Understanding GET Duty Ratio Implications

Preamble:

This Guideline provides clarification regarding the very significant difference between "GET Life" as measured by machine hours and Actual "GET Life" (hours engaging the ground). It is generally quite inaccurate, and potentially very misleading, to measure and compare GET performance based on machine hours alone, and "Duty Ratio" is just one of the significant reasons why.

Definition:

For the sake of this Guideline, GET Duty Ratio is defined as the ratio of actual time in which the GET components are engaging the ground in motion ("wearing") versus the amount of time in which the machine service meter is activated (clocking machine service hours).

A Very Significant Difference!

In a typical truck loading application (loading soil or rock into haul trucks, with trucks always ready and waiting so as to exclude any waiting time), the GET components are generally only engaging the ground in motion for the following % of Service Meter hours (GET Duty Ratio):

- 23~27% for med~large Wheel Loaders in V-shape Loading operations
- 25~30% for med~large Excavators (Backhoe) in 45-degree bench loading (trucks below)
- 20~25% for med~large Excavators (Backhoe) in 120-degree bench loading (trucks same level)

**Based on standard assumptions as follows, sourced from major machine manufacturer data -*
Job Efficiency: "Average~Good" = 80~83%
Avg. Total Cycle Times: 50 secs for V-shape WL, 28 secs for 45deg Exc., 37 secs for 120 deg Exc.
Avg."Load/Dig" Times: 15 secs for V-shape WL, 10 secs for 45deg Exc., 10 secs for 120 deg Exc.

Example: In 1000 service meter hours of (solely) V-shape loading operations, the GET on a Wheel Loader will likely only engage the ground in motion (wear) for 230~270 hours maximum.

Other Machine Applications

The above Duty Ratios assume constant loading operations in the nominated application (no clean-up, scraping rock walls, etc). Other operations can vary Duty Ratios significantly. Some examples:

- Higher Duty Ratios: Scraping rock walls, cleaning up truck loading areas, maintaining haul roads, etc, will all lead to higher Duty Ratios, sometimes higher than 50%!
- Lower Duty Ratios: Waiting time between dump trucks, load-and-carry operations, larger swing angles and extended cycle times, etc, will all lead to lower Duty Ratios.

Higher Duty Ratios REDUCE life as measured by service meter,
while lower Duty Ratios INCREASE it.

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So, What Does This Mean In Practice?

Even small changes in working conditions or machine application can drastically change the GET Duty Ratio, and therefore drastically alter the GET life as measured by the service meter.

Examples:

- Small But Significant:
  If a wheel loader which has previously been utilized purely for V shape loading operations with some waiting time between trucks (Duty Ratio 20%), is then utilized for clean-up duties of only 5 minutes extra each Service Meter hour (instead of waiting for trucks), the GET will likely spend an extra 3 minutes per hour engaging the ground. The result is that the Duty Ratio will increase 20%.
  Therefore, if the initial GET life as measured by the service meter was, for example, 1500 hrs, the increase in Duty Ratio due to 3 minutes of cleanup per hour would reduce this to 1200hrs (300 service meter hours less life).
- Extreme But Quite Realistic:
  If a quarry excavator which has previously been utilized purely for 120 degree loading operations (Duty Ratio 20%), is then moved to alternative work cleaning up rock walls, the teeth could plausibly then be engaging the rock walls for 50% of each service meter hour. As such, the Duty Ratio is now more than double, at 50%!
  Therefore, if the initial GET life as measured by the service meter was, for example, 600 hrs, the increase in Duty Ratio alone, due to changed application, would reduce this to just 240 hrs!

Alternative Methods For Assessment?

Measuring and comparing GET performance by "cost/ton" is generally promoted as a more reliable methodology, and it generally is so for production machines. Note, however that it can still provide very inaccurate results, as any increase in non-loading duties (such as clean-up, scraping walls, etc.) will significantly increase Duty Ratio and wear rates while reducing tons loaded (productivity). As such "cost/ton" comparisons are also potentially misleading. A practical comparison of available wear material and relative metallurgy of components is generally a more reliable indicator of *Actual* GET life potential, though many variables still remain.

Summary Warning:

As can be seen, any minor alteration in application or operating cycles has the potential to significantly alter Duty Ratio and therefore GET Life as measured by service meter. Many times these alterations are small and go by unrecognized, making Service Meter GET life a misleading and inaccurate means of comparing GET performance.