

Utilization of Process Mapping Tool to Enhance Production Drilling in Underground Metal Mining Operations

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Abstract : Underground mining is at the core of rapidly evolving metals and minerals sector due to the increasing mineral consumption globally. Even though the surface mines are still more abundant on earth, the scales of industry are slowly tipping towards underground mining due to rising depth and complexities of orebodies. Thus, the efficient and productive functioning of underground operations depends significantly on the synchronized performance of key elements such as operating site, mining equipment, manpower and mine services. Production drilling is the process of conducting long hole drilling for the purpose of charging and blasting these holes for the production of ore in underground metal mines. Thus, production drilling is the crucial segment in the underground metal mining value chain. This paper presents the process mapping tool to evaluate the production drilling process in the underground metal mining operation by dividing the given process into three segments namely Input, Process and Output. The three segments are further segregated into factors and sub-factors. As per the study, the major input factors crucial for the efficient functioning of production drilling process are power, drilling water, geotechnical support of the drilling site, skilled drilling operators, services installation crew, oils and drill accessories for drilling machine, survey markings at drill site, proper housekeeping, regular maintenance of drill machine, suitable transportation for reaching the drilling site and finally proper ventilation. The major outputs for the production drilling process are ore, waste as a result of dilution, timely reporting and investigation of unsafe practices, optimized process time and finally well fragmented blasted material within specifications set by the mining company. The paper also exhibits the drilling loss matrix, which is utilized to appraise the loss in planned production meters per day in a mine on account of availability loss in the machine due to breakdowns, underutilization of the machine and productivity loss in the machine measured in drilling meters per unit of percussion hour with respect to its planned productivity for the day. The given three losses would be essential to detect the bottlenecks in the process map of production drilling operation so as to instigate the action plan to suppress or prevent the causes leading to the operational performance deficiency. The given tool is beneficial to mine management to focus on the critical factors negatively impacting the production drilling operation and design necessary operational and maintenance strategies to mitigate them.

Keywords : process map, drilling loss matrix, SIPOC, productivity, percussion rate

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