



22nd July 2014

Re: Coroner's Report - Kimberly Depot Accident: 5th June 2013 / Genie Z135/70

Dear Sir,

The following is a response to the Regulation 28 Report issued on 30th May 2014. Following the accident on 5th June 2013 at the Kimberly Depot in the United Kingdom, Genie Industries, Inc. conducted a full investigation of the accident. In addition, Genie has thoroughly reviewed and confirmed the design, testing and manufacturing procedures for the Z135/70. Based on the information and data available, Genie believes that the machine became unstable because it was mis-calibrated. These conclusions are consistent with the findings made by [REDACTED]

On 29th July 2013, Genie issued a mandatory Safety Notice that requires all Z135/70 owners to remove their machines from service and to confirm that the secondary boom angle sensor on all machines is calibrated correctly before returning the machines to service in accordance with the procedure set out in the Safety Notice. A copy of the Safety Notice is attached hereto. In addition, through research and development efforts, Genie has updated the controller software that, in the event of a mis-calibration, prevents machine instability. The following four updates to the control system software are discussed below. These changes update the calibration and operation of the secondary boom angle sensor.

Software Update No. 1 - Value too High Voltage Diagnostic. The voltage diagnostic for a "Value Too High" has been recalculated based on the sensor range. Working in tangent with software update no. 2 Secondary Boom Up During Extend, if the sixth point is calibrated at a value lower than the maximum angle, the boom will continue to rise until reaching the new closer "Value Too High" diagnostic. This diagnostic informs the control system to stop functions associated with the diagnostic.

Software Update No. 2 - Secondary Boom Up During Extend. Secondary boom up is energized for 20 seconds anytime the secondary extend function is activated. Looking at the hydraulic system, if the boom is left in the raised condition and the oil is hot and allowed to cool the boom potentially can lower a couple degrees due to the thermal state change of the hydraulic oil. Thus, if secondary extend is activated, the secondary boom up output is enabled at 50% for 20 seconds. This lifts and pressurizes the lift cylinder to hold it at maximum angle.

Software Update No. 3 - Primary and Secondary Calibration Windows. The earlier revisions of the software only required that all calibration points were ascending in output voltage. The latest version has "windows" in degrees and voltage for each calibration point. The windows were developed from a statistical analysis of data obtained from



existing production machines for angle vs. output voltage. Now each calibrated point must reside in an expected range of output voltages.

Software Update No. 4 – Active Crosscheck Fault. *Note: This update is not related to machine instability or mis-calibration.* If the output of the angle sensor remains constant for more than 7.5 seconds while the boom up or down directional or proportional valves are active then a fault will be declared. This cross-check should apply only if the angle sensor is in the middle 80% of its range, the function input is greater than 50%, and the auxiliary power is not active.

The updated software no longer tolerates an incorrect secondary boom angle calibration. If the machine is mis-calibrated, the software faults the machine out in a stable and safe position as designed. The fault interrupts machine movement automatically and prevents further boom extension eliminating the potential for machine instability.

Genie requires operators to conduct a pre-operation function test from the ground controls before entering the platform. Any errors in calibration or machine faults will be detected during this inspection. However, in the event of a fault during operation from the platform, certain machine functions will remain active, allowing the operator to lower the platform safely. Genie began installing the updated software on the Z-135/70 manufacturing line on 1st April 2014. As of 14th July 2014, Genie has made this updated software available to all Z135/70 owners. On the 14th July 2014, Genie issued a Service Advisory to all Z135/70 owners. This advised owners to install the software in a number of situations including when the secondary boom angle sensor needs to be calibrated for any reason. A copy of the Service Advisory is attached hereto. Genie's actions have eliminated the potential for machine instability due to human error.

Genie has also carefully evaluated the design alternatives proposed by Kimberly, and adopted by [REDACTED] (discussed in detail below). Based on Genie's analysis, evaluation and engineering experience, the proposed alternative designs do not address or prevent the root cause of this June 2013 accident. As noted above, the accident occurred because the boom was mis-calibrated. The designs suggested by Kimberly will not prevent mis-calibrations. The proposed switch can be mis-calibrated or fail leading to instability

Genie installed and evaluated several switch ideas onto a prototype Z135/70 machine to examine the implementation of this design. While the intent of the proposal was to prevent the type of accident experienced, the switch will not prevent machine mis-calibration and requires a custom installation due to the design tolerances between the secondary boom and the turntable connection.

The proposed switch also adds to complexity and requires an additional, separate calibration procedure. The switch would have to be calibrated after the angle sensors are calibrated.



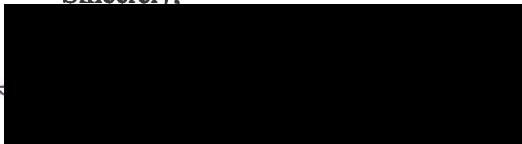
Genie's assessment is that the switch does not comply with Performance Level D requirements of EN280 and EN ISO 13849. In general, safety-related parts of a control system that performs a safety function must satisfy the following requirements:

- Well tried component;
- Be monitored for failure;
- If used in line with power to output, it must be normally closed forced open in an unsafe condition;
- Be redundant. No single failure would result in the loss of safety.

The proposed switch does not meet any of these requirements. Unlike the dual (redundant) angle sensors used on the Z135/70, this single mechanical switch operates separate from the control system. If the switch is damaged or is improperly calibrated, the control system will not be able to detect the problem.


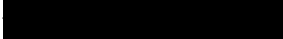
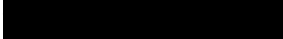
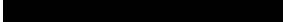
In conclusion, Genie has appropriately addressed the issue of mis-calibration by updating the software in the control system and making it available to all Z135 owners. The accident on 5th June 2013 would not have happened had the machine been properly calibrated. If an error is made during calibration, Genie's updated software addresses this issue and prevents machine instability. Kimberly's proposed design modifications do not prevent machine mis-calibration, are unreliable within the application of a Z-135/70, are subject to human error, do not comply with industry standards, and add unnecessary complexity to the machine.

Sincerely,



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Enclosures:

- 1 Mandatory Safety Notice dated 29th July 2013
- 2 Service Advisory dated 14th July 2014