

Cutting completion costs of marginal reservoirs

CAPEX reduction with 3M™ Ceramic Sand Screens

Customer challenge

Several potential solutions posed significant technical challenges in the zones to be completed.

- ▶ Multi-zone single trip gravel packs would be complex to implement, and had limitations with regard to the total gross distance between the uppermost and lowermost reservoirs.
- ▶ Wire-wrap screens are prone to “hot spots”; an accelerated erosional effect generally leading to sand control failures.

The customer’s goal was to more quickly identify and implement a simplified, standardized and commercially acceptable technical solution that would ensure acceptable well productivity.

Why ceramics?

Wire-wrap screens failed every erosion test (lower photo). The ceramic screens did not show any visible wear or material loss.

Erosion test results



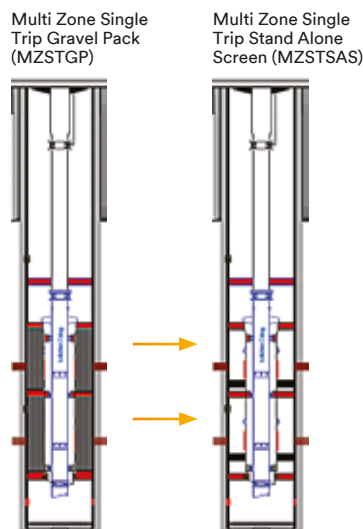
3M™ Ceramic Sand Screen. After 240 min.

Wire-wrap sand screen. After 60 min.

Made of abrasion-resistant silicon carbide, 3M™ Ceramic Sand Screens mitigate wash-out erosion compared to all steels and hard coated steels tested.

Results

- ▶ 4 wells equipped with ceramic sand screen technology in multiple zone single trip
- ▶ Proved simple, cost effective and required no gravel pack stimulation
- ▶ Simplified design and shortening the time of completions which reduced total well cost
- ▶ Demonstrated good performance holding sand at sand face



Customer key decision drivers

Overcome technical limits of existing sand control and CAPEX reduction

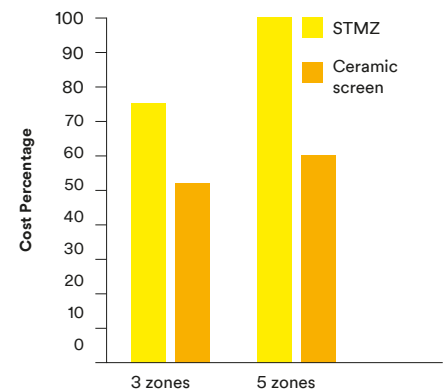
Decision matrix included:

- ▶ Reduce overall well cost
- ▶ Resist erosion/hotspotting while placing across perforation as stand alone
- ▶ Simplify logistics and operation

Economic comparison with other options includes:

- ▶ Gravel pack completions

Cost comparison: MZ-STGP vs. ceramic screen



Using a cased hole stand alone ceramic screen as an alternative removes the necessity for a gravel pack – potentially reducing time and cost.

Technical references

SPE 176225-MS: cased hole ceramic screen cutting completion cost for marginal reservoir: application in Tunu Field

OTC 25106-MS: an innovative approach of revival for damaged wells in high erosive environment using ceramic sand screens – BG Group

SPE 146721: An innovative milestone in sand control – Maersk Oil & Gas

SPE 160327: ceramic sand screens for sand control in unconsolidated reservoirs (with fines content) – RAG

SPE 166092-MS: ceramic sand screen: ceramic sand screen – an innovative downhole sand control solutions for old & challenging cased holes – BG Group

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. 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 Technical Ceramics

Zweigniederlassung der 3M Deutschland GmbH
Max-Schaidhauf-Str. 25, 87437 Kempten, Germany

Phone +49 (0)831 5618-0
Web 3M.com/ceramicsandscreens

3M Advanced Materials Division

3M Center
St. Paul, MN 55144 USA

Phone 1-800-367-8905
Web www.3M.com/advancedmaterials

The management system has been certified according to DIN EN ISO 9001, DIN EN ISO 50001, DIN EN ISO 14001.

3M is a trademark of 3M Company. Used under license by 3M subsidiaries and affiliates.

Please recycle. Printed in USA © 3M 2016. All rights reserved. Issued: 11/16 12163HB 98-0050-0352 Rev. A