IBC Utilisation Guide

IBC Handling Advice

Factors affecting PE liner performance

Chemical compatibility

UN Certification

April 2018

Introduction

Francis Ward's intermediate bulk containers include metal, plastic and composite types.

This utilisation Guide is intended to provide answers to frequently asked questions about Francis Ward IBC's. What factors affect IBC performance? Will my chemical product be compatible? What does the UN marking mean?

Should you require information not contained within this Guide please contact the Francis Ward sales team who will be pleased to assist.

IBC Handling Procedures

Francis Ward IBC's can be handled in several ways using conventional, standard equipment. No specialised equipment is required. These guidelines are intended to assist the user with establishing procedures and should always be used in conjunction with current in house operating practice and relevant legislation such as HSE "Rider Operated Lift Trucks – Operator Training COP".

Fork Lift Truck

Conventional fork lift trucks can be used however there are several checks that should be made prior to use:

1) Is the total weight to be lifted within the lifting capacity of the truck, this should also consider the height to be lifted?
2) Do the forks pass across the base fully?
3) Is the vehicle in good working order?
4) Ensure that the forks are as wide as possible and at least 80% of the width of the load to be lifted.

When lifting always try to lift from the widest side. Avoid raised loads in congested areas or where people are working.

Approach the IBC with the forks approximately 50 mm from the floor level and parallel to the base, fully enter the base until the fork back is touching or almost touching the container.

Ensure that the brake is applied. Lift the IBC approximately 50 mm from the floor. Apply suitable tilt to the forks for the next stage of the journey, this is normally tilted back towards the truck.

Travelling should always be with the load as low as possible and the speed adjusted considering the surface to be travelled across. Acceleration, braking and cornering should always be done evenly and in control. Gradients should always be addressed with the fork lift on the down side and traversing gradients should be avoided.

When raising or lowering the load the truck should be stationary and the brake applied.

Pallet Truck

Many of the Francis Ward IBC's can be handled with a pallet truck, however those fitted with anti-tilt bars or fork lift channels may not suit all types of pedestrian operated truck.

Consideration should be given to the type of truck to be used but it is not normal to attempt to move weights greater than 500 kg without assistance.

Stacking

When stacking use the lifting procedure as above with the following additional considerations:

1) Only stack containers that are designed to be stacked and ideally on containers of the same design.

2) Ensure that stacking is aligned, often the easiest way to identify this is to ensure the outlet valves are aligned.

3) Only stack containers on a smooth, even surface which is sufficiently supportive for the load. Normally containers above 2.0 m would not be stacked.

Overhead Crane

Many of Francis Ward's IBC's are designed to be lifted from above as standard, others have this facility as an option. It is important to check that this facility is available on the units intended to be lifted.

Lifting in congested areas or above a work area should be avoided.

It is advised to use a "spreader frame" during lifting to ensure that the load applied is even and correctly supported. It is normal that such equipment should be tested and approved for the load to be lifted.

Where chains are to be used it is vital that these are appropriately rated and in good order and that they are correctly secured before lifting. Units should be slung evenly and raised from four points ensuring a maximum angle of chain at 45 degrees.

Units should be raised just above ground level and held momentarily to ensure they are secure.

Factors Affecting PE liner Performance

There is a range of factors which can enhance or reduce the performance of polyethylene liners and these should always be considered when specifying IBC's for the carriage of hazardous chemicals.

Outdoor Weathering

Most plastics are highly resistant to weathering agents such as oxidation, extremes of temperature, humidity, wind, precipitation, chemical impurities in the atmosphere, fall-out, biological agents and light. They will however undergo some chemical transformation and consequent degradation when exposed to sunlight or fluorescent light for long periods. The result is discolouration, loss of clarity, loss of gloss, and tensile, impact strength reductions. Visibly polyethylenes will exhibit crazing, cracking and become increasingly brittle. In order to prevent this UV photo catalytic degradation the polyethylenes used in the manufacture of Francis Ward IBC's are UV stabilised by adding a high strength HALS type UV stabiliser to the base polymer. Even greater protection can be provided by the incorporation of a small percentage of carbon black which effectively blocks out UV light.

Chemical Attack

Oxidisers are the only group of materials capable of chemically degrading polyethylenes. The polyethylene types chosen for Francis Ward IBC's are resistant to many oxidisers but will be attacked to varying degrees by some acids.

Chemical + Physical Attack

This is encountered in two forms as environmental stress cracking (commonly referred to as ESC) and plasticisation due to absorption.

Stress Cracking

Stress cracking occurs when stress crack agents such as strong detergents are brought into contact with stressed areas of a container. If cracks are present for example as scratches or gouges the stress crack agents can cause propagation of the fracture resulting in wall failure.

The polyethylenes used in the composition of all Francis Ward IBC's have very high ESCR (environmental stress crack resistance) values. UN Group II containers use polymers which match or exceed the maximum test results achievable. In addition the rotomoulding process used to produce the IBC liners is a largely stress free process. The combination results in liners with very high ESCR properties.

Plasticisation

Polyethylene will absorb certain chemicals and this will result in swelling, weight gain, softening and some loss of stiffness. These plasticising agents do not chemically degrade the polymer and in some cases they are sufficiently volatile that their removal from contact with the polymer results in drying out and a return to the original polymer properties. The chemicals concerned are chiefly solvents and other hydrocarbon derivatives. For a variety of reasons some of these materials are not considered compatible with Francis Ward IBC's and this is indicated in the chemical listing.

Filling

When filling Francis Ward IBC's ensure that filling nozzles do not damage the neck of the container the inside of the container or it's closure.

Closures should be correctly attached and tightened to the correct torque setting defined in their relevant UN certification. Where vented closures are to be used, ensure they are in good condition, all components are present and undamaged, and that once attached, containers are only stored upright.

Temperature of Contents

Chemicals are more reactive at elevated temperatures. With some acids, raising their temperature 10° to 20° C above room temperature will cause accelerated attack of the polyethylene container wall - thermal oxidative degradation. For this reason the practice of diluting acids within Francis Ward IBC's is not recommended. The exothermic reaction which occurs can lead to premature embrittlement and potential impact failures.

Physical Abuse

IBC's that are physically mishandled, dropped or dragged on their sides are less likely to realise long service life.

If handling equipment is to be employed ensure that it is suitable for use with the IBC design.

IBC Dedication

The adoption of a dedicated IBC policy greatly improves service life expectancy. The use of individual IBC's for the carriage of more than one chemical substance is not recommended. Such practice can lead to liner failures as synergistic reactions between the residues of one product and new contents can occur. Laundering (rinsing out of IBC's) is not always effective in removing residues especially in the case of chemicals which permeate the polyethylene liner wall.

Container Laundering

It is recommended that IBC's are rinsed before initial filling in order to remove any possible contaminants from production finishing operations. This is particularly important prior to packing high purity solutions.

Rinsing out IBC's with clean water before each repeat filling helps remove residues and also prevents cross contamination.

Light Sensitive Chemicals

Chemicals which are subject to photo catalytic reactions such as Sodium Hypochlorite are best packed within black containers. This will prevent reactions occurring that could accelerate chemical degradation of the container.

As mentioned previously black containers will also provide longer service life since they are resistant to UV attack from sunlight.

Mixed Chemical Solutions

These should always be assessed carefully. The synergistic reactions possible in such formulations are often aggressive and can cause premature liner failure. If in doubt contact the Francis Ward sales team for advice.

Chemical Compatibility & Service Life

The following table is intended as a guide to the suitability of various chemicals for storage in Francis Ward IBC's. It is an amalgamation of the various standard information which normally appears on separate sheets.

Since Francis Ward has no control over the conditions of service that are encountered by individual IBC's no assurances in any form are provided.

The list of chemicals shown is of course not exhaustive. Wherever solutions are to be packed for which no data exists we strongly recommend that the end user determines acceptable compatibility by conducting laboratory tests.

Mixed chemical solutions should always be assessed carefully. The synergistic reactions possible in such formulations are often aggressive and can cause premature IBC failure. If in doubt contact the Francis Ward sales team for advice.

All advice contained here is based on ambient conditions of temperature and pressure.

Key

Compatible
Variable Compatibility
Not Compatible

Chemical		IBC Composition				Ancillaries								Comments
	Conc %	PE	CS	SS 304	SS 316	GRPP	GRPE	BRASS	CS	SS	EPDM	VITON	PTFE	
A														
Acetic Acid	≤50													
	51-80													
	≥81													
Acetic Anhydride														
Acetone														
Aluminium Chloride														
Aluminium Sulphate														
Ammonia Solution														
B														
Battery Acid	40													
Benzene														
Benzyl Alcohol														
Bleach														
C														
Calcium Chloride	All													
Calcium Hydroxide	All													
Calcium Hypochlorite	All													
Carbon Tetrachloride	10													
	Pure													
Caustic Potash	All													
Caustic Soda														
Chloro Benzene														
Chloroform														
Chromic Acid	10													
	50													
	100													
Citric Acid	10													
	50													
	Conc.													
Copper Salts														
Copper Salts Inc.Chloride														
Copper Carbonate														
Copper Nitrate														
Copper Sulphate														
D														
Detergents														Some are stress crack agents
Dichlorobenzene														
Dichloroethane														
Dichloroethylene														
Diesel														
Diethyl Amine														
Dimethyl Amine			?	?	?					?				
E														
EDTA Solutions														
Ethyl Acetate														
Ethyl Alcohol (ethanol)														
Ethyl Chloride														
Ethylene Glycol														
F														
Ferric Chloride														
Ferric Hydroxide			?					?	?					

Chemical		IBC Composition				Ancillaries								Comments
	Conc %	PE	CS	SS 304	SS 316	GRPP	GRPE	BRASS	CS	SS	EPDM	VITON	PTFE	
Ferric Nitrate														
Ferric Sulphate														
Ferrous Chloride														
Ferrous Sulphate														
Formaldehyde														
Formic Acid	0-50													
	51-100													
G														
Glycerine						?	?							
Glycol solutions						?	?							
H														
Heptane														
Hexane														
Hydrochloric Acid	All													
Hydrofluoric Acid	0-40													
	41-60													
Hydrogen Peroxide	0-60													
I														
Isopropyl Alcohol														
L														
Lactic Acid														
Lubricating Oils														
M														
Malic Acid						?	?							
Methanol														
Methyl Acetate														
Methyl Amine														
N														
Nickel Nitrate Solution						?	?							
Nitric Acid	0-40													
	41-50													
	51-70													
NTA Solutions														
O														
Oxalic Acid						?	?							
P														
Peracetic Acid						?	?							
Petroleum - Paraffin														
Petroleum - Petroleum														
Petroleum - Diesel														
Petroleum – Fuel Oil														
Phosphoric Acid														
Polyaluminium Chloride						?	?							
Potassium Carbonate													?	
Potassium Chlorate														
Potassium Chlorite													?	
Potassium Chromate														
Potassium Hydroxide	All													
Potassium Nitrate														
Potassium Phosphate														
Potassium Sulphate														

Chemical		IBC Composition				Ancillaries								Comments
	Conc %	PE	CS	SS 304	SS 316	GRPP	GRPE	BRASS	CS	SS	EPDM	VITON	PTFE	
Propionic Acid	50							?					?	Suspected stress crack agent
	100							?					?	
Propylene Glycol														
S														
Saltpetre														
Sodium Aluminate		?				?	?	?						
Sodium Bisulphite							?							
Sodium Carbonate														
Sodium Chlorate														
Sodium Chloride														
Sodium Chlorite						?								
Sodium Hydroxide	All													
Sodium Hypochlorite	All													Venting required, Black UV screen
Sodium Nitrite (liquid)						?	?	?						
Sulphuric Acid	0-30													
	31-85													
	86-90													
	91-96													
	96+													
Sulphurous Acid														
T														
Toluene														
Trichloroethylene														
Turpentine														
U														
Urea														
Vegetable & Animal Oils -														
Aniseed						?		?			?	?	?	
Beeswax						?		?			?	?	?	
Butter						?		?			?			
Camphor											?	?	?	
Castor Oil														
Cinnamon								?			?			
Clove Oil								?			?			
Coconut														
Codliver														
Corn Oil														
Cottonseed														
Fir Needle						?		?			?	?	?	
Honey						?		?			?			
Lemon Oil								?						
Linseed														
Molasses														
Nutmeg Oil								?			?	?	?	
Olive Oil														
Palm Oil														
Peppermint						?		?			?			
Pine Oil														
Sesame								?			?			
Soy Oil														

Starch														
Chemical		**IBC Composition**				**Ancillaries**								**Comments**
	Conc %	PE	CS	SS 304	SS 316	GRPP	GRPE	BRASS	CS	SS	EPDM	VITON	PTFE	
Tar Oil						?					?	?	?	
X														
Xylene														
Z														
Zinc Chloride														
Zinc Sulphate	0-50													
	51-100													

Key

? – No data, Conc. – Concentrated, PE – Polyethylene, CS – Carbon Steel, SS – Stainless Steel, SS304 – Stainless Steel, SS316 – Stainless Steel GRPP – Glass Reinforced Polypropylene, GRPE – Glass Reinforced Polyethylene, EPDM – Ethylene Propylene Diene Monomer, PTFE - Polytrifluoroethylene

UN Certification

Regulations and Testing

The packing and carriage of hazardous chemicals is controlled within the EC via modal regulations. Those most applicable to are the ADR and RID regulations which cover road and rail transportation respectively.

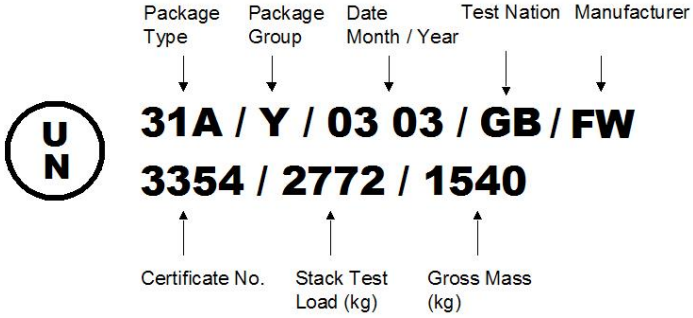
In order for an IBC to be used with hazardous chemicals it must be tested and certified in accordance with the ADR and RID regulations. The performance tests applied are those defined by the United Nations and include a bottom lift test, a top lift test, a stacking test, a leakproofness test, a hydraulic pressure test and a drop test.

IBC Marking

All chemical products have a hazard rating and an associated Packaging Group as follows:

Extreme Hazard	Group I	Pack Group X
Moderate Hazard	Group II	Pack Group Y
Low Hazard	Group III	Pack Group Z

IBC's, once tested, have to display a marking which indicates their UN test rating and packaging group. An example marking with an explanation of its components is shown below.



All UN certified Francis Ward IBC's have corrosion resistant metal plates attached to them with their respective UN marking.

Whilst every attempt has been made to ensure that the information provided in this product information guide is accurate and reliable Francis Ward cannot accept responsibility for the interpretation of the information provided. It is the responsibility of the user to determine the chemical compatibility of the container with its intended contents.

Francis Ward – A Division of The Rotational Mouldings Group
Brook House, 221 Bowling Back Lane, Bradford, BD4 8SJ, UK
Tel: +44 (0)1274 707030 | Fax: +44 (0)1274 724704 | Email: sales@francisward.com | Web: www.francisward.com