

RDX vs. HMX Charge Performance

“No Significant Difference”

Recently questions have been raised concerning the relative performance of RDX versus HMX charges. Some have said that there is a dramatic performance difference, and that API test data with one is not valid for the other.

As a simple method for comparison, API RP-43 Performance data published during the year 2001 has been examined. A total of 96 API data sheets, including results from well over 1000 shaped charges, were found with data for both RDX and HMX versions of charges. The data sheets were from 4 different shaped charge manufacturers.

Based on those published API tests, the hole diameter for HMX charges was found to average 1.006 times the hole diameter for RDX versions of those charges. This is a 0.6% increase in performance. The data is shown plotted in Fig. 1.

The penetration for HMX charges was found to average 1.028 times the penetration for RDX versions of those charges. This is a 2.8% increase in performance. The data is shown plotted in Fig. 2.

How does this difference affect typical downhole performance results? As an example, P.E. Moseley & Associates' *Gun Evaluation Model* (GEM) software program was used to predict downhole performance for a charge used in the above analysis. The 3-3/8" charge chosen has RDX API penetration of 22.80", and HMX API penetration of 23.65". This is a difference of 0.85", or about 4% (slightly greater than the average 2.8% above). Using downhole conditions of 10,000 ft. depth and a medium strength formation (8,000 psi), downhole performance for the RDX version of the charge is predicted to be 15.33", and HMX is predicted to be 15.62". The downhole performance difference under these conditions, then, is less than 0.3" (under 2%). Similar results are obtained under other downhole conditions.

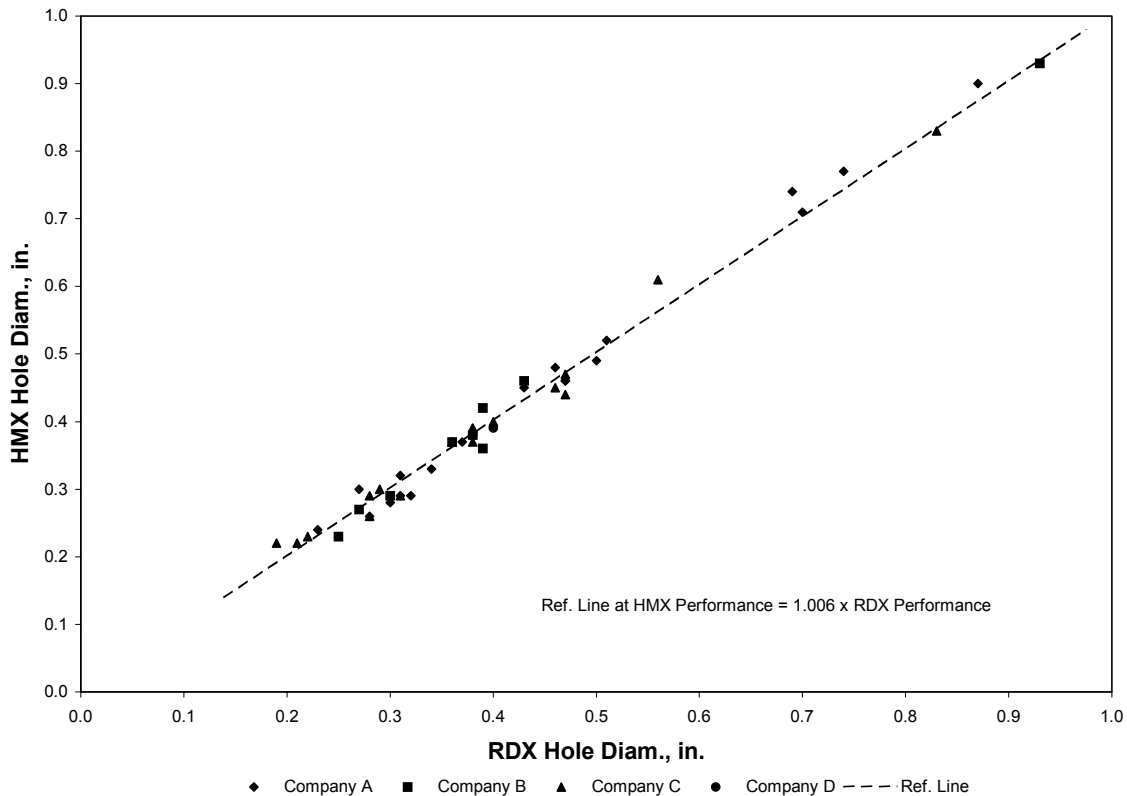
Whether considering surface API data or downhole performance, these differences are quite small. They are well within the normally accepted variation of charge performance. Typically one would not adjust performance to account for the difference. If one does desire to make an adjustment, the following equations can be used for API data:

$$EH_{HMX} = 1.006 EH_{RDX} \quad \text{or} \quad EH_{RDX} = 0.994 EH_{HMX}$$

$$\text{and,} \quad PEN_{HMX} = 1.028 PEN_{RDX} \quad \text{or} \quad PEN_{RDX} = 0.973 PEN_{HMX}$$

Of course, this was not a carefully planned and carried out test to evaluate the performance differences. It is made with the knowledge that one does not know for certain that the charges chosen to compare RDX versus HMX performance are truly comparable, and does not account for possible target differences. It relies on the volume of data (96 API tests; well over 1000 shaped charges) to essentially average out or "wash out" these issues. Past experience has shown that this method of averaging out is valid (Ref.: Ott, R.E., et.al., *Simple Method Predicts Downhole Gun Performance*, SPE 27424).

RDX vs. HMX Casing Hole Diameter
From Published 2001 API RP-43 Data



RDX vs. HMX Penetration
From Published 2001 API RP-43 Data

