

Swing Performance And Rating Procedure, Material Handlers, Knuckle Boom Log Loaders And Certain Forestry Equipment

1. Scope—This SAE Standard describes a uniform method to calculate and specify swing performance characteristics of material handlers, knuckle boom log loaders, delimbers, feller bunchers, harvesters, processors, and other knuckle boom material handlers. It establishes definitions and specifies machine conditions for calculations and tests. This document applies to knuckle boom log loaders as defined in SAE J1209 and SAE J2055 and to certain forestry equipment defined in SAE J1209 and ISO 6814 that have rotating upper-structures such as feller bunchers, harvesters, processors, and forwarders. Included in the definition of knuckle boom log loaders are behind the cab and rear-mounted log loaders not having their own power supply.

1.1 Purpose—The purpose of this SAE Standard is to establish a consistent, repeatable means of determining and specifying the swing performance for the types of equipment contained therein.

2. References

2.1 Applicable Publications—The following publications form a part of the specification to the extent specified herein. Unless otherwise indicated, the latest revision of SAE publications shall apply.

2.1.1 SAE PUBLICATIONS—Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

SAE J745—Hydraulic Power—Pump Test Procedure

SAE J746—Hydraulic Motor Test Procedure

SAE 1209—Identification Terminology of Mobile Forestry Machines

SAE J1349—Engine Power Test Code—Spark Ignition and Compression Ignition Net Power Rating

SAE J2055—Identification Terminology and Component Nomenclature—Knuckle Boom Log Loader

2.1.2 ISO PUBLICATION—Available from ANSI, 25 West 43rd Street, New York, NY 10036-8002.

ISO 6814—Machinery for forestry-mobile and self-propelled machinery—Identification vocabulary

2.2 Related Publication—The following publications is provided for information purposes only and is not a required part of this document.

2.2.1 SAE PUBLICATION—Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

SAE J1371—Hydraulic Excavator Swing Performance and Rating Procedure

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3. Definitions

3.1 Swing—The rotation of the upper-structure with respect to the undercarriage.

3.2 Rated Engine Speed, N_r —As defined in SAE J1349 and specified in revolutions per minute.

3.3 Swing Reduction Ratio, P_r —The total gear ratio between the swing gear and the swing pinion. It shall be determined by using Equation 1:

$$P_r = \frac{\text{Number of teeth of swing bearing gear}}{\text{Number of teeth of swing drive pinion}} \quad (\text{Eq. 1})$$

3.4 Swing Motor Speed, S_m —The output shaft rotational velocity, in revolutions per minute, as determined according to SAE J746 at the hydraulic pressure differential required to sustain swing motion on a level surface.

3.5 Swing Motor Torque, T_m —The maximum output torque, in Newton Meters, of the hydraulic drive motor(s), at stall pressure and determined according to SAE J746.

3.6 Hydraulic Pump delivery, Q_p —The output flow in liters per minute, with the engine at rated engine speed, N_r , of the pump supplying oil or the flow limit of the swing control valve to the hydraulic swing motor(s) as determined according to SAE J745 and at the hydraulic pressure differential required to sustain swing on a level surface.

3.7 Swing Control Valve—The valve or valve section that controls the flow of hydraulic oil to operate the swing motor(s). The valve controls clockwise and counterclockwise swing operation.

3.8 Gear Reduction Ratio, R_g —The total gear reduction ratio between the swing motor and the swing pinion.

3.9 Gear Efficiency, E_g —That proportion of power expressed as a percentage, transmitted through the total gear system. For the purpose of developing uniform ratings within this document, an efficiency no greater than 98% should be used for each spur gear mesh or planetary set. E_g is the multiple of all individual gear set efficiencies.

3.10 Swing Control—The control that activates the pump or the swing control valve to swing or rotate the upper-structure in either a clockwise or counterclockwise direction.

3.11 Operating Mass, M —The total mass specified in kilograms, of an upper-structure and attachment equipped ready to perform its intended function, in standard configuration as defined by the manufacturer. Included in the operating mass is a 75 kg allowance for the operator, full fuel tank, the mass of all oils and greases necessary to fill oil reservoirs, and lubrication compartments to the specified levels and the mass of the standard bucket, magnet, grapple, or processing head.

3.12 Operating Weight, W —The weight of the upper-structure and attachment specified in units of force, Newtons, where:

$$W = 9.807M$$

3.13 Rated Swing Speed, S_n —The swing speed at Rated Engine Speed, N_r , determined using Equation 2 and specified in revolutions per minute.

$$S_n = \frac{S_m}{(P_r)(R_g)} \quad (\text{Eq. 2})$$