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## SmartLube™ Economic Benefit Analysis Model for Analyzing Alternate Lubricant Types

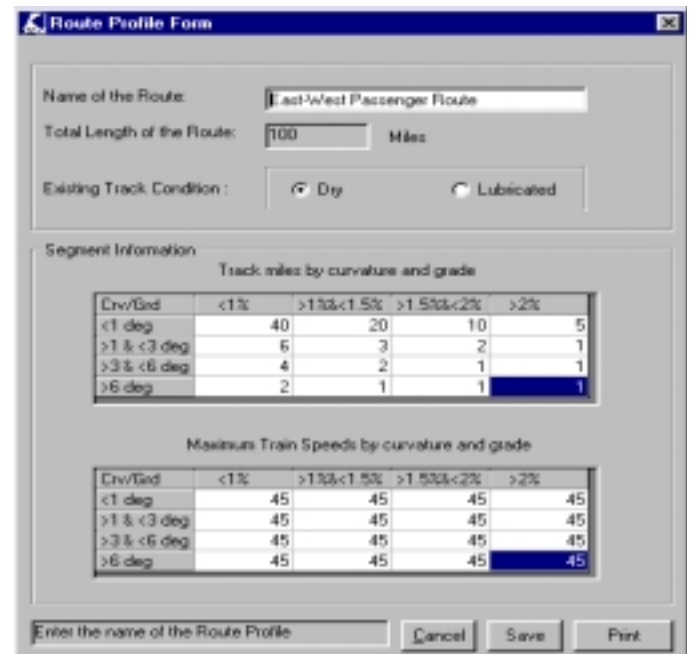
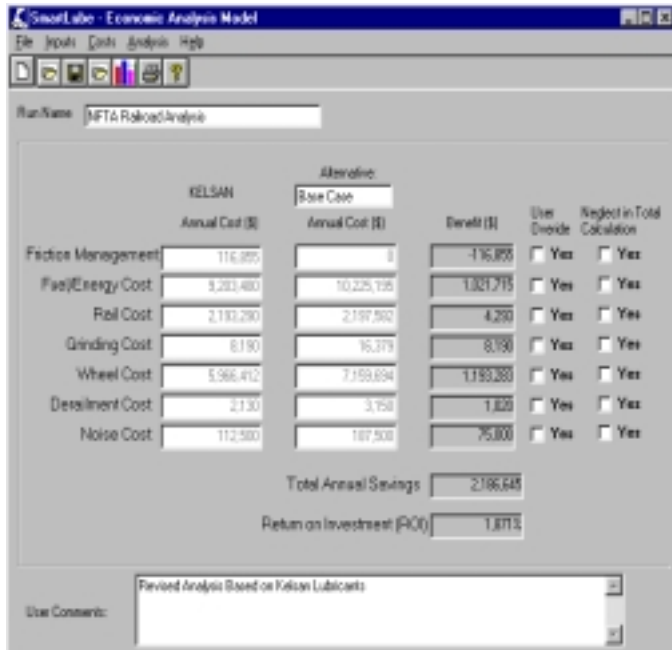
The SmartLube economic benefit analysis model was developed by ZETA-TECH Associates, Inc. for the KELSAN TECHNOLOGIES Corporation. The model is a user friendly and menu-driven Windows application that allows the user to determine and compare the total annual costs of train operations and track maintenance using alternate lubricant types as compared to a defined base case for both freight railroad and transit operations. The system was developed for Windows 95 or higher, and Windows NT.

The primary interface screen is shown below along with the system menu, tool bar, and a total cost summary listing different operations and maintenance costs associated with the defined train movement over a specific route. The annual cost difference for each individual maintenance cost category is

in the override column. Also, the user can ignore any maintenance cost category in the calculation of annual savings. The cost categories include the following:

- |                               |                      |
|-------------------------------|----------------------|
| Rail Maintenance Cost         | Fuel/Energy Cost     |
| Friction Management           | Rail Grinding Cost   |
| Wheel Maint./Replacement Cost | Derailment Risk Cost |
| Noise Abatement Cost          |                      |

The different options in the menu allow the user to access the more detailed analysis forms to enter data related to train operation, locomotive and car information, route profile characteristics, and track maintenance/lading damage costs. An example of the Route Profile form is shown below. The fuel/energy costs are one of the major cost items in the

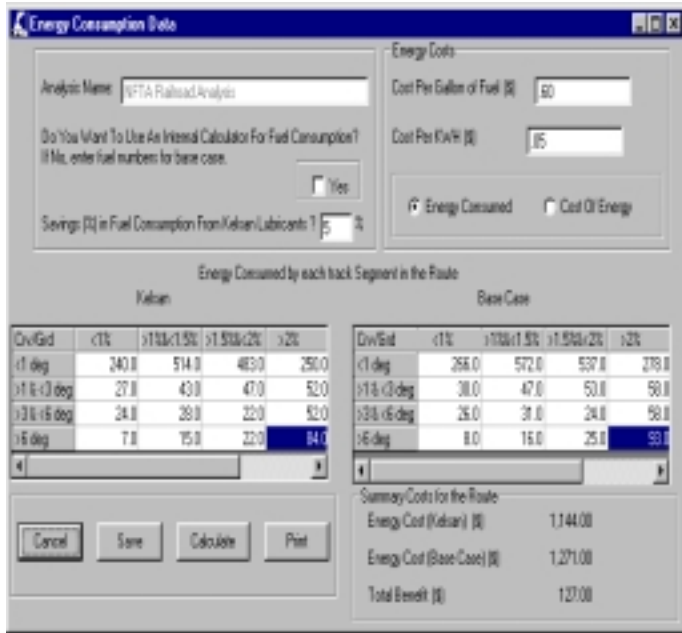


determined based on the associated extension or reduction in component life. The cost summary also shows the total annual savings due to train operations using alternate lubricant types, and return on investment (ROI) for the premium cost of the alternate lubricants. The user has the option to override any particular cost category by un-checking the corresponding box

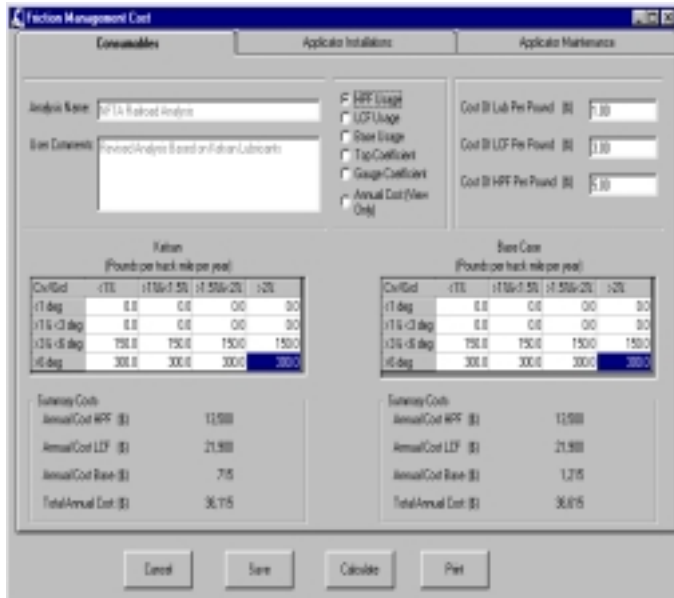
analysis, and have the potential of driving the outcome of the analysis. The running time and fuel consumption of a particular train consist over a specific route can be obtained either from a simulation model (external to model) or an internal calculator used to estimate running time and fuel usage. The energy usage data is shown in a grade/curvature matrix format. The user can also specify the cost of fuel per

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gallon (Freight train), or cost per KWH (MU/Transit trains). The user has the option to see either energy usage, or energy costs in the grade/curvature matrix format as shown in figure below.

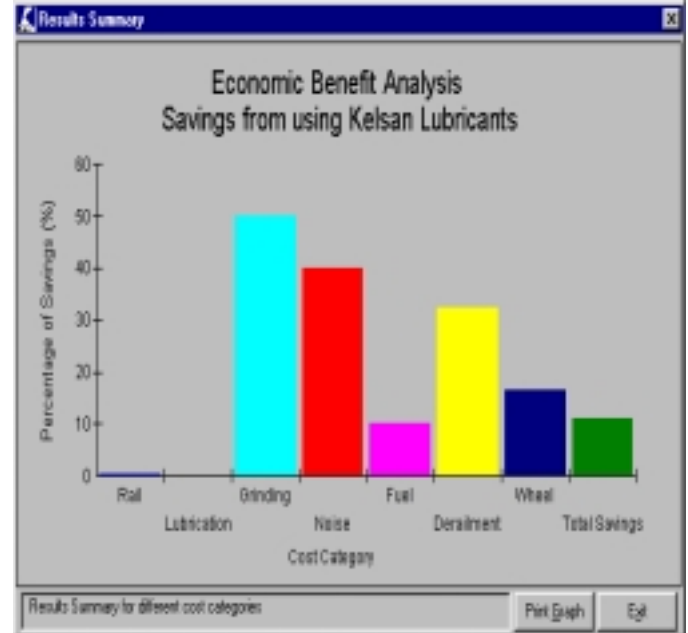


The friction management data is divided into three sections – lubricant consumables data, lubricant applicator installation data, and applicator maintenance data. The lubricant usage data is shown in the grade/curvature matrix, and data is presented for both the alternate lubricant and the base case. The data can be modified to include unit costs for base (grease), HPF, and LCF lubricants as shown in the figure below.



The model offers the user several options for viewing and understanding the results of the economic benefit analysis. The

first is a constant view of the ROI along with a summary of all the cost categories on the cost summary form. These values are automatically updated each time a change is made. A graphical summary of savings (shown below) can be



obtained with the click of a button from the results menu. The savings obtained in each cost category from using alternate lubricant types is shown in the bar graph.

Several software interface features are available to the user that make the model intuitive and easy to use. All inputs are via easy to understand forms. Whenever possible the input choices are limited through the use of drop down list boxes and/or radio buttons. All numeric inputs are verified by the model and input ranges for these values are applied.

A standard Windows format toolbar allows the user to access input screens immediately and easily. Those options, available through the menu system, are also available through the toolbar.

A standard Windows help file is also available. This allows the user to access information pertaining to any form, input screen, output screen, etc.