HIGH SPEED CURRENT COLLECTION - THE 'ROMAN' EFFECT

Whether on an overhead line or a rigid rail, heating of a current collector occurs as a consequence of three factors:

a) Mechanical friction between the two surfaces in relative motion
b) The contact resistance
c) The collector resistance

(a) and (b) are well known and it may be assumed that the design of a collector will be sufficiently adequate to allow for head dissipation. The third cause (c) is also known and for speeds generally relevant to the railway systems of today it is not a problem, the cross-section of the collector transverse to the direction of current flow being adequate in terms of maximum current density.

However, it has hitherto been assumed that the current density will be uniform over the cross-section, and although this is substantially true when the collector is stationary, it is certainly not the case as soon as relative motion occurs. At today's maximum speeds this loss of uniformity is not, apparently, significant but nevertheless a concentration of current in part of the cross-section will increase the effective resistance of the collection and hence increase the electrical heating.

The purpose of this report is to attempt a simplified and qualitative explanation of this phenomenon which may be referred to as the 'Roman effect'.

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