

## PREDICTING GAS DECLINE RATE FROM COAL MINES

Coal companies can now predict the decline of gas make and calculate the total gas reservoir capacity of underground coal mine goaves using simulation software developed by Lunagas through Australia's coal research program.

There are more than 50 decommissioned, gassy, underground coal mines in New South Wales alone that were closed after 1954. These sites are active gas reservoirs where coal mine gas is being vented, emitted to the atmosphere or used. Until the development of Lunagas Coal Mine Goaf Gas Predictor (CMGGP), there was no complete and final method available to assess gas emissions versus time from sealed goaves and abandoned coal mines.

The CMGGP specialised engineering software runs on Windows XP with .NET Framework Version 2.0 or higher, Windows Vista or Windows 7, and comprises three main sections:

- The decline curves simulator into which data for calculating the decline curves for dry and wet mines can be entered;
- The gas reservoir characteristic section into which stratigraphic data can be entered to calculate the available gas reservoir; and
- The data entry flowchart which shows flowcharts based on data from the decline curves simulator and gas reservoir characteristics sections.

This software is applicable to dry and flooded mines, and also takes into account coal mine methane utilisation options.

Lunagas CMGGP helps mine operators to:

- Assess and standardise the quantity of fugitive coal mine gases from abandoned coal mines as the source of greenhouse gas emission and potential of coal mine methane utilisation;
- Improve reliability and accuracy of monitoring and reporting greenhouse gas emissions from coal mines;
- Develop the next stage of reliable Tier-2 to assess fugitive emissions from decommissioned underground mines in line with Australian Greenhouse Office requirements; and
- Reduce the risk of uncontrolled emissions of hazardous gases from abandoned mines to the surface.

This research has consolidated the knowledge of gas emission characteristics of coal mine goaves and abandoned mines in Australia and selected mines in Europe and Asia into a form which enables emission predictions to be made using either limited or accurate input data. In particular, it has used unique statistical data records at Teralba, Stockton Borehole, Central, Tower, Appin, Cordeaux, Munmorah, Endeavour, South Bulga and others.

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Project Leader Les Lunarzewski said the aim of this project was to provide the Australian coal mining industry with a practical, scientifically based prediction tool for assessing the methane production potential of abandoned underground coal mines and/or goaves, ranging from a single panel to whole-of-mine.

“The proposed coal mine goaves have been classified into nine categories based on the New South Wales and Queensland underground coal mine case studies – high gassy, low gassy, low permeability, high permeability or shallow mine, temporarily closed, sealed district goaves, sealed longwall goaves, longwall and bord and pillar, and bord and pillar only,” he said.

“If key data is available, the decline curves (based on empirical mathematical formulae) and gas reservoir simulation will provide a rapid and practical prediction of abandoned coal mine methane quantity versus time potential. Where some input data is missing, site investigation may be required including drilling a test hole, gas monitoring, and water/gas pumping tests.

“We found that coal mine goaf methane resources estimated using constrained emission decay curves and related mathematical formulae avoid difficulties of identifying all gas sources and their magnitudes; full knowledge of the latter is problematic in practice.”

In order to use Lunagas CMGGP with full functionality, a licence must be obtained from Lunagas.

Industry Monitor Neil Alston said industry now had a software tool to estimate gas make decline in a range of coal mine goaf situations.

“It will be of particular use for assessing the methane utilisation potential of closed, decommissioned or abandoned mines. I commend the researcher on his commitment and consider the project has exceeded objectives, particularly in the area of software capability,” he said.

“A coal mine goaf classification matrix was also devised to assist explanation of the various stages of goaf formation which should assist users.”

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