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NO-TWIST Mill Gear Specifications

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MORGAN CONSTRUCTION CO.
ROLLING MILL DEPT. MEMORANDUM

TO: As Noted

DATE: 31 July 1967

FROM: Norman A. Wilson

SUBJECT: NO-TWIST Mill Gear Specifications

We have reviewed the NO-TWIST Mill gear specifications in order to determine if the AGMA quality class can be lowered in an effort to reduce cost. This review was based upon our shop test experience, operating results at STELCO, and the MTI vibration and noise observations made at STELCO.

It is our conclusion, which is supported by Darle Dudley, that the AGMA quality class cannot be reduced without a detrimental effect on the performance of the NO-TWIST Mill. Decreasing the quality class increases the permissible gear errors. Increased errors will in turn increase noise levels, and torsional vibration amplitudes, and reduce gear capacity.

The noise level as measured by MTI was just below the limits established by STELCO for 40 hours per week exposure. It is not unreasonable to expect an increase in noise level as the present gears wear. Thus it can be assumed that any relaxation of gear tolerances could create a noise health hazard.

The MTI report indicates that the torsional vibration amplitudes with dampers, are all "low" severity. However, they noted that in some instances the torsional vibration levels increased by more than 100% in eight months. If gears of a lower accuracy were specified, the torsional vibration levels would be higher initially accompanied by a more rapid deterioration rate in spite of the use of dampers.

The load carrying capacity of the gears would decrease rapidly with less accurate gears. A reduction of 1/3 in fit across the face width and similar reduction in profile would reduce the capacity by 55%.

Thus, the manufacturing tolerances should not be changed for any gearing used in the NO-TWIST Mills.

There are two possible means of achieving a cost reduction in the bevel gears only. The first would be to manufacture the bevel gears from medium hard forgings, but with the same manufacturing tolerances in order not to further reduce load capacity. Gears of AGMA quality 12 can be finish cut on a Gleason #26 generator. 

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This would eliminate carburizing and grinding. However, before proceeding with this change, two pairs of bevel gears, one pair each for #16 stand and #23 stand, should be manufactured and installed on an operating mill.

The second means would require some engineering. This would require selecting line shafts' speeds that would permit the use of four ratios common to four oval and four round stands. Thus, the number of ratios would be reduced from 8 to 4. In addition, the largest gears that can be fitted into each box should be used for each ratio. The durability capacity would increase as the ratio of the squares of the diameter with the strength increasing directly.

If the medium hard bevel gears without grinding prove to be satisfactory, then more gear sources become available.

Norman A. Wilson