Energy Consumption Report
KELTRACK® HiRail
Western Canadian Freight System

EXECUTIVE SUMMARY

The objective of this two-week trial was to determine the potential magnitude of fuel savings achievable by applying a top of rail friction modifier on the Tumbler Ridge subdivision using a Hi-Rail vehicle prior to the departure of a fully loaded coal train. The proposed methodology involved calculating theoretical fuel consumption rates from locomotive throttle notch settings and plotting them as a function of train speed for a given segment of track. Comparison of baseline and conditioned rail fuel efficiency factors were used to determine % fuel savings. Other analysis performed with the trial data collected investigated the TOR friction modifier impact on train handling.

The results of the test were as follows:

	Grade	Baseline (GTM/Gallon)	KELTRACK® Conditioned (GTM/Gallon)	% Savings
Segment 1	Uphill	486.3	480.2	-1.2%
Segment 2	Uphill	309.7	306.4	-1.1%
Segment 3	**Flat**	**699.1**	**737.7**	**5.2%**
Segment 4	Downhill	6057.5	6094.2	0.6%
Segment 5	Downhill/flat	2548.4	2344.2	-8.0%**

** Fewer data points collected

No extraordinary train handling issues were reported. Some minor wheel slippage was observed during the last day of testing but was attributed to a heavy frost on the rail when the loaded consist left Teck in the early morning.

Analysis of the data also involved modeling the Tumbler Ridge sub-division using a form of the Davis Equation to determine train resistance for a typical consist. Results of this analysis indicated the following:

- *Modeled train resistance values correlated with calculated fuel efficiency factors.* The model demonstrated that as the train resistance values increased (mainly due to the presence of uphill grades), the fuel efficiency factor decreased.

- *Benefits of TOR friction modifiers can be "masked" by use of self-steering trucks.* Self-steering trucks are also designed to reduce curving resistance. As a result, the baseline conditions for this trial were lower resulting in less potential savings.

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- *Optimal energy savings will occur on flat/rolling corridors with a high density of sharp curves*. The model accurately predicted a minimal savings when the consist is traveling in corridors with steep (uphill) grades and/or is in continuous dynamic braking (downhill). The primary impact that TOR friction modifiers can have on reducing train resistance is by reducing curving resistance. When operating in a hilly environment, *the most significant drag impacting on train handling is grade*. In many instances, the resistance due to gravity can be higher than all the other resistances combined. The model also predicted that the largest reduction/savings would be observed in segment 3 which was a relatively flat grade.

Note: To obtain a copy of the full report or find out the identity of the Western Canadian Freight System, please contact John Milobar, Vice President Sales & Marketing at 604-984-6100 or jmilobar@kelsan.com.