INTRODUCTION

These notes are intended for users of air lift bags who may not be trained in their use. We make no apology for the for the 'basic' nature of some of the information and ask experienced users to bear with us if we are stating the obvious. As manufacturers we are continually being surprised by the level of ignorance in the behaviour of flexible buoyancy underwater, and hope these notes go some way towards a simple and straightforward explanation.

BASIC CONCEPTS

As ambient pressure increases with water depth a flexible buoyancy unit will decrease in volume as it goes deeper because the air inside becomes compressed and occupies a smaller volume. Conversely, as it rises, the air inside will experience a lesser surrounding pressure and expand to provide a greater volume.

As the amount of buoyancy (lift) is equal to weight of the volume of water displaced, it follows that the amount of lift varies in proportion to the change in depth.

In other words, a lift bag going down is compressed and provides decreasing buoyancy while a bag coming up expands and provides increasing buoyancy.

TYPES OF BAGS

There are two basic types of flexible buoyancy units with fundamental differences

Air Lifting Bags. (ALBs)

These are designed to dynamically lift objects from depth and rise up through the water column dumping excess air from the open bottom as they ascend. They are rigged so that only a single point fixing is required and because of this they remain upright and stable regardless of the angle of the load. The larger bags can be towed at low speeds on the surface in moderate sea states and excess air can be released from a manually operated dump valve in the crown of the bag by a diver pulling a lanyard at the hem of the bag.

Inflatable Buoyancy Units (ILBs)

Sometimes referred to a Fully Enclosed Lifting Bags (FE) these units have the sole purpose of decreasing the weight of a static underwater object or providing buoyancy to objects on the surface. They are not designed or suitable for dynamic lifting from any depth. Their rigging requires multiple fixing points at set spacing and they must be kept close to horizontal at all times. Their capacity to dump excess air through Pressure Release Valves (PRVs) is limited and any outside pressure variation must be carefully controlled.

Choosing a suitable unit.

If the load is required to rise through the water column then open bottom Air Lifting Bags must be used. This covers vessel salvage and the recovery of underwater objects and they are also good for static buoyancy at any depth as they only need a single attachment point. If the load simply needs lightening or supporting on or close to the surface, then Inflatable Buoyancy Units are the best choice. Typical applications are vessel draft reduction and pipe pulls.

BAG USAGE

SAFETY

The power of a lifting bag should not be underestimated! They are the most deceptively docile pieces of lifting equipment around and just because they don't have big wires and hooks or powerful engines, people tend to forget their incredible power. A fairly modest bag, say a 5tOB, is capable of lifting 5 family cars with capacity to spare.

POSITIONING

Just as no-one in their right mind would walk under five cars dangling on a crane hook, divers should never get under the load or over the bag, nor allow their umbilicals to do so. At all times they should be aware of the consequences of gear parting and position themselves safely. While a 10t bag ripping a sampson post out of a trawlers rotten deck is a bit of a heart stopper, it's not actually dangerous unless you, your umbilical or the DSV are over the lift bag when it happens (or under where it's going to land on its return journey!), i.e. positioning is the first personal safety rule!

GEAR CHECK

It surely goes without saying that any lifting equipment should be carefully checked before use and doubly so if used underwater. Procedures for this are included with all Seaflex units.

CONTROL TECHNIQUES

CONTROLLED LIFTING

The first and most common method is slowing the rate of a free ascent by limiting 'over-capacity'. For example if a 5t unit is used to lift a 1t load from the seabed it will obviously 'lift off' when 20% inflated. As the bag rises, the other 80% is filled with the expanding air until the bag has an over-capacity of 4t. (now thrust) which converts into dramatic vertical acceleration - with often dire result at the surface! Therefore 'match the lift to the load'. One kilo extra capacity would be ideal but in practice 10% is common and 20% not unheard of.

Alternatively, a tethered ascent involves the majority of the load being supported on flexible buoyancy with the remainder, and controlling force, being provided by a light winch. In this way a 5t winch + 95t of buoyancy can bring up a 100t load under centimetre accurate control.

CONTROLLED SINKING

In the writer's experience there is no such thing as 'controlled sinking' using air lift bags alone. The moment the top of a liftbag goes below the surface it will continue to sink, and at an ever increasing rate. Where air lift bags are used for 'controlled sinking' the method usually involves maintaining volume within the bag by air replenishment and hauling down to a weight on the seabed. This operation needs careful planning and even more careful control, but in some circumstance it can provide a very cost effective solution.

While these are the most common methods of controlling bags there are just about as many different solutions as problems, so please contact us with any specific requirements not covered by these basic comments above.

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