TRACERMAX

INFORMATION/DATA SHEET FOR TRACING HYDRAULIC FRACTURING AND RELATED OPERATIONS

TRACERMAX TECHNOLOGY IS PROTECTED ON A GLOBAL BASIS UNDER PCT/CA2010/001446.

APPLICATIONS:

- TRACERMAX TECHNOLOGY CAN BE USED TO DETERMINE HEIGHT AND GROWTH PROPPAGATION FOR THE CHARACTERIZATION OF ROCK MECHANICS IN HYDRAULIC FRACTURING OPERATIONS
- TRACERMAX CAN DETERMINE SELECTED PERF INTERVALS THAT TOOK TAGGED PROPPANT STIMULATION IN MULTI STAGE WELLS WITH MULTI PERFORATED INTERVALS IN EITHER VERTICAL OR HORIZONTAL CASED HOLE WELL COMPLETIONS
- AQUEOUS BORATED TRACERS SUCH AS SODIUM PENTABORATE ($Na_2B_5O_3$) CAN IDENTIFY FRAC POINTS IN BARE FOOT WELL COMPLETIONS FOR PLANNING PRIOR TO HYDRAULIC FRACTURE OPERATIONS

TECHNICAL:

- BORON CARBIDE (CB_4) HAS SIMILAR DENSITY AS SILICA PROPPANTS (2.5 g/cm^3)
- CB_4 IS COMPATIBLE WITH ALUMINA PROPPANTS
- CB_4 CAN BE MATCHED TO SAME PARTICLE SIZINGS AS PROPPANTS
- CB_4 CAN BE ADDED DIRECTLY INTO BLENDER COMPONENT TO GIVE MAXIMUM HOMOGENOUS MIXTURE. TRACER PARTICLES TRAVEL AT SAME VELOCITY AS PROPPANTS THROUGH PUMPING EQUIPMENT. DRY ADD FEEDER SYSTEM ON BLENDER COMPONENT PROVIDES QUALITY CONTROL WITH RESPECT TO TRACER CONCENTRATION INTO FLUID DISPLACEMENT(S)
- CB_4 IS A CHEMICALLY INERT CERAMIC. STABLE COMPOUND WILL NOT REACT WITH OTHER CHEMICALS USED IN THE HYDRAULIC FRACTURING PROCESSES
- TRACERMAX TECHNOLOGY GIVES ACCENTUATED LOG RESULTS. BORON IS 22 TIMES MORE EFFECTIVE TO CAPTURE NEUTRONS THAN CHLORINE, WHICH IS USED AS THE REFERENCE ELEMENT FOR NEUTRON CAPTURE CROSS SECTION DATA USED BY LOG

ANALYSTS. THE USE OF ENRICHED BORON (^{10}B) COMPOUNDS INCREASES NEUTRON CAPTURE AGAIN BY A FACTOR OF 4.3 TIMES

- LOG DATA GIVES THE ABILITY TO DISCRIMINATE BETWEEN PAD AND PROPPANT (TAGGED AND UNTAGGED MATRIX) STAGES OF A FRAC (THE SAME RESULTS AS USING TWO RADIOACTIVE TRACERS)

ECONOMICS:

- LESS EXPENSIVE THAN RADIOACTIVE TRACERS AND PRETAGGED PROPPANTS IN RELATED OPERATIONS
- NO SPECIALIZED REGULATORY LICENSING REQUIRED
- NO DANGEROUS GOODS, MANIFESTATION, PACKAGING OR TRANSPORATION SURCARGES
- NO EXPENSIVE REMEDIAL ACTIONS SUCH AS SITE MONITORING, CLEAN UP, DECOMMISSIONING OR RETENTION OF RADIOACTIVE CONTAMINATINATED EFFLUENTS IN RENTAL TANKS
- THE CHARACTERIZATION OF ROCK MECHANICS CAN BE USED FOR PLANNING FURTHER HYDRAULIC FRACTURING OPERATIONS IN THE SAME FIELD. THIS CAN REDUCE WATER CONSUMPTION, MINIMIZE THE QUANTITIES OF PROPPANTS USED TO MAXIMIZE RESERVOIR PRODUCTION. THE REDUCTION OF FRACTURING MATERIALS MINIMIZES THE AMOUNT OF ROAD TRIPS REQUIRED TO MOVE MATERIALS ONTO LEASES WHERE OPERATIONS WILL BE CONDUCTED
- IN SOME CASES, WELLS CAN BE LOGGED WITH A SINGLE LOGGING PASS DEPENDING ON LOGGING TOOL AND THE AVAILABLILITY OF EXISTING WELL LOG DATA
- CAN BE LOGGED OVER PROLONGED PERIODS OF TIME

OCCUPATIONAL:

- NO EXPOSURES OR BURDENS TO RADIOACTIVE MATERIALS
- NO SPECIALIZED FIELD TECHNICIAN REQUIRED; TRACER COMPOUND CAN BE ADDED BY BLENDER OPERATOR OR SUPPORT PERSONNEL. ONE LESS BODY ONSITE
- NO SPECIALIZED PPE OR EQUIPMENT REQUIRED BY PERSONNEL OVER THAT IS ALREADY IN USE TO HANDLE TRACER COMPOUND

ENVIRONMENTAL:

- NO RISK FROM SPILLS
- NO RISK FROM CONTAMINATED WELL FLOW BACK PRODUCTION
- NO RISK FROM CONTAMINATED EQUIPMENT
- NO SITE MONITORING OR DECOMMISSIONING REQUIRED

- LOG DATA CAN BE USED FOR FRAC PLANNING AND PREVENTS FRACKING INTO AQUIFERS AND WATER TABLE. THE PHYSICAL INTEGRITY OF CAP ROCK IS NECESSARY TO MAINTAIN THE CONTAINMENT OF HYDROCARBON RESERVOIRS AND PREVENTS COMMUNIATION INTO SUBTERANIAN WATER SOURCES THAT POTENTIALLY CAUSE THE POLLUTION OF SURFACE POTABLE AND/OR FRESH WATER SUPPLIES
- REDUCES OVERALL ECOLOGICAL FOOTPRINT AND NEGATIVE IMPACT OF HYDRAULIC FRACTURING OPERATIONS IN GENERAL

MEDIA:

- HAS THE ABILITY TO CHANGE NEGATIVE PUBLIC PERCEPTION WITH RESPECT TO PERCEIVED DANGEROUS CHEMICALS USED IN FRACK TRACING OPERATIONS AND SHOWS POSITIVE "GREEN" DIRECTION BY ENERGY PRODUCERS TO IMPROVE SAFE CONDITIONS FOR WORKERS AND PRESERVE ENVIRONMENT

LOGGING TOOLS OPTIONS:

- FLUID DISPLACEMENTS TAGGED WITH CB_4 OR OTHER BORATED TRACER COMPOUNDS CAN BE LOGGED WITH MOST CONVENTIONAL NEUTRON TOOLS USED FOR WELL LOGGING. TRACERMAX LOOKS AT DESCENDING NEUTRON-NEUTRON (N-N) TO DETERMINE TAGGED FLUID PLACEMENTS
- THE PERFORMANCE OF LOGGING TOOLS VARIES BY DETECTOR RESPONSE AND LOG PRESENTATION VARIES BETWEEN LOGGING COMPANIES FOR PURPOSES OF INTERPRETATION.
- A REFERENCE LOGGING PASS WITH THE SAME TOOL IS PREFERRED, HOWEVER, NORMALIZATION LOG ANALYSIS TECHNIQUES CAN BE USED FOR COMPARISON PURPOSES AGAINST EXISTING OPEN OR CASED HOLE LOGS.

THE FOLLOWING TOOLS CAN BE USED FOR WELL LOGGING AS FOLLOWS:

- HOTWELL PNN
- GEOLOG CHAT
- WEATHERFORD CNP
- SCHLUMBERGER CNL, RST
- HALLIBURTON DSEN
- ANY OF THE OTHER GEOPHYSICAL ACCELERATORS OR NEUTRON TOOLS ON THE MARKET