THE EFFECT OF STAMPING BURRS ON INTERLAMINATION RESISTANCE

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Booster dipole shaped laminations were punched from silicon steel using an existing die which was designed to punch thicker material. As a result a sizeable burr was turned up on the periphery of the bunching.

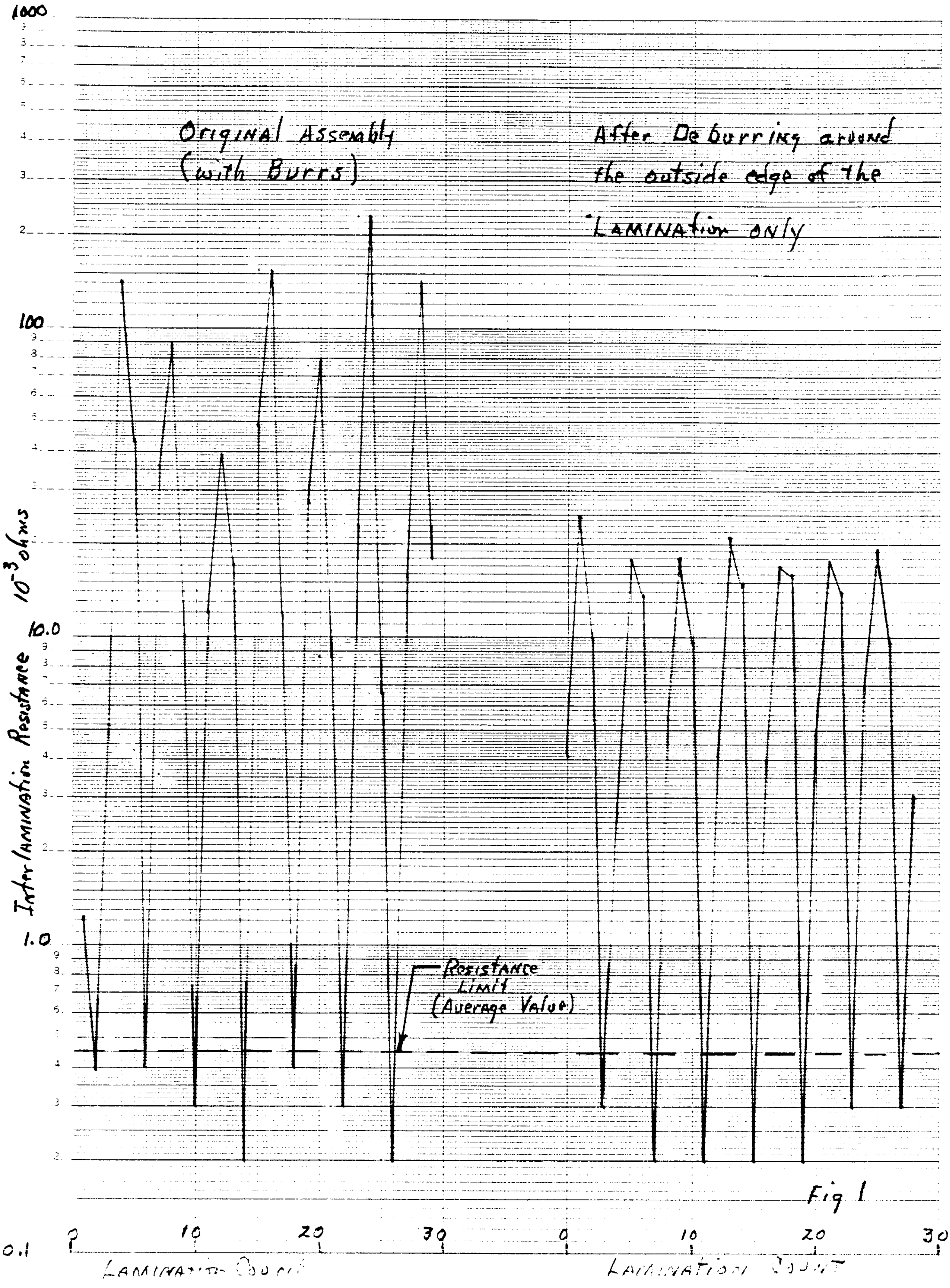
The following experiment was conducted to determine the effect of this burr on the interlamination resistance of a stack of these laminations assembled and pressed as planned. Four assemblies are made after the deburring described.

1. No deburring, assembled as received.
2. Hand filing of the outer periphery of the lamination only.
3. Hand filing of the remainder of the lamination periphery.
4. Sanding (light) of the "burr side" of the lamination.

The interlamination resistance was measured on each assembly and the results are shown in Figures 1 and 2. The laminations were turned and flipped so as to cancel punching errors and rolling asymmeties. This flipping altered the burr orientation, in one of four locations the burr sides were facing. In two locations the burr faced the back side of the adjacent lamination and in one both back sides were adjacent. When the burrs faced each other they touched and shorted, lowering the interlamination resistance. This pattern is clearly shown in the results of all four experiments. It was hoped that deburring the outside periphery would raise the interlamination resistance but the opposite was the result. Deburring all of the periphery edges did produce the desired result moving all of the interlamination resistance values,except one, above the limit set by Morgan in Booster Tech. Note No. 29. Sanding of the lamination produced the opposite result and must have widened the burr contact area making the resistance go down instead of up.

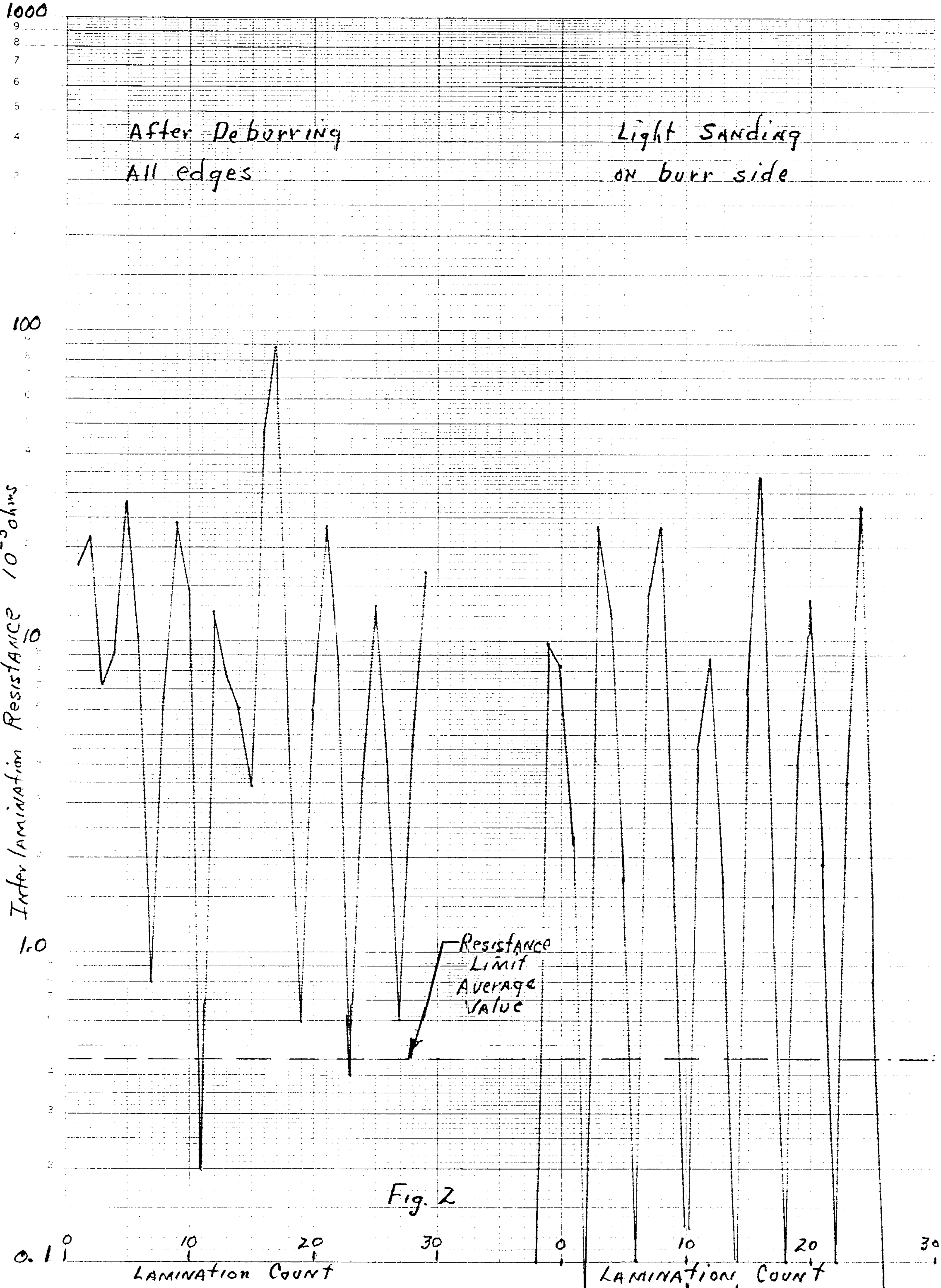
While proper deburring works, and no short-cut was found, an examination of the original effect of the burrs on the interlamination resistance reveals that it would be acceptable for material of this thickness (.026 inches). In an analysis presented at the June, 1986 Booster Review, Morgan finds the thickness limit a low silicon steel, M43, to be .035 inch. If 0.026 inch steel is used and every fourth lamination is shorted, the effect is to have one 0.052 inch thick lamination followed by three laminations of 0.026 inch thickness. Since the eddy current effects add as the square of the lamination thickness, the total effect resulting from this lamination arrangement is the same as that which would result from a set of uniformly thick laminations whose thickness were 0.034 inches. This thickness is less than the thickness limit set by Morgan and is, therefore, acceptable.

We wish to thank John Tradeski for his workmanship, skill, and helpful consultations in performing these tests.



Original Assembly (with Burrs)
After Deburring around the outside edge of the Lamination only
Interlamination Resistance 10^{-3} ohms
1000
100
10.0
1.0
0.1
Resistance Limit (Average Value)
0
10
20
30
0
10
20
30
Lamination Count
Lamination Count

Fig 1



1000
After Deburring
All edges
Light Sanding
on burr side
100
Interlamination Resistance 10^{-3} ohms
10
1.0
Resistance Limit Average Value
0.1
0
10
20
30
Lamination Count
0
10
20
30
Lamination Count

Fig. 2