



CURRICULUM VITAE
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PROFILE

Technical expert in Mechanical Engineering with 19 years of experience. Inventor on 77 issued patents. Recipient of the Utah Genius Award in 2013 for number of patents issued in a single year.

Member of joint steering committee between Novatek and Schlumberger (SLB). Given technical seminars to field experts in numerous states and Europe. Experienced teacher of both industry experts and those outside the field.

Design experience in the oil & gas, road milling, mining, renewables, modular housing, personal powered air-purifying respirator, and consumer markets.

EDUCATION

Master of Business Administration (MBA) 2011-2013
Marriott School of business | Brigham Young University

Bachelor's of Science - Mechanical Engineering 2000-2007
Ira A. Fulton College of Engineering | Brigham Young University

WORK EXPERIENCE

Oil & Gas

Thirteen years designing innovative tools for SLB. Special expertise in drilling tools including drill bits, steering systems, measurements while drilling (MWD) tools, logging while drilling (LWD) tools, bent mud motors, expandable underreamers, turbine generators, mud pulsers, wired drill pipe, American Petroleum Institute (API) threaded connections, hammers, and electromechanical actuators. The drilling environment required certifying these tools would survive at 150 C, 20,000 psi, and continuous 200 g shock. Other oil & gas projects include a top drive swivel, mud pump piston hardening, wireline side wall coring, well intervention crawler, side tracking coiled tubing drilling crawler, casing while drilling system, well abandonment casing cutter, and fracking needle valve. Several projects are highlighted below.

Drill Bit with Shaped Polycrystalline Diamond Compact (PDC)

Introduced Shaped PDC drill bits to the industry. Ran extensive full-scale test program with vertical mining rig in a quartz mine to optimize bit profile, cutter spacing, cutter shape, and number of blades. Varied weight on bit (WOB), revolutions per minute (RPM), flow rate, and pressure drop across bit to find optimal drilling parameters. Leached shaped PDC to increase wear resistance and cutter life. Performed extensive single cutter testing in granite and quartz blocks on vertical turret lathe (VTL) with load cells to measure forces and expose any delamination issues.

Rotary Steerable System (RSS)

Increased drilling efficiency by 40% in deviated wells with step-change push-the-bit RSS, PowerDrive NeoSteer, eliminating a trip by enabling operator to drill bend and lateral in a single run. Designed custom test site with 10'x10'x120' cement blocks, horizontal rig, high pressure mud pump, and control room. Added sensors to equipment to measure pressure differential, top drive position, temperature, and flow rate. Performed final testing, prior to field deployment, on SLB test oil rig in shale formation.

High Frequency Torsional Oscillation (HFTO) Suppressor Damping Tool

Eliminated tool failures causing lost in hole incidents and requiring fishing. The HFTO suppressor utilizes tungsten carbide rings in a viscous fluid to dampen torsional oscillations due to the drill bit and rock cutting interaction, and the natural frequency of the BHA below the mud motor.

Diamond Valve & Generator

Led the 10-year research project to utilize polycrystalline diamond as a solution to wear and life issues for moving components in the bottom hole assembly (BHA). Helped to optimize cubic diamond press parameters and cube design to enable larger PDC components. Iterated dozens of possible valve types including poppet, spool, and rotary along with several drive systems including solenoid, AC motor, and piezoelectric. Solved valve sticking and pressure locking issues. Developed custom laser cutting system to shape diamond components with .0001" accuracy.

Drilling Dynamics Logger

Designed mechanical package and mounting system encasing a custom printed circuit board (PCB) with accelerometers, magnetometers, high temperature battery, and custom read out connector. Measured shock, vibration, temperature, and azimuthal orientation to monitor bit dynamics and stick-slip. Extensive finite element analysis (FEA) and testing proving tool performance at 20,000 psi differential, 150 C temperature rise, and 200 G shock. Ran computational fluid dynamics (CFD) analysis to optimize flow and wear life.

Projects in Other Industries

Mining and Road Milling Picks

Conducted analysis on stress in pick bodies including braze interfaces between diamond inserts, tungsten carbide bolsters, and steel bodies. Analyzed alternative retention methods including bolted connections. Performed full scale tests on road milling machines and field tests on continuous miner in coal mines.

Hydrogen Generator

Optimized system for ceramic geometry and reaction surface area. Developed designs for sealing between ceramic and stainless steel with drastic differences in thermal expansion coefficient under extreme temperature changes. Designed and built high temperature test cells used to optimize ceramic material properties.

Personal Powered Air-Purifying Respirator (PAPR)

Redesigned PAPR for manufacturability and launched initial commercial product. Incorporated N95 filter to remove hazardous airborne particles. Designed manufacturing process and assembly lines. Developed custom injection molded parts.

Overhead Hoists

Designed lifting system to store furniture overhead including beds, closets, and platforms. Researched many lifting devices including garage door mechanisms and springs, strap hoists, winches, and cranes. System included a wire management system and motion control electronics. Led the development of control system and software to ensure the safe operation of overhead storage.

Modular Housing

Designed preassembled subcomponents to only require simple operations such as screwing, taping, or plugging together during final assembly. No electricians, plumbers, or HVAC specialists required during assembly. Performed structural analysis of modules for wind and transport loading.

Equipment, Processes, & Materials

Plant Management

Managed prototype machine shop and testing facility for five years. Equipment included computer numerical control (CNC) 4-axis lathes, CNC 5-axis mills, wire and plunge electron discharge machines (EDM), 5-ton overhead cranes, grinders, fork lifts, 3D laser scanner, optical comparator, fume hood, abrasive blast cabinet, bit brazing oven, 1000 psi mud pumps, desander & desilter, vertical & horizontal drill rigs, hydraulic tongs, and pipe handling crane. Ensured all safety trainings were held and safety equipment were available and used properly.

WORK
EXPERIENCE
CONT.

Engineering Processes

Managed teams of 5-20 engineers performing the following processes for 15 years: engineering design, computer aided drafting (CAD), technical drawings, custom PCB design, prototyping, assembly, functional testing, field testing, and shipping. Responsible for outcomes and safety of employees during all phases of projects and processes.

Material Processes

Experienced with the following material forming processes: machining, gun drilling, aluminum extrusion, 3D printing, tube seam welding, tube flaring, drill bit brazing and hard facing, wire soldering, plastic injection molding, thermoforming, press-fitting, shrink-fitting, and gluing.

Materials

Many years of experience designing with the following materials: steel, stainless steel, aluminum, Inconel, tungsten carbide, Zirconia, alumina, polycrystalline diamond, Polyetheretherketone (PEEK), Teflon, and Buna and Viton rubbers.

Mechanisms and Components

Designed with or aspects of all of the following: whipstock, diamond press, gear pump, vane pump, progressive cavity pump, gear box, spool valve, pressure release valve, down-hole ball drop, bulkheads, ball bearings, journal bearings, thrust bearings, O-rings, shaft seals, face seals, metal-to-metal seals, snap rings, bolts, nuts, heat shrink, wiring contacts and wiring harnesses.

During his time at Novatek & SLB, Mr. Marshall has become familiar with patent creation. He has reviewed many provisional patent applications, and has worked with attorneys in writing the specifications, creating drawings and drafting claims for utility patents on products he has helped design. Mr. Marshall is listed as in inventor on seventy seven issued patents.

PATENTS

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|-------------|-----------------------------|
| • 8,172,009 | Expandable Downhole Reamer |
| • 8,281,880 | Expandable Downhole Reamer |
| • 9,556,682 | Expandable Downhole Reamer |
| • 7,624,821 | Constricting Flow Diverter |
| • 8,333,254 | Downhole Steering Mechanism |
| • 8,365,821 | Downhole Valve Actuator |
| • 8,371,400 | Downhole Valve Actuator |

PATENTS CONT.

• 10,190,368	Downhole Valve Actuator
• 10,947,787	Downhole Valve Actuator
• 7,648,210	Asphalt Pick Retention
• 8,414,085	Asphalt Pick Retention
• 8,007,051	Asphalt Pick Retention
• 8,033,615	Asphalt Pick Retention
• 8,061,784	Asphalt Pick Retention
• 7,946,656	Asphalt Pick Retention
• 7,404,725	Wired Drill Pipe Power & Data Connection
• 7,537,053	Wired Drill Pipe Power & Data Connection
• 10,669,786	Wired Drill Pipe Power & Data Connection
• 10,577,917	Wired Drill Pipe Power & Data Connection
• 7,488,194	Wired Drill Pipe Power & Data Connection
• 10,683,895	Polycrystalline Diamond Bearings
• 10,030,704	Polycrystalline Diamond Bearings
• 9,976,348	Polycrystalline Diamond Bearings
• 10,113,399	Diamond Turbine Generator
• 10,472,934	Diamond Turbine Generator
• 10,907,448	Diamond Turbine Generator
• 1,1767,723	Diamond Turbine Generator
• 11,639,648	Diamond Turbine Generator
• 11,255,143	Diamond Turbine Generator
• 10,439,474	Diamond Turbine Generator
• 8,365,842	Indexing Mechanism
• 9,085,941	Downhole Steering Tool
• 8,342,266	Downhole Steering Tool
• 11,053,961	Downhole Steering Tool
• 11,788,359	Downhole Steering Tool
• 11,118,408	Downhole Steering Tool
• 8,820,440	Downhole Steering Tool
• 8,342,266	Downhole Steering Tool
• 10,837,234	Rotary Steerable System
• 10,633,923	Rotary Steerable System
• 11,542,805	Rotary Steerable System
• 11,795,763	Rotary Steerable System
• 11,125,020	Rotary Steerable System
• 10,731,420	Indexing Drill Bit
• 11,220,865	Indexing Drill Bit
• 8,353,354	Downhole Crawling Mechanism
• 10,830,359	Diamond Choke Valve
• 11,549,593	Diamond Choke Valve
• 11,796,068	Diamond Choke Valve

PATENTS CONT.

• 8,033,330	Drill Pipe Threads
• 9,989,665	Diamond Resistivity Sensor
• 9,880,311	Diamond Resistivity Sensor
• 7,934,570	Data Swivel
• 11,479,981	Moving Storage Platform
• 10,920,412	Modular Building Structure
• 9,038,739	Drilling Dynamics Logger
• 12,018,556	Rate of Penetration Measurement
• 11,028,685	Rate of Penetration Measurement
• 7,537,051	Through bore Downhole Generator
• 10,947,814	Diamond Valve
• 11,795,781	Diamond Valve
• 11,608,719	Diamond Valve
• 10,927,647	Diamond Valve
• 9,976,348	Diamond Valve
• 8,297,375	Downhole Turbine
• 7,730,972	Downhole Turbine
• 8,408,336	Downhole Turbine
• 8,267,196	Downhole Turbine
• 8,201,645	Drill Pipe Threaded Connection
• 82,97,378	Drilling Hammer
• 7,730,975	Drilling Hammer
• 8,225,883	Drilling Hammer
• 7,661,487	Drilling Hammer
• 7,730,972	Drilling Hammer
• 8,297,375	Drilling Hammer
• 10,711,833	Bearings
• 8,365,820	Valves