

PROTRAN TECHNOLOGY

A Harsco Rail Company

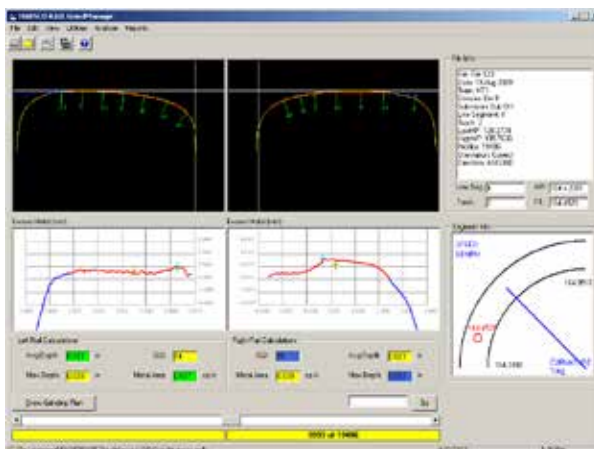


“Rail profile grinding encompasses:

1. Control of gauge face wear and lateral wheel-rail curving forces
2. Control of corrugations
3. Control of rail surface fatigue where improvements in average rail life on the order of 50 to 300+% have been reported.”

Dr. Allan M. Zarembski, PE, FASME

RAIL GRINDING



Harsco Rail's suite of planning and quality control tools aid railways in grinding management:

- Determine and optimize grinding requirements
- Allocate grinding resources
- Monitor quality control of grinding effort
- Determine effective grinding cycles
- Extend rail and wheel life

SMARTGRIND

REAL TIME PROFILE GRINDING ANALYSIS AND QUALITY CONTROL SYSTEM

What is SmartGrind?

SmartGrind is a real time profile grinding analysis and quality control system utilized by onboard grinders and track geometry cars. The easy to use software system interfaces with optical rail profile measurement systems. Onboard a grinder, two systems can be used as input; a pre-grind and post-grind system, before and after the grinding cars. Other railway inputs include; track profile data (curves, etc.), rail surface condition data (corrugations, surface fatigue, etc.). The system provides railway personnel with grinding requirements, current grinding production, and grinding quality control measures onboard and in real time.

How Does SmartGrind Work?

During operation, SmartGrind utilizes a library of desired rail shapes, or templates, that can vary for each rail segment based on rail elevation (high / low) and degree of curvature. The template is matched to existing rail, minimizing the area of metal to be removed, and the best set of passes are predicted: how many, patterns, speeds. In addition, a Grinding Quality Index (GQI), objectively quantifying the conformity of the measured rail profile, is calculated. This is calculated for both the before and after grinding rail profiles, allowing the user to decide if additional grinding is required. In addition, this GQI can be utilized as a quality control measure for grinding operations to determine if rail profile condition is satisfactory after grinding. All output data is available to the grinding supervisor / operator in real time, and is stored, along with all the results for later analysis, review, and future planning.

What are the Benefits of SmartGrind?

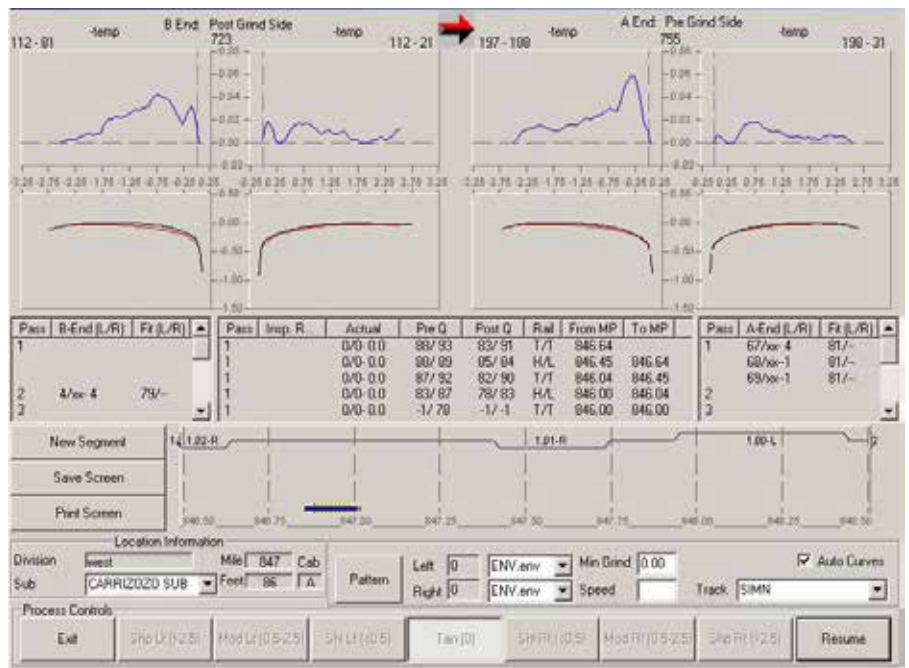
Some of the Features and Benefits of SmartGrind are listed below. The number one benefit is optimized rail grinding resulting in the maximum life of the rail.

Features:

- Updatable collection of desired rail templates
- Updatable collection of rail grinding patterns (metal removal)
- Interfaces with rail profile measurement system
- Calculates Grinding Quality Index (GQI) to compare rail profile conformity over multiple measurements
- Calculates grinding requirements
 - Number of Passes
 - Patterns
 - Speed

Benefits:

- Monitor effectiveness in real time
- Determines next pass requirements
- Provide production reports for segments (curves, tangents)
 - Spark Time
 - Pattern
 - Speeds
 - GQI



GRINDMANAGE

OFFLINE PROFILE GRINDING ANALYSIS AND QUALITY CONTROL SYSTEM

What is GrindManage?

GrindManage is a rail profile grinding management tool used to optimize rail grinding maintenance techniques that extend rail life and reduce rail costs. Grind-Manage is a production rail grinding management tool that uses input profiles taken by optical rail profile measuring systems and calculates the production grinding requirements for a given territory or entire rail network. This includes grinding patterns, grinding speeds, and number of grinding passes required to achieve the desired rail profiles. Unlike SmartGrind, GrindManage works in an offline mode to provide grinding management staff the ability to develop and prioritize grinding programs, and maximize the utilization of grinding resources.

How Does GrindManage Work?

GrindManage utilizes rail profiles from an optical rail profile management system as input, as well as other railway specific inputs such as curvature, desired shape, surface condition, tonnage, etc. GrindManage calculates a dynamic difference profile (amount of rail head to be ground) using a library of desired rail head profiles (templates) which are stored within the system. GrindManage analyzes the input rail profiles using sophisticated algorithms to match the profiles to the standard rail templates. The software provides a comprehensive grinding plan for a territory, which provides recommended grinding, including the patterns and speeds on a segment by segment basis. In addition, an exception report is provided which shows grinding segments that did not meet a desired profile listed segment-by-segment, as well as quality reports, shift reports, and next grinding plans.

What are the Benefits of GrindManage?

The GrindManage system provides the grinding operations manager with the ability to effectively plan and define a grinding program, monitor grinding effectiveness, and adjust the grinding program to meet the specific railway's needs.

Features:

- Easy-to-Use Windows™ Application
- Updatable collection of rail templates
- Updatable collection of rail grinding patterns
- Calculates Grinding Quality Index (GQI) to compare rail profile conformity over multiple measurements
- Reports:
 - Shift Report
 - GQI Report
 - Next Plan
 - Output displayed in tabular or graphic form

Benefits:

- Monitor effectiveness offline in the office
- Quantifies rail conformity for each segment
- Determines future grinding requirements for each segment
- Aids in monitoring grinding cycles
- Prioritizes rail grinding activities



ECOGRIND

ECONOMIC BENEFIT ANALYSIS OF RAIL GRINDING

EcoGrind presents the benefits of rail grinding as compared with a base case of no-grinding. These benefits include extension in rail life, reduction in fatigue defects, reduction in surfacing cycle, reduction in derailment risk, and reduction in fuel costs.

EcoGrind evaluates the costs on an annualized basis and a present value analysis is presented based on the unit costs and cycle of maintenance, with a user defined cost of money. Using the benefits of grinding and the costs of grinding, a return on investment (ROI) for grinding is determined.

EcoGrind takes site and operation characteristics into account, including segment length, curvature, annual tonnage, wheel load, level of lubrication, and type of grinding to determine the life cycle of the various track components and maintenance activities that benefit from grinding.

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