Grinding superflat – the options

When considering upgrading an industrial floor there are two methods of grinding that are commonly used: manual floor grinding and mechanised grinding using a LaserGrinder, but what is the difference?

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"The LaserGrinder is the most technologically-advanced narrow aisle floor grinding system in the world."

Manual floor grinding

Manual floor grinding, using trolley-mounted grinding machines (see Figure 1), is a method that has been used for over 20 years. This method uses walk-behind, diamond headed grinders that have, until a few years ago, provided the most effective method of upgrading the floor flatness in a very narrow aisle (VNA) warehouse. However, this method has a number of drawbacks, which are outlined as follows.

Labour intensive

The manual grinding operation is labour intensive. The amount of time and effort required to treat even the smallest of flatness problems can be significant – and tedious for the grinding operative. Frequent checking of the manual grinding process is necessary to ensure that the correct amount of concrete is being removed in the correct areas. This checking, using optical levels, straight edges or Profileographs, is disruptive to the grinding process as the floor needs to be cleaned and cleared of equipment before each check is made. It may then be necessary to regrind the same area, and then reclean and recheck many times.

Unsuitable dimensions

The relatively small diameter of the grinding blades is not appropriate for the width of most VNA fork truck wheels. Therefore, to create a sufficiently wide running path, the grinding machine needs to be moved from side-to-side along the wheel tracks. This action can create a 'dished' profile (see Figure 2). A badly dished ground path can affect the forklift truck's ability to drive in a straight line, as the wheels naturally try to run into the base of the ground path. This can create excessive loading on rail guidance systems and, with wire guidance systems, the trucks can actually 'come off the wire' and lose the guidance signal. The Third edition of the Concrete Society's Technical Report 34 (TR 34)[1] clearly has picked up on this problem and now states that any remedial grinding must result in the wheels having full contact with the floor surface.

Depending upon the amount of dishing and the exact wheel spacing of the Profileograph's sensors, the 'compliance check' survey can represent a significantly different floor profile to that upon which the wide wheels of the VNA fork-lift truck will operate (see Figure 3).

Lack of coordination

The left and right wheel tracks are treated entirely separately, making it extremely difficult to make them follow identical profiles. A VNA truck feels every bump in its defined wheel paths and if these bumps occur in different places and on opposite sides of an aisle to each other, the VNA truck is going to feel them, even when they are 'within tolerance'.

Working too close to the limit

Perhaps the most serious disadvantage of the manual grinding process is the general tendency to work as close as possible to the limits of the floor flatness specification.

For example, if there is a 3.5mm transverse difference in elevation, between left and right wheel tracks, and the specification allows up to 2.5mm, the manual grinding contractor will only remove 1.0mm. This will be just enough to satisfy the specification, but it will leave the warehouse user with a floor that has the worst possible surface regularity allowed within the confines of that specification. If these results were then defined in terms of standard deviation they would be far removed from the specifications defined in TR 34, which the 95% and 100% limits represent, being two and three times the standard deviation.

LaserGrinder

The drawbacks of the manual grinding methods are now

(Photos: Concrete Grinding Group.)

Figure 1: Walk-behind manual grinding.

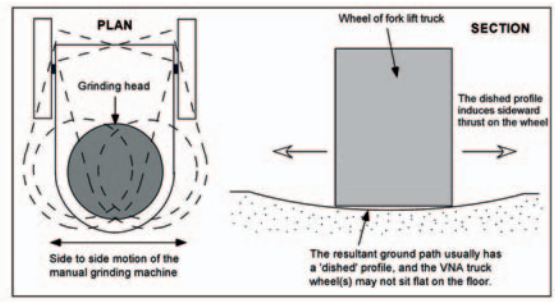

Figure 2: 'Dishing profile' from manual grinding

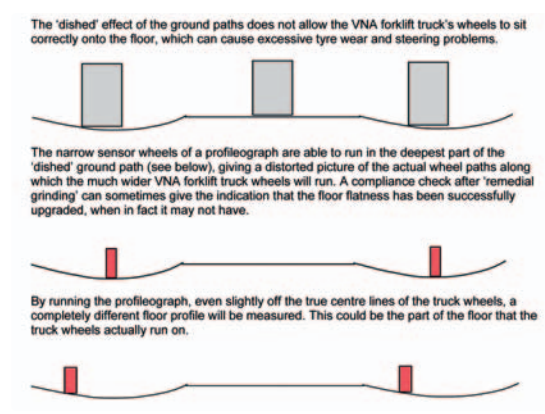

Figure 3: The resultant effect of the 'dished profile' on the truck and profileograph results.

Figure 4: The LaserGrinder

overcome with the LaserGrinder (see Figure 4). The LaserGrinder is the most technologically advanced narrow aisle floor grinding system in the world. It uses one of the world's cleanest lean burning diesel engines to power the hydraulic system that in turn drives the grinding equipment. A catalytic converter ensures that a negligible amount of harmful exhaust fumes are emitted into the workplace, allowing normal warehouse activity to continue in the immediate vicinity of the work (see Figure 5).

Throughout the grinding process, the LaserGrinder uses water from its on-board tanks to totally prevent any airborne dust. The waste product – a mixture of finely ground concrete dust and water – is collected in a container by the LaserGrinder's vacuum system.

The grinding profile

Although the resultant ground path created by the LaserGrinder is flat across the aisle, allowing full wheel contact, the grinding process will not form a 'flat' profile along the aisle as this would usually require grinding to excessive depths. By using the allowable gradients determined by the flatness specification, the longitudinal grinding profile (along the aisle) will consist of a number of very gradual slopes. This enables the grinding profile to closely follow the general profile of the existing floor, while removing those parts of the floor surface that are non-compliant with the flatness specification (see Figure 6).

Transversely, from one side of the aisle to the other, the aim is to provide zero tolerance between the left and right load wheel tracks. This results in a ground path that falls well within the criteria of the flatness specification and minimises the potential 'static and dynamic' lean of the VNA trucks. If the survey results are then analysed and the standard deviation calculated they would fall well within the standard deviation limits set out in TR 34.

The grinding options

The LaserGrinder easily adapts to grind in a number of different formats to suit all types of VNA fork-lift trucks/MHE, grinding individual defined wheel tracks for three- or four-wheeled VNA trucks, or the full width of an aisle can be ground to accommodate any number of different potential wheel tracks (see Figures 7 and 8).

Concluding remarks

The 2003 edition of TR 34 introduces guidelines for remedial grinding works to floors for their potential use for VNA trucks. The two most important guidelines introduced are the note that the wheel of the fork-lift truck must be in full contact with the floor and the introduction of the

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Figure 5 above: The LaserGrinder working in an operational warehouse.

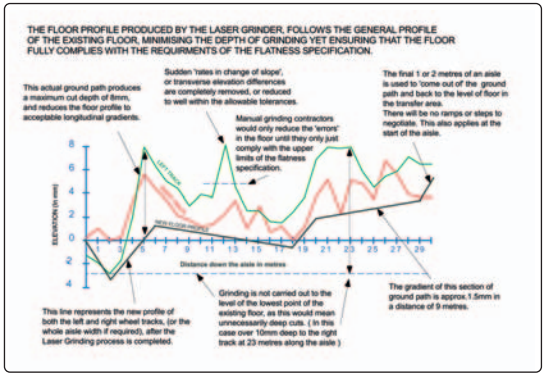

Figure 6 above right: The cut profile created by the LaserGrinder minimising the grinding necessary but ensuring the best profile for a safe and efficient operation.

flatness specification in Appendix C, which ensures that all wheels of the fork-lift truck must be taken into account whereas the Superflat, Category 1 and Category 2 specifications, that have been used since the first edition of TR34, only relate to the front two wheels of the forklift truck. Using the Appendix C specification will ensure a safer and more efficient fork-lift truck operation. ■

Reference:

1. THE CONCRETE SOCIETY. Technical Report 34 (Third Edition): *Concrete industrial ground floors – a guide to design and construction.* Camberley, 2003.

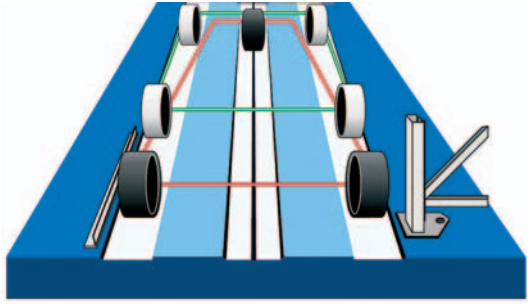

Figure 7: Track grinding for either three- or four-wheel fork-lift trucks.

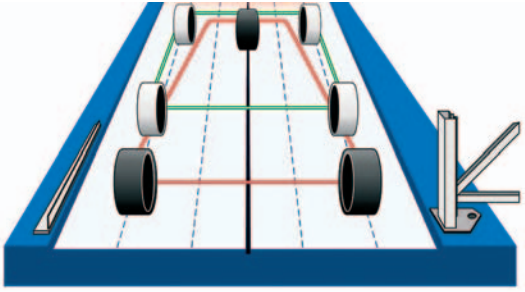

Figure 8: Whole aisle width grinding for use by any fork-lift truck, the floor profile a warehouse user would have had if no remedial work were necessary.