



## TRACTION OPTIMIZING PLUG-IN SYSTEM (TOPS)

- Replaces existing WS-10, WS-11 and IDAC panels
- Increases adhesion up to 57% (25.12% on wet track)
- Simple installation-no transducers or axle generators
- Plug compatible with existing modules and panels
- Backward compatible-unplug TOPS and plug in WS-10
- Reduces sand usage-uses sand as a last resort
- Motor management-protects motors from overheating
- Fail safe operation-allows limp home capability
- Linear excitation control-not a bang-bang controller
- Never exceeds the system ratings of O.E.M. equipment

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## ELCON, INC.

**ELECTRICAL CONTROLS AND CONTROL SYSTEMS**

### THE MOTIVATION

Older locomotives' analog wheel-slip controller, e.g. the SD40-2 locomotive's WS-10 wheel-slip control module, provide adhesion levels which are significantly lower than those provided by contemporary microprocessor controlled locomotives. Even when operating with good track conditions, available tractive effort from older locomotives is low. The situation with poor track conditions is even worse.

Additional locomotive power is required to sustain a given load when compared to newer high adhesion locomotives. In addition, fleet management with older low adhesion locomotives is more complicated. The results of mixing low adhesion and high adhesion power must be managed effectively.

### THE SOLUTION

TOPS focuses directly on main generator current maximization. It uses existing locomotive wheel-slip signals (WST and WSR) and monitors main generator voltage and main generator current to drive a fuzzy logic current maximizing controller. Advanced signal processing routines tune the locomotive signals for input to the fuzzy logic controller. The system ensures that the locomotive-to-locomotive parameter variations do not adversely affect operation (e.g. locomotive weight, traction motor type, wheel size differences, as well as, wheel-to-wheel mismatch).

In head-to-head performance testing against the WS-10 system (with tests designed and executed by an independent railroad), TOPS dramatically outperformed WS-10. On dry track, TOPS achieves 27% adhesion to the WS-10's 19%. On wet track, TOPS achieves 25% adhesion to the WS-10's 16%.



QUALITY AND INNOVATION SINCE 1953

