Right on Target: Intelligent Compaction Drives Quality and Productivity
Intelligent compaction simplifies operation, completes jobs in as few passes as possible and helps minimize the risk of over or under compaction, saving time and money.
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[Compaction equipment](#) is about as straight forward as it gets: weight, movement and vibration are used to compact construction materials (soil, gravel, asphalt) to required specifications. But there is a science to that compaction, and intelligent compaction technologies – ranging from simple meters to automated systems that adjust machine performance for the operator – help simplify operation and allow contractors to improve productivity by getting work done right the first time.

Getting it done right the first time is the most important factor at play here: most agencies require the contractor to come in and repair improperly compacted surfaces at no cost. This is where intelligent compaction provides the greatest benefit, allowing you to move forward on paid work versus doubling back and working for free.

Style 1: Simple Rebound Detection
Intelligent compaction technology comes in different varieties. It can be as simple as a compaction meter. A compaction meter tells the operator how much rebound there is on the drum, so the operator can adjust as needed. This ability to continuously monitor and react to the data is invaluable.

If there's too much rebound, the operator knows that the material is well compacted and they can lower vibration. If there's little to no rebound, there's still a lot of force going into the ground, which means the area isn't fully compacted yet and the operator needs to continue their operations or determine if the compacted material is still good.

Style 2: Instructing the Operator Based on Real-Time Material Conditions

The next level of intelligent compaction actually provides the operator with recommended operating settings/conditions based on the feedback it gets from real-time conditions of the compacted material. This is based on desired stiffness settings. The desired stiffness is preset based on a benchmark pass that's already met requirements. It lets the operator know within a range of where they should be operating as the compactor travels along. The display screen shows operators the miles per hour they should be traveling in and the level of vibration that should be set. The operator still handles all the adjustments, but the system gives them guidelines of where they should be operating.

This method is more advanced than simple compaction meters because it displays the parameters being worked within, allowing the operator to intervene in the compaction process and learn as they go. It's up to them to take action.

It's important to note that these technologies measure stiffness, not density. Nuclear density meters, the most accepted measurement tools in the industry, measure how dense the ground is.

Measuring stiffness is said to be a better indicator than density. If a company strictly goes off of the data from a nuclear density meter, they're not getting load-bearing capabilities. A nuclear density test is still required, but it will be more accurate and there will be a higher chance of passing if intelligent compaction is used.

Style 3: Automating the Process

The third level of intelligent compaction is the "deluxe" compaction option. It's a system that will adjust the vibration of the drums automatically as it goes along, so the only thing the operator worries about is steering and the speed at which they're traveling. These systems are more advanced and rely more heavily on electronics, so some manufacturers place these systems strictly into enclosed cab units to avoid dust and protect the electronics.

These machines that automatically adjust themselves tackle the feat in a few ways. It can be with weights that offset from one another, so the operator goes from being at full amplitude, to low, to completely offsetting each other with no amplitude and no vibration. The other style features the weights turning themselves, changing from being an up-and-down vibration to oscillation. It decreases to the lowest possible frequency and shuts itself off when it's done.

A Word on Temperature Readings

Another important factor that a good intelligent compaction system will monitor in paving applications is the temperature of the asphalt. Depending on the mix of asphalt, it either has to be compacted at temperatures up to 425 degrees. As soon as it starts to get too cold, it will no longer compact correctly – it will start to ripple, shove and crack. Asphalt temperature is extremely important, and these systems help ensure that compaction is taking place at an acceptable temperature.

Taking it to the Next Level with Mapping Technology

Documentation is a standard function on many intelligent compaction systems. The system can document and display (either via printout or on a computer) the details of every pass so the contractor can prove the job was performed to spec. The future of documentation and intelligent compaction, however, lies in the hands of mapping technologies. Unlike the standard documentation feature, owners can plug in the coordinates of the jobsite and match that up with the information documented through the intelligent compaction system. This new combination of data and location helps show where the passes were, how many passes were made, the compaction levels, what the parameters were and more.

With the intricate detail of the mapping systems, if there's an area on the jobsite that's not reaching compaction levels, contractors will be able to pinpoint exactly where it is. This is crucial because there could be bad base materials underneath or some other obstruction that is impeding the ability to achieve proper compaction. Without the mapping technologies, the operator simply knows that there is a bad patch somewhere on the lift. They may be able to make an educated guess as to where it is, but they won't be able to pinpoint it. With the mapping technology, they can make targeted adjustments or repairs.

These mapping solutions take intelligent compaction to a whole new level and are not difficult to integrate as many jobsites already have the system set up for machine control technology used on dozers, graders, etc.

Benefits from the Ground Up

Not only do these systems offer increased productivity and the ability to get the job done quicker due to optimal performing parameters, but they also offer lower costs because of the lesser chance of coming in and doing re-work.

With such a rapid increase in compaction quality during the initial passes, fewer passes are needed to reach the target specs. The result of fewer passes may include savings in time, fuel and machine maintenance – as well as avoiding pitfalls related to under or over compaction.

Another major selling point is simplified training. Contractors can put a newer operator on the compaction machine and it will help them understand how to efficiently run the machine. While these systems are getting more intelligent, the human factor is critical, and simplified training helps bring those operators up to speed. They'll be able to see certain looks or hear sounds that tell them when they've reached optimum compaction, which they'll start to recognize more quickly in the future.

With its long list of benefits, intelligent compaction is the future of productive, efficient compaction technology. The benefits in productivity, operating costs, quality and training/operator performance are too great to not consider. After all, what could be better than a more intelligent future?

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