Duty Cycle Cranes vs. Lift Cranes

The main difference between a lift crane and a duty cycle crane is its ability to dissipate heat. Lift cranes are lightweight with large counterweights designed for ease of mobilization and stability. Duty cycle cranes are designed for stability with oversized components that can withstand the shock loads of starting and reversing a counterweight and payload without overheating.

PLM engineers have designed its cranes to move a payload without moving excess weight such as hydraulic arms and cylinders. The excess weight of these components at extended radiuses will result in excessive maintenance costs without contributing to payload capacity.

Horsepower

Lift cranes being used in clamshell operations typically have smaller engines than a duty cycle crane causing them to overheat and shorten lifespan.

Construction of the Upper

Lift cranes are built up from two rails that carry bolt-on winches, counterweight and remaining components. Duty cycle crane uppers consist of a heavy bedplate to which very heavy and deep side plates are welded. The entire upper including the boom trunnions is built as one piece and then line bored for mounting the components.

Construction of the Lower

In lift crane design, the lower is built lightweight and pins together for fast dismantling and ease of mobilization. This becomes an issue in long term duty cycle work, as the pin holes become worn and elongated and the machine becomes loose. In a duty cycle machine, the entire bottom is one weldment. The axles and the crawler side frames are heavily bolted to the center frame. This gives a very solid, rigid and heavy base for the crane which will not “loosen” over time.

Single Layer Winches, 4-Rope Design

Duty cycle applications require wire rope on one layer of the drum, including the boom hoist wire, to ensure long rope life. This can only be accomplished when ropes dead end on both ends of the drum.

The photograph above illustrates the concept. Note two ropes coming from each drum, one from the right which is a right lay rope and one from the left which is a left lay rope. The ropes go straight up the boom over very large diameter sheaves down to the clam.

The clam is equipped with an internal reeving wire that connects to the closing ropes. The two holding ropes attach with chain sections to the top frame of the clam.

This principle is illustrated in the photograph below.

The clam is stable and does not require a tagline. This is important for unloading ships where the tagline rubs on hatch coamings and in dredging operations where the clam extends well below the base of the crane. In standard configuration, a 4-rope crane can dig as much as 100ft below the base of the crane. The boom hoist is designed to take the rope on one layer of the drum and is designed for continuous high speed booming needed in clamshell work and breakbulk.

Line Speed

The question of line speed is an issue of horsepower. In order to achieve high cycle times, hoisting velocity of the full load should be as much as 230 fpm and hoisting down should be in excess of 300 fpm. The engine must be sized to allow hoisting, swing and luff at full speed simultaneously without exceeding 85% of the engine rating.

Slew Bearing

The construction of the upper and the lower must be very stiff, deep and heavy structures that will not flex during high speed duty cycling. Large diameter rings are required to ensure high capacity and large radius for the swing pinions. Rolling elements must be very large, 2 inch diameter in the case of ball bearings. On larger machines, some makers use a triple roll roller bearing design. The slew bearing must be designed for at least one million cycles under full load.

Hydraulic Systems

Closed loop design is preeminent in duty cycle applications. In closed loop systems, each function has its own pump; pressure is created only when demanded. In open loop machines such as lift cranes and excavators, the pump is continually supplying oil under pressure to a valve manifold that directs oil to various functions. This creates an abundance of heat and results in short life of the pumps. PLM uses Mannesman Rexroth pumps and Motors that are designed for 5000 psi, but are running at about 2500 psi. Closed loop hydraulics operating at 2500psi to 3000psi are vital to cooler operating temperatures which achieves longevity.

Control Systems

Acceleration loads are usually ignored in lift crane design. Duty cycle cranes use pilot line control or electronic control. Duty cycle cranes are equipped with dual mode systems. In clamshell or dragline mode, boom angle is displayed digitally in the operators cab; however, the load is not indicated. Load is controlled by the size and opening of the bucket and sensors built into the winch circuits that prevent hoisting loads which are too heavy. Boom is controlled by limit switches to prevent working outside the safe range.

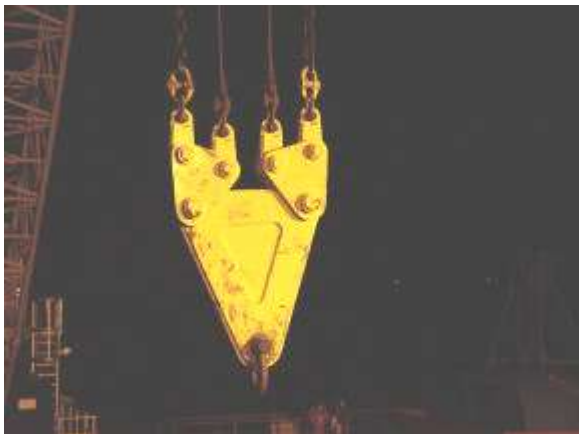
Ease of Operation

PLM Cranes have no frictions, no brakes, and no foot pedals. All functions are performed with two joystick controls, including but not limited to barge positioning.

Multi-Function

Look for a crane that is designed as a duty cycle machine that has lift crane as an optional feature, not a lift crane that offers duty cycle as an option. In duty cycle machines, a selector switch is provided in the cabin for clamshell, dragline or lift crane to enable the machine to be used for breakbulk, bulk and dragline.

The photo below shows the lifting block used for breakbulk and lift crane on a four wire crane.



In a 4-rope crane, the winches are automatically locked together so that the holding and closing lines work together without operator input.

Maintenance

The photograph below illustrates ease of accessibility.

The side panels of the crane are raised hydraulically and cover the mechanic to protect from the elements. Lights are provided inside the covers. PLM Cranes are designed for ease of maintenance. PLM offers a diagnostic package with the electronic control option that allows the mechanic to connect a pc or dial up from remote location to diagnose the crane. PLM is able to diagnose your crane remotely from the factory.

Corrosion Protection

PLM Cranes are grit blasted after all welding has been completed and are coated immediately with zinc rich epoxy. Two additional epoxy anti-corrosive coats are applied followed by a polyurethane top coat.

Boom and Sheaves

Heavy boom construction with large diameter heel pins and large diameter sheave axles are required for continuous duty cycle applications. Chord sections should be thick and must be designed as compact sections. Chords must also be thick and heavy to withstand years of corrosive service. Sheaves must be sturdily constructed with very wide bore, large diameter and open throat design for heavy side loading.

Automatic Lubrication

Autolube is a standard feature on duty cycle cranes to ensure that all points such as the slew bearing, slew pinion, head sheaves, boom sheaves, and boom trunnions receive grease.

Cabin and Comfort

PLM Cranes for barge and ship unloading come equipped with hydraulically raised and extendable cab as standard equipment. This gives the operator clear view over the cargo holds.
Standard equipment includes heating, a/c climate control, cd/radio player and comfortable seating.

Longevity

PLM Cranes are designed for 40,000 hours of continuous duty cycle work.

Parts and Service

All components on PLM Cranes are available directly from the component manufacturer, from the PLM factory, or from PLM Cranes USA's network of suppliers. Service is also available from
the PLM factory or from PLM Cranes USA's network of technicians.

Multi-Function

PLM Cranes can be used as a clamshell, dragline or lift crane, and can be mounted on crawlers, rubber tires, gantrys, or pedestals. They may also be mounted onto ships or barges. PLM offers floating crane platforms for loading and unloading ships at anchorage from barges up to panamax size ships.