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Specialty Grinding Survey and Analysis

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Key Findings:

- The relative workload for specialty grinders compared to production grinders varies by railroad. On average between 2016 and 2020, specialty grinders completed between 3- and 12-percent of the total annual stone work hours for the Class 1 railroads.
- The applications (such as grinding untestable rail in open track), target intervals, and deployment methods for specialty grinders vary by railroad.
- The majority of railroads responded that their primary motivation for specialty grinding is equally balanced between maintaining a good rail surface condition and maintaining an appropriate rail profile shape, which implies that improved capabilty of specialty grinders to accurately control rail profile would be viewed positively by the industry.

TTCI conducted a survey regarding the use of specialty grinders by Class 1 railroads in North America. An analysis of the relative use of production grinders and specialty grinders by each of the railroads was used as a quantitative supplement to the survey responses. Although much commonality exists in the perspectives on production grinding of open track with regard to important metrics like million gross ton (MGT) intervals between grinds, there appears to be more variation with regard to the applications, deployment methods, and emphasis on specialty grinding.

Large production grinders with as many as 120 10-inch diameter grinding stones are typically used to maintain rail profile and surface condition on open track. Specialty grinders have historically been used to treat rail in turnouts and road crossings with a much reduced stone count of smaller stones that are better able to grind rail in the tighter clearances associated with these track locations. Production grinders are typically more capable of applying specific grinding templates compared to specialty grinders and therefore have better control of the resulting rail profile.

SURVEY

TTCI developed and distributed a survey to Class 1 railroads (referred to here as railroads A through F) to improve industry awareness of the issues surrounding specialty grinding. The survey covered typical uses for specialty grinders, target MGT intervals, deployment methods regarding track authorities, primary motivations, perceived relative importance of specialty grinding compared to production grinding, and the expectations for increased or decreased use of specialty grinders in the near future. Table 1 summarizes the responses from the responding railroads using a generic naming system. Each question contained an option to write in additional responses if the provided options in the survey were insufficient and space to explain details or other thoughts related to the topic.

Table 1. Specialty grinder survey response summary

Topic	Response	Railroad					
		A	B	C	D	E	F
Typical uses of specialty grinder	Switches and crossings	X	X	X	X	X	X
	Other spot locations not ground by production grinder	X	X	X	X	X	X
	Open track when production grinder is nearby to balance workload			X			
	Open track when production grinder is not nearby	X	X	X		X	
Target MGT intervals (An.=Annually, Ir.=Irregular)		120	An.	25-35	Ir.	50	50
Work with production grinder under same track authority	Always			X		X	
	Rarely						X
	Never	X	X		X		
Primary motivation for specialty grinders	Maintain/restore good surface condition						
	Maintain/restore appropriate rail profile shape						
	Of equal importance to maintain/restore good surface condition and rail profile shape	X	X	X	X	X	
	Grind locations missed by production grinders						X
Relative importance of specialty grinders in comparison to production grinders	More important than production grinders						
	Essential part of the grinding program, on par with production grinders	X					
	Important, but less than production grinders		X	X	X	X	
	Useful, but non-essential						X
Expected use of specialty grinders in the near future	More		X			X	
	About the same	X		X	X		
	Less						X

Because of their historical use, it is not surprising to see that each responding railroad uses speciality grinders at switches, crossings, and other spot locations not ground by the production grinder such as near wayside detector sites to avoid damaging equipment. Two railroads (C and E) pair a specialty grinder with a production grinder to try to gain maximum efficiency from both machines while reducing the number of track maintenance windows. Railroad C takes this efficiency effort one step further by using the specialty grinder to treat open track as needed to balance the work load between the two machines. Four of the six responders use specialty grinders on open track when the production grinder is not nearby to treat areas with poor surface condition as a means of keeping the production grinder moving or reducing the need to bring back the production grinder at a shortened MGT interval. One railroad mentioned the use of smaller grinders and even a truckable grinder to help quickly address surface defects resulting in improved rail life and fewer slow orders.

One of the largest areas of variance in the survey responses was the target intervals for specialty grinding. Four railroads mentioned target MGT intervals ranging from 25 MGT to 120 MGT. Railroad B targets an annual treatment by the specialty grinder and Raiload D does not have a regular interval for specialty grinding.

There was remarkable agreement among five responders that their primary motivation for specialty grinding is equally balanced between maintaining a good rail surface condition and maintaining an appropriate rail profile shape. None of the railroads showed preference for surface condition as more important than profile or vice versa. This is an interesting finding because most specialty grinders are less capable of automatically controlling rail profile shape compared to many production grinders that are able to optimize the angles of the grinding stones. Relatively recently, advancements have been made in the ability of some specialty grinders to optimize the post-grind rail profile, and railroads appear to want this type of improvement.

Regarding the perceived relative importance of specialty grinding in comparison with production grinding, most railroads agreed that specialty grinding is important, but less so than production grinding due to the larger amount of track miles treated by a production grinder. Railroad A responded that specialty grinding is as important as production grinding. Railroad C commented that special trackwork is subjected to similar damage as the adjacent out-of-face rail, but is substantially more expensive to replace and this helps increase the motivation for specialty grinding. Railroads C and F noted some loss of the potential grinding benefit in turnouts due to wear and degradation of some small portions of the turnout that cannot be maintained by a specialty grinder, such as switch points and frog points.

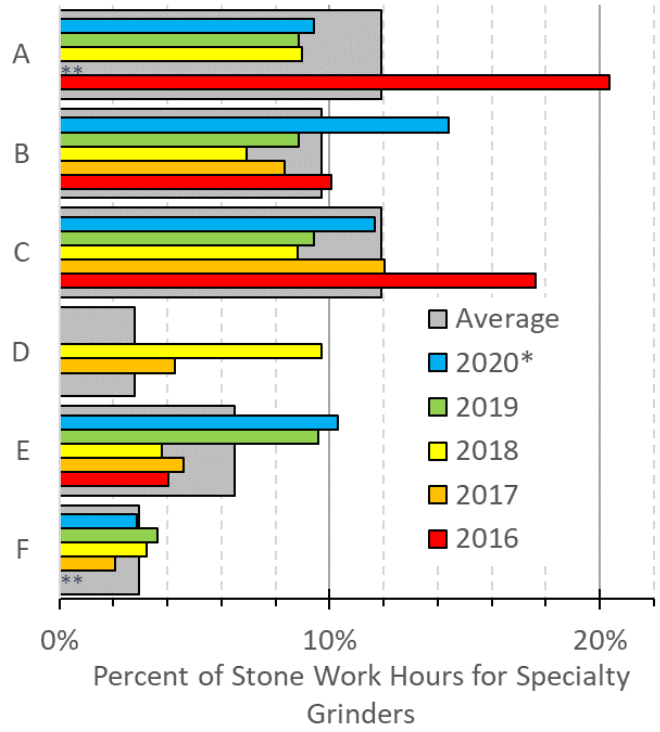
Two of the railroads expect to see an increase in the use of specialty grinders in the near future, one expects a decrease, and the other three expect the use to be about the same.

ANALYSIS

In addition to understanding the use cases and motivations for specialty grinding equipment through a survey, annual grinding statistics were analyzed. Because the Class 1 railroads differ with regard to many important grinding variables such as number of track miles and percentage of curved track, each railroad's specialty grinding statistics were normalized using its own total grinding statistics.

The metric of stone work hours was calculated as the product of the average time spent grinding per work day, the number of grinding work days, and the number of stones per grinder. For example, if a 120-stone production grinder was deployed on a particular railroad for 100 days per year and was able to average 4 hours of grinding per day, it would have accumulated 48,000 stone work hours in that year. Similar calculations can be made for each production grinder and specialty grinder deployed on the system. This metric incorporates the railroad's strategic focus on grinding (through the number of work days and size of the grinders) and the day-to-day operational environment (through the time spent grinding per work day).

For each railroad, the stone work hours attributed to specialty grinders was normalized as a percentage of the total stone work hours for that railroad. This allowed the percentage of stone work hours attributed to specialty grinding to be compared from year to year and from railroad to railroad. Figure 1 shows the percentage of annual stone work hours attributed to specialty grinders for each railroad for recent years. Over the time period represented in Figure 1, Railroad D made use of specialty grinders only in 2017 and 2018.



* 2020 values include grinding from January to September
** Data not available

Figure 1. Specialty grinder stone work hours as a percentage of all stone work hours

Several observations can be made through this analysis. On average from 2016 to 2020, anywhere from 3 to 12 percent of the Class 1 total stone work hours were completed by specialty grinders. This is simply an observation that different railroads place more or less emphasis on specialty grinding, and it is not intended to imply there should be any particular target percentage. The differences observed in Figure 1 may also reflect the different physical plants of different Class 1 railroads. Railroads B and E responded on the survey that they expect to increase their use of specialty grinders and this appears to be occurring based on Figure 1. Conversely, Railroads A and C exhibited a heavy focus on specialty grinding efforts in 2016 that then decreased in more recent years. Railroad F indicated the lowest relative importance of specialty grinding in the survey responses, which corresponds with a consistently low percentage of stone work hours allocated to specialty grinding.

CONCLUSIONS

In contrast to production grinding, there is substantial variation among Class 1 railroads regarding the applications, deployment methods, target grinding intervals, and relative work load of specialty grinding.

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For comments or questions about this publication, contact Scott_Cummings@aar.com