

Overview of advanced drilling and geomechanics research at Memorial University of Newfoundland

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Drilling is the primary means of reaching subsurface exploration targets for oil and gas exploration and the primary means of reservoir production. In the past few decades, there has been significant progress in the tools and technology for drilling, ranging all the way from advances in bit design to development of mobile drilling systems for the harshest Arctic and deepwater environments. In 2011, several major drilling technology companies invested more than 1B USD each in drilling research, with many other smaller companies, universities, and research institutes investing millions more.

At Memorial University, the Advanced Drilling Group (ADG), consisting of 5 faculty members and nearly 30 Highly Qualified Personnel lead by Principal Investigator Dr. Stephen Butt, has been focused on laboratory infrastructure development and fundamental investigation of fixed cutter drill bit penetration mechanisms using integrated experimental and numerical simulation methods. This presentation will give an overview of the ADG research from 2006 to the present, including plans for ongoing and future research. Research to be reviewed includes: (1) influence of cutter vibration and rock-cutter compliance on penetration rates and mechanisms; (2) modeling of drill string vibration induced by drillstring rotation and bit penetration for vertical and directional well trajectories; (3) evaluation of drill string and bit vibration on bit wear and drilling tool damage; (4) development of advanced experimental drilling and geomechanics simulators; and (5) evaluation of the influence of drilling from a floating MODU and influence on bit penetration and drill string vibration.

These research areas address many of the factors that limit drilling capability in terms of offshore water depth and extended reach, drilling costs and efficiencies, and penetration rates, and ultimately contribute to defining the economic and technical barriers to drilling in deeper and harsher offshore environments. Incremental advances in drilling research and technology by the ADG at Memorial University can assist with extending drilling capabilities for future exploration and development in challenging environments, in particular those relevant for NL and Canada.