Minimize resin-conveying distance.
- **Ground and maintain proper grounding of all equipment by making sure:-**
  - All conveying equipment, pipes and hoses are made of electrically conductive materials, such as, aluminum, stainless steel, conductive rubber or plastics.
  - Properly bond together all conveying and storage components including bins, rotary valves, dust collectors and internal bag cages and conveying lines both rigid and flexible such that ungrounded sections do not act as capacitors and develop large static discharge.
  - Ground all sea bulk containers while unloading material.
- **Prevent accumulation of fines and dust to prevent possible explosions: -**
  - Design and operate storage vessels and conveying systems for minimizing hazardous concentration of fines.
  - Select proper size of dust collectors for your system.
    - Keep air to cloth ratio of 5.7:1*
    - Keep superficial upward air velocity between bags below 250ft/min (76m/min).*
  - For pulse jet feature of dust collectors keep a 90psig (630kPa) pressure in the blowback manifold.
  - Ensure good housekeeping in resin storage and processing areas. Fines accumulated on walls, ceiling supports or equipment top can easily become air borne and pose a potential explosion and health hazard.

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### SECTION 7: Resin Unloading and Haulage

#### Protective Clothing

Employees handling the resin must wear the protective clothing and equipment as and when necessary.

#### Truck/Container Ranking

Park truck/container in a safe designated area with a firm, flat and leveled ground for unloading. Unloading open sided trucks shall be made without loading ramps after opening trucks sidebars, Containers and closed trucks should be only unloaded through loading door ramps with help of forklifts.

#### Loose Bags

To prevent loose bags in the top layers from falling, open one container door first and remove the bags.

Open the other door only after removing all loose bags in the top layer.

***Follow safe lifting techniques, such as the one below while picking up the bags:***

- Make sure you have a tight grip on the bag.
- Pay special attention to your grip while handling bags of LLDPE grades (i.e.: EFDC-7050 and EFDC-7087), as they can slide out of hands.
- Bend your knees and not the waist.
- Let strong muscles in your legs do the lifting.
- Do not twist your body. Twisting can overload your spine and cause serious back injury.
- Hug the bag. Hold it as close to your body as possible.
- Slowly straighten your legs.

### SECTION 8: Palletized Bags

While unloading pallets be aware of the hazards and risks associated with forklift operations. Only trained and licensed personnel should operate the forklift following manufacturer instructions and site procedures. Create exclusion zone around the truck/container. Check loads to make sure they are stable and within the capacity of the forklift. Do a trial lift to make sure the load is secure and safe on the forklift.

#### Sea Bulk Container

The equipment used by customer determines the unloading mode. Containers can be discharged by tipping them either by means of a tipping chassis on the delivery vehicle or a tipping platform, which may tilt the whole vehicle or the container alone. Properly ground the container. Connect discharge tube with the discharge spout. Connect flexible hose and tilt the container to 45 degree.

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Transfer of resin pellets to silo is done by using gravity/air, a pump or pneumatic system. Unloading rates will depend on the size of your transfer system. Use the liners air bag facility when the pellets/resins are no longer free flowing out of discharge spout to remove easily the residual product remaining at the bulkhead corners, without the operator's manual intervention, thus eliminating any risk of material contamination.

Note: It is recommended to keep one door closed while offloading, especially when the container is fully loaded in order to reduce the pressure in the sea bulk liner which should be supported by the container wall and avoid any liner failure.

Avoid spillage of resin as spilt pellets result in slippery floors. They can also seep into the drainage and cause blocking. Use vacuum to remove the spilt pellets.

### **SECTION 9: Resin Storage**

Storage of resin should not create a hazard. Bags stored in tiers should be stacked, blocked, interlocked and limited in height so that they are stable and secure against sliding or collapse.

- Ensure your warehouse/storage area is under the protection of a deluge system. It is dust-free and dry with adequate ventilation and absence of sunlight. Keep storage temperatures preferably below 40°C.
- Pallets of LLDPE grades should be stacked in a single layer - no double stacking. Loose bags stacking should not exceed more than five (5) layers.
- HDPE resin Pallets should be stacked two high maximum. The upper layer pallets should overlap the middle of the two adjacent bottom pallets in an interlocking position ( Pyramid stacking ). Loose bags stacking should not exceed more than seven (7) layers.

### **SECTION 10: Further Precautions**

- Dust can collect on the stretch hood as well as bags during transportation and storage. Care must be exercised to avoid dust contamination of the resin. Wipe the bags clean with a lint-free cloth.
- Under large fluctuations in ambient temperature and high atmospheric humidity, moisture can condense inside the packed bag.
- Under these circumstances, dry the resin before use.
- Use a sharp razor to split open the bags to avoid fiber contamination.

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- Empty bags in to a clean, enclosed feed bin or covered polyethylene lined bulk carton or drum. Remove empty bags from the processing area immediately.
- Inspect the feed apparatus for cleanliness and if necessary, wipe with a clean lint-free cloth before inserting the feed tube into the resin.

### **SECTION 11: Housekeeping**

- Do not allow waste to accumulate. Adopt a regular and frequent waste removal and cleaning procedure. Keep storage areas clean and free from all refuse and incorrectly stored materials.
- Never block fire exits.

#### **Waste Disposal Considerations**

- Polyethylene waste is not a hazardous.
- Dispose of Polyethylene waste in accordance with appropriate government and local regulations.

#### **Contact us:**

EQUATE strives to offer the best possible products and services available. Our experts are available to offer answers when you need them, as well as to expand on any of the techniques discussed here. We are also willing to visit your operations and work with you to optimize your operations.

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