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Visit to Indiana Gea and Mr. D.W. Dudley to Discuss Gearing for Stelco No-Twist Mill

Robert D. Wykes

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MORGAN CONSTRUCTION CO.
ROLLING MILL DEPT. MEMORANDUM

TO: As Noted

FROM: Robert D. Wykes

DATE: 5 January 1965

SUBJECT: Visit of Indiana Gear and Mr. D. W. Dudley to Discuss Gearing for Stelco No-Twist Mill

Present: D. W. Dudley (M. T. L.)
G. T. Fogas, A. Korman (Indiana Gear Works)
W. Morgan, D. Sieurin, E. W. Randall, M. Knott
R. Smol., A. Rich, R. D. Wykes (M. C. Co.)

The following points were discussed:

Gearing

Tooth Profile Modifications - This should be depicted on the gear drawings using an involute chart as shown on page 71 of Mr. Dudley's "Practical Gear Design". Gear tooth inspection should be made to check the involute form first, then the tip relief should be checked from the actual start of the modification, not the theoretical start.

Reference Axes - Mr. Korman requested that reference axes be established for all gears and shafts to ensure pitch line accuracy during operation. For gears being cut on shafts, the reference axis should be established at the bearing journals. For separate gears (e.g. driven bevel) it should be established at the back mating face and the bore of the gear.

Mounting of Bevels - With both lineshaft and driven shaft in place, the driven shaft will be set to a given distance from the center of the lineshaft. Indiana Gear will machine a circular area on the end face of the driven bevel, and will stamp there the exact distance from that face to the pitch apex. A corresponding section of lineshaft will be ground concentric, so that by the use of an inside micrometer the driven shaft can be shimmed to the correct mounting dimension. The lineshaft thrust bearing will then be shimmed to obtain correct backlash.
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Drawings should carry instructions covering this.

Bevel Gear Backlash - Mr. Dudley felt that bevel gears should be designed and cut for a normal backlash of .007" - .009" and shimmed at assembly to give .012" - .014" when mounted. This will allow for the anticipated expansion of the driven shaft. Mr. Korman favored allowing larger backlash in manufacture. It was agreed to seek the advice of Gleason in this matter.

The Following Notes Should be Added or Changed

Dwg. 164577

1 (c) - Change to: "Stress relieve at 1060° F".

1 (g) - Add: "Reference surfaces to be ground".

2 (a) - Add note defining tooth spacing requirements, using "Gear Handbook" page 23,22 as guide for correct wording.

3 (a) - Change so that individual members are balanced by gear manufacturer.

Add note to all reference surfaces requiring axial runout to be held to .003 max. and radial runout to be held to .0005" max. relative to reference axis.

Dwg. 164527

2a - Add involute chart to show profile modification.

2b - Change pitch tolerance note as for bevel gears.

Add 2c - Lead tolerance to be held to .0005" on face width instead of .0009" called for by AGMA.

Indiana Gear suggest a note after 1 (k) covering Nital Etching as a means of inspection for grinding wheel burns. They will send us details of a suitable note.

They also suggested that all gear drawings should carry a note for Magnaflux inspection, and here again they will send details of such a note.
Accuracy and Cost - Mr. Korman was questioned on the ability of their Gleason 26 Machine to cut the bevel gears to AGMA class 12 accuracy. He assured us that such gears were produced by this machine as a matter of standard production. Furthermore, so long as the gears are being cut on the Gleason 26 the cost would be the same, regardless of the class of accuracy we specified. The cost would be substantially increased, however, if we felt it necessary to go to ground gears to obtain class 12 accuracy.

V. and H. - Mr. Korman voiced concern over the proposed V. and H. checks. He was confident that, given our worst conditions of shaft alignment, he could produce a pair of bevels which he would be able to check for good tooth bearing under these extreme shaft positions. However, until he had seen the Gleason requirement for V. and H., he could give no guarantee that their contact specifications could be met.

It was agreed that M. Knott should visit Gleason to discuss V. and H., backlash, internal bolting in gearboxes etc. This trip has since been scheduled for 7-8 Jan. 1965. W. Morgan and M. Knott will visit both Gleason and M. T. I.

In summing up this V. and H. problem, it can be said that there appears to be no doubt in the minds of Mr. Dudley or the Indiana Gear people that a satisfactory tooth bearing can be obtained; the problem is rather a fine difference over the type of tooth bearing pattern required and the means of specifying it.

General Design - Mr. Dudley was shown our proposed labyrinth seal for the lineshafting. The design differed from the labyrinth seals with which he was familiar. He expressed surprise at the proposed use of packing to exclude water. He promised to send us such information as he had on labyrinth designs.

Mr. Dudley was asked to comment on the mill supporting structure from the point of view of vibration. He said he would like photographs of the model, or the model itself, and such drawings as were available, so that he could consult with his associates at M. T. I. on what measures we could take to reduce the chances of noise in the structure. W. Morgan and M. Knott will take this information when they call at M. T. I.