

Particle Wizard™ Particle Management Software

EVALUATING LCM PARTICLE SELECTION AND CONCENTRATION FOR OPTIMAL PASSAGE, SUSPENDABILITY, AND TRANSPORT

OVERVIEW

From moderate losses to remedial sidetracks or relief wells, lost circulation is one of the costliest problems encountered during cementing operations. Adding lost circulation material (LCM) to wellbore fluids helps to overcome these losses, while preparing the wellbore for effective cement bonding.

Mud companies make recommendations on the types and quantities of particulate materials to cure loss situations, based on historical use. However, there currently is no effective method for determining whether recommended materials will result in particle packing or jamming in undesired locations along the wellbore.

In extended horizontals, where a slimhole design is commonly used, fibers and/or particles often settle into tight spots along the wellbore – plugging float valves, bottom plugs, and liner hangers. Tight spots can form with the installation of certain downhole cement equipment, and with the settling or accumulation of materials – which can result in LCM plugging off equipment in the casing or bridging off in the annulus before ever reaching the problem zone.

To help ensure that particles successfully flow from the pipe into the annulus, Particle Wizard™ particle management software evaluates the material type, size, and concentration, based on the cementing plan. As the latest addition to our iCem® service, Particle Wizard software can evaluate any particle, whether it is from LCM or from a mechanical property additive.

By analyzing fluid properties, pump schedules, wellbore geometries, and equipment dimensions, Particle Wizard software can predict an optimal particle solution by calculating the probability of safe passage through critical equipment dimensions, particle suspendability, and transport efficiency.

SAFE PASSAGE THROUGH EQUIPMENT

It is important to identify the areas along the wellbore that can restrict the effective passage of particle-laden fluids, such as float equipment, liner hangers, and other downhole tools. Presently, since there is no easy way to do it, particles are often not evaluated to determine if they can successfully travel to their intended location in the formation.

Particle Wizard software can evaluate these critical equipment dimensions to determine the most effective fluid and material concentrations for these restricted areas, thus allowing for safe particle passage into the annulus. Looking at defined dimensions of equipment and properties of materials, the software calculates the potential for bridging or packing when passing through restrictions.

HIGHLIGHTS

- » Evaluates safe-passage options for particle-laden fluids, and helps ensure particle clearance through critical dimensions
- » Promotes particle transport, and determines if fluids can effectively transport materials
- » Predicts static suspendability, and calculates the amount of particle accumulation for a given time



Including LCM into spacers and cements has become common practice to cure losses. However, more is not always better. Selecting the right LCM and determining the right concentration for it will help ensure that the LCM gets to its intended location. Particle Wizard™ software helps to determine how much LCM can be added safely before plugging float shoes, collars, and other casing equipment.

ADEQUATE SUSPENSION DURING SHUTDOWNS

The density and the settling rate of particles are elements to consider, especially during shutdowns, as they can lead to plugging off due to settling. These are common issues encountered when shutting down a pump to set a liner hanger or drop a plug, which can take 5 minutes to 40 minutes. It is important to evaluate shutdown periods to determine if there is a potential for unwanted accumulations of particles above float equipment, hangers, and other upsets in wellbore geometry.

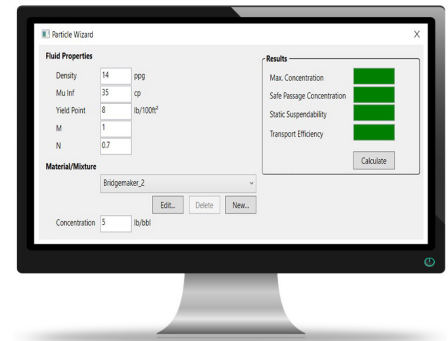
Particle Wizard software takes into account fluid and material properties in order to calculate the accumulation per second, based on the equipment profile in the wellbore. Typically, this includes the float collar, shoe, and plug set.

By evaluating design parameters for critical areas, along with the circulating rate, Particle Wizard software can determine how much material will accumulate, along with the amount of time left before static suspendability failure.

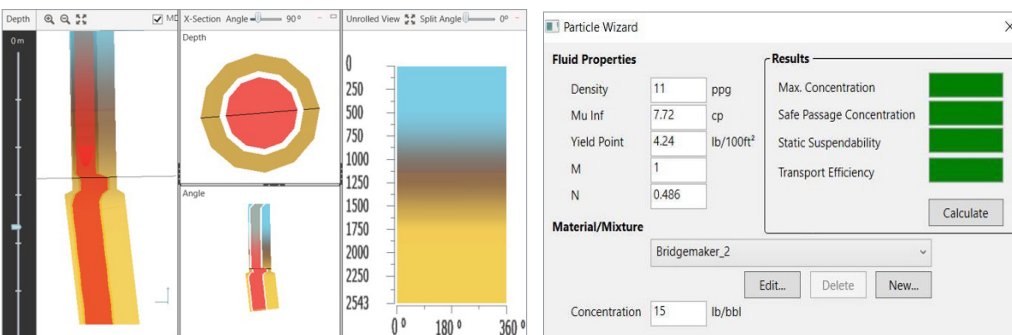
EFFECTIVE TRANSPORT WITHOUT SETTLING

During particle transport, it is important to maintain fluid velocity. The faster these particles move, the less likely they are to settle or salt. However, changes in wellbore geometries can impact velocity, causing particles to settle. This occurs when fluids transition into a wide annulus and lose the velocity required to keep material suspended. In horizontal wells specifically, dynamic saltation begins to bridge around the pipe until operators are unable to continue pumping.

Particle Wizard software compares the fluid, concentration of materials, depths of interest, and pump rates to determine if the fluid will effectively carry the material through the annulus or result in saltation.



Particle Wizard[™] software evaluates and predicts the ideal material, fluid, and concentration for effective annular clearance. It also accounts for equipment in the well by evaluating depth flow areas and critical flow path dimensions.



Effective Transport: iCem[®] software helps ensure that the spacer and cement can effectively displace the mud in the annulus in order to create an effective barrier, while Particle Wizard[™] software helps ensure that the spacers and cement can reach the annulus to create the barrier.

For more information, contact your local Halliburton representative or visit us on the web at www.halliburton.com

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