

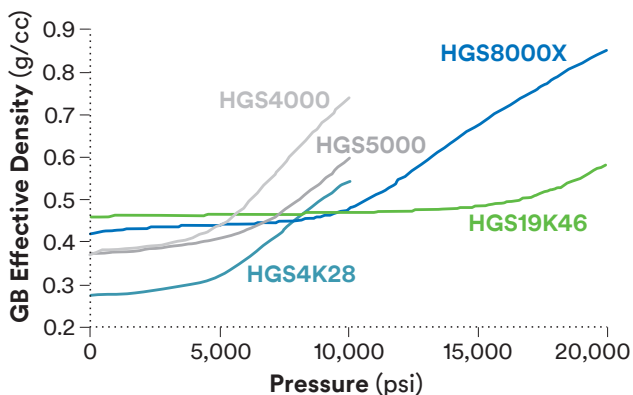
## Engineered to Perform Under Pressure

When drilling across highly depleted zones and weaker formations, low density systems are required to prevent/minimize problems associated with excessive overbalance conditions including fluid loss/lost circulation, differential sticking, minimal penetration rates, formation damage, and reduced well productivity.



### 3M™ Glass Bubbles in drilling/completion/work-over fluids:

- Successfully and predictably reduce the fluid density
- More homogeneous and incompressible fluid properties compared to aerated systems
- Eliminate the need for specialized equipment used in foamed or aerated systems
- More economical and allow a greater density reduction window than synthetic oils
- Compatible with both water based and oil based systems
- Resistant to harsh downhole conditions



### 3M™ Glass Bubbles Typical Physical Properties (Not for specification purposes.)

Nominal Density (g/cc)	D <sub>50</sub> (Microns)	Minimum Fractional Survival	Test Pressure (psi)	Product
0.28	30	80%	4,000	HGS4K28
0.38	40	80%	4,000	HGS4000
0.38	40	80%	5,500	HGS5000
0.42	26	90%	8,000	HGS8000X
0.46	20	80%	19,000	HGS19K46

### 3M™ Glass Bubbles achieve and maintain the target density throughout the operation:

- **Light** – When synthetic oils are used as base fluid, densities as low as 5.5 lb/gal (0.66 kg/l).
- **Tiny** – HGS8000X and HGS19K46 remain in the fluid when circulating through solids control equipment, including shale shakers, hydrocyclones and centrifuges.
- **Tough** – HGS8000X and HGS19K46 are resistant to shear and impact forces when circulating through bit nozzles and impacting formation walls.

### 3M™ Glass Bubbles help reduce your cost through reconditioning and reuse of the lightweight fluid.

**Warranty, Limited Remedy, and Disclaimer:** Many factors beyond 3M's control and uniquely within user's knowledge and control can affect the use and performance of a 3M product in a particular application. User is solely responsible for evaluating the 3M product and determining whether it is fit for a particular purpose and suitable for user's method of application. User is solely responsible for evaluating third party intellectual property rights and for ensuring that user's use of 3M product does not violate any third party intellectual property rights. Unless a different warranty is specifically stated in the applicable product literature or packaging insert, 3M warrants that each 3M product meets the applicable 3M product specification at the time 3M ships the product. 3M MAKES NO OTHER WARRANTIES OR CONDITIONS, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OR CONDITION OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR ANY IMPLIED WARRANTY OF NON-INFRINGEMENT OR ANY IMPLIED WARRANTY OR CONDITION ARISING OUT OF A COURSE OF DEALING, CUSTOM OR USAGE OF TRADE. If the 3M product does not conform to this warranty, then the sole and exclusive remedy is, at 3M's option, replacement of the 3M product or refund of the purchase price.

**Limitation of Liability:** Except where prohibited by law, 3M will not be liable for any loss or damages arising from the 3M product, whether direct, indirect, special, incidental or consequential, regardless of the legal theory asserted, including warranty, contract, negligence or strict liability.

**Technical Information:** Technical information, recommendations, and other statements contained in this document or provided by 3M personnel are based on tests or experience that 3M believes are reliable, but the accuracy or completeness of such information is not guaranteed. As to such information 3M makes no warranties or conditions, express or implied, including, but not limited to, any warranty or condition of non-infringement of a third party's intellectual property rights or warranty or condition of technical or commercial success. Such information is intended for persons with knowledge and technical skills sufficient to assess and apply their own informed judgment to the information. No license under any 3M or third party intellectual property rights is granted or implied with this information.



#### 3M Advanced Materials Division

3M Center

St. Paul, MN 55144 USA

Phone 1-800-810-8499

Web [www.3M.com/glassbubbles](http://www.3M.com/glassbubbles)

3M is a trademark of 3M Company.

Used under license.

Please recycle. Printed in USA. © 3M 2016.

All rights reserved. Issued: 12/15 11135HB

98-0212-4244-5 Rev. B