# Overburden Collapse as Defining Factor in Performance of Large Underground Coal Gasification Reactors

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A large-scale Underground Coal Gasification (UCG) plant operates a number of in-situ reactors, simultaneously or sequentially. Design, evolution and interaction of these reactors define efficiency, extraction rates and consistency of output of the UCG plant.

In-situ reactors continuously interact with environment: a) a reactor expansion causes deformation of surrounding rock, resulting in collapse and cave-in of overburden; b) groundwater percolates into the reactor, reaching the highest ingress rates immediately after the overburden cave-in.  It's these factors that tend to control gasification process.

Propagation of the rock deformation following the overburden collapse modifies effective permeability of rock formation so that this induced permeability determines large-scale redistribution of groundwater flow and pressure.

Using numerical modeling and analysis of empirical data obtained from field operations of several large-scale UCG reactors, it is demonstrated that collapse and cave-in of inert overburden rock into an active UCG reactor, far from being detrimental to gasification process, is necessary for ensuring continuous efficient operation of the UCG reactor.

Effects of groundwater on gasification process efficiency and extraction rate are considered using analysis of empirical data from a number of large-scale UCG operations. It is shown that groundwater influx critically affects cold gas efficiency, heating value of the gas, gas leakage, and environmental performance of the UCG reactors.

Practical implications for site selection and design of UCG reactors for production of syngas optimized for IGCC and XtL applications are discussed.