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The Life Expectancy of a Lorry Loader

ALLMI TRAINING LTD
Lorry Loader Training Accreditation Service

As with all types of mechanical handling equipment, Loader cranes do not last forever and life expectancy should be a key consideration when buying either a new or second hand crane.

A Loader crane is designed around the fatigue life of the materials used in its manufacture and the life expectancy of the equipment can be expressed in terms of load cycles. Loader crane designs fall into three categories, which are dependent on their mode of operation and with each having different life expectancies in terms of load cycles.

Loading Group	Typical operation	Average load cycles	Full rated load cycles
B2	Hook Duty	60,000	20,000
B3	Grab or Bucket	200,000	60,000
B4	Timber or Scrap	600,000	200,000

A method for calculating the remaining life of a loader crane is shown below, using Brick and Block application. It is worth noting that loader cranes equipped for bucket or grab operation will almost certainly have performed a much greater number of load cycles than a crane equipped with just a hook.

While the formula below is a useful means of estimating the remaining life of a crane, it is not an exact science, many of the load cycles completed will have been less than fully rated, and a truck is often not fully loaded. There are though, systems available which provide a more accurate calculation.

Data acquisition (Data Monitoring /logging) systems are available which store information about the lifting duties that the crane has been subjected to in terms of percentage of rated capacity used and number of lifts performed. This enables the remaining life of the crane to be calculated more accurately. The data can then be downloaded and analysed by the manufacturer. The use of such systems obviously provides additional safety for the users as the correct time to replace the machine can be more accurately determined. It can also help to identify whether the crane being used is too small or, too big for the job it is performing. This information can be invaluable to crane hirers, allowing them to examine the usage to which the crane has been put by each customer.

However, when calculating life expectancy, even with data monitoring, other factors come into play. The remaining life expectancy is partly dependent on the quality of the crane's service history. This issue was discussed on this page in the October edition, highlighting how operator training can be an important factor. In fact, the operator's ability to look after the crane doesn't only apply to basic preventative maintenance, but also the way in which the equipment is operated. For example, a key part of an ALLMI training course is to stress the importance of lifting loads with the correct boom geometry. Where this is not performed, the operator may overload either the inner or outer boom cylinders, which is detrimental to the life of the crane. In fact, when buying a used loader crane it might be prudent to investigate the training level of its operators, as badly trained operators may affect any pre-purchase life expectancy calculations.

Example of life expectancy calculation

The following example demonstrates the method for calculating the remaining life of a loader crane using Brick and Block application:

Crane	10 Tonne/metre crane
Crane class	B3, 60,000 full load cycles
Chassis	26 Tonne GVM (GVW)
Chassis	7250kg kerb weight
Body	1000kg
Subframe	300kg
Grab and Rotator	300kg
Age of Loader	5 Years
Weight of Brick Pack	1100kg
Working days per Year	260 days

This example assumes that the vehicle is loaded with a fork truck and that two full trips are made every working day. Be aware that if a lorry self loads, as well as off loads, then the number of load cycles will be double that shown. Each load is considered a full rated load. It should also be noted that a number of other operational and demographic factors could further influence the accuracy of the calculation.

Step One

Add all the component weights of the vehicle and subtract from the GVW to obtain the vehicle's Payload.

	Weight
Chassis kerb (inc. fuel)	7250kg
Crane	1500kg
Body	1000kg
Subframe	300kg
Grab + Rotator	300kg
Total	**10350kg**
Gross Vehicle Weight	26000kg
Payload	**15650kg**

Step Two

To calculate the maximum number of packs of bricks the vehicle can carry. Divide the Payload figure by the weight of a single pack of bricks.

$$\frac{15650}{1100} = 14 \text{ Packs}$$

Step Three

To calculate the number of packs carried in one day. Multiplythe maximum number of packs that can be carried by the maximum Number of trips made per day.

14 x 2 = 28 Packs per day

Step Four

To calculate how many fully rated load cycles that the crane would have expended during its life.

Multiply the number of packs carried per day, by the number of working days in a year, and the age of the loader crane in years.

28 Packs a day x 260 days a year x 5 years = 36,400 completed cycles

Step Five

Calculate the remaining load cycles by subtracting completed load cycles from total number of fully rated load cycles as specified in the loader cranes loading group, i.e. B3

60,000 – 36400 = 23600 cycles remaining

Step Six

To calculate the maximum life remaining in the loader crane. Divide the number of fully rated load cycles remaining bythe number of packs carried per year.

$$\frac{23600}{28x260} = \textbf{3.2 years life remaining}$$