

Message from the CEO



Henk Lodewijks

We are in a new Coaltech financial year, signalling the start of a number of new and exciting projects to run over the next few years. In total the Coaltech Board has approved 10 new projects in the mining, coal processing and surface environment technology areas.

These projects are set out in this newsletter to provide you with some insight into the projects and what we hope to achieve with them.

Our next newsletter will relay some of our completed projects and their results. But for a better understanding and more detail on these, reserve 31 May 2024, when our Coaltech Colloquium will take place. On this day, the researchers involved will showcase some of our best projects.

Enjoy this newsletter. Visit the Coaltech website for further information.

Coaltech dry coal processing research

Coaltech started research into the use of dry processing technologies to process South African coal in 2007. Since then, the following dry processing technologies have been investigated:

- Dry screening
- Fuhe Gan Fa Xuan Mei' (FGX)
- X-ray transmission sorting (XRT)
- Allair jig
- Dry dense medium processing
- Sepair
- Winoxing

The research projects undertaken by Coaltech were fully supported by the local coal industry and also by South African universities.

To date, dry screening of coal, dry processing using FGX technology as well as the use of XTR has been implemented by the South African coal industry. Dry processing is now accepted as the preferred technique to de-stone and upgrade coal in specific cases.

To date Coaltech has financially supported 15 dry coal processing projects at South African universities which resulted in 13 Masters in Engineering and two PhD degrees.

Thirty-six dry processing research reports were issued and 38 presentations were delivered at local and international conferences.

Dry processing of fine (minus 8 mm) coal remains problematic and Coaltech plans to conduct further research on this subject.



RESEARCH IN PROGRESS

Environment

CARBON FARMING MODEL FOR REHABILITATED COAL MINED LAND: A SMALL-SCALE SMART FARM INCUBATOR FOR LAND AND COMMUNITY REGENERATION

To evaluate the potential of the EUP Smart Farm Incubator® for a Carbon Farming Model® by small-scale community farmers on rehabilitated mine land.

- Regenerate rehabilitated mine soil and spoil using high-producing biomass and vigorous root system species as a primary soil carbon input to the model, an erosion control measure, and a renewable energy production process feedstock.
- Develop a biomass feedstock plan to support renewable energy production through anaerobic digestion or pyrolysis to produce natural gas (methane-captured carbon output).
- Evaluate the by-products (captured carbon outputs) from these processes as soil ameliorants as secondary soil carbon inputs to the model.

AN ASSESSMENT OF THE POTENTIAL FOR CARBON CAPTURE, FOOTPRINT REDUCTION, AND OFFSETTING THROUGH REGENERATIVE POST-CLOSURE MINE AGRICULTURAL AND AGROFORESTRY LAND USE

The overall aim is to explore agricultural options on how to develop opportunities for regenerative post-closure mine land use that reduce its carbon footprint and then provide management with the information required to take these potential opportunities forward.

The aims are:

- To identify a representative farming system for each of the cropping, rangeland / pasture integrated crop and pasture-based livestock, and agroforestry post-closure mine land use options.
- To predict the soil carbon sequestration potential of each farming system scenario for the Mpumalanga Highveld to be able to identify strategies to optimise carbon capturing potential.
- To determine the full carbon green house gas (GHG) footprint of each farming system scenario to explore and identify strategies to optimise GHG emission reductions and identify potential carbon offset projects.
- To assess the risk, feasibility, and high-level cost-benefit of each of the agricultural post-closure land use scenarios to be able to identify appropriate farming systems through the exploration of potential future scenarios, and to articulate improved carbon capturing and reduction in the GHG emissions and carbon footprint.

REHABILITATION OF COAL DISCARD DUMPS USING INDUSTRIAL PLANT MATERIAL

In 2002, the government of South Africa passed the Mineral and Petroleum resource development act (MPRDA), which requires mines to rehabilitate the site after closure. The cost for proper mine rehabilitation is often significant and can result in millions of rands which is seen as an additional cost to adhere to legislation at the end of the mine's life. However, if the land can be utilised to harvest industrial crops, then rehabilitation can be turned into a business opportunity for the local community.

This project aims to determine the possibility to grow and harvest Kenaf (*Hibiscus cannabinus*) and/or Flax (*Linum usitatissimum*) on reworked coal tailings dams.

SOIL COVER GUIDELINE-CONSULTATION WITH AUTHORITIES TO ACQUIRE ENDORSEMENT OF GUIDELINE

The guideline supports and aligns with the statutory provisions of water and environmental legislation, and the document presents distinctive value to mine rehabilitation and closure. Acquiring the sanctioning of the guideline from the relevant government department(s) will significantly enhance the value and useability of the guidelines to the mining industry.

DEVELOPMENT OF A DIATOM-BASED INDEX FOR ACID MINE DRAINAGE IMPACTED WETLANDS IN SOUTH AFRICA

The aim of this study is to develop diatom-based indices for different Acid Mine Drainage (AMD) impacted wetlands, including seeps, wetland flats, floodplain wetlands, channelled valley-bottom wetlands and unchannelled valley-bottom wetlands which may be affected by AMD.

The study aims to determine the diatom communities associated with the different wetlands to develop an index that can distinguish between AMD-impacted and non-impacted wetlands accounting for the heterogeneous features of the different wetlands.

This makes for a more accurate method with which to determine real-world water quality and track rehabilitation success. To increase ease of use, the study aims to incorporate the detection of aquatic Environmental DNA (Deoxyribonucleic acid) (eDNA), a rapidly developing technology using DNA found suspended in the water column to barcode and then identify aquatic organisms present at a study site.

Mining

DEMONSTRATE THE EFFICIENCY OF UNMANNED AERIAL VEHICLE-GROUND PENETRATING RADAR (UAV-GPR) FOR THE ASSESSMENT OF REHABILITATION SITES AND DETECTION OF SUBSURFACE CAVITIES

The research's main objective is to demonstrate the suitability of the unmanned aerial vehicle-ground penetrating radar (UAV-GPR) tool for mapping rehabilitation soils and underground mining cavities.

This will be done by:

- Conducting field tests with the newly acquired unmanned aerial vehicle-ground penetrating radar (UAV-GPR) system to determine the topsoil depth and other soil variations in mining rehabilitation areas.
- Ground truthing in the form of follow-up soil characterisation using the traditional auger-based approach is also recommended.
- Conducting a field test with the newly acquired UAV-GPR system to demonstrate its ability to detect subsurface cavities in coal mining areas.



Processing

IN-DEPTH DESKTOP STUDY OF THE ALTERNATIVE USES OF COAL IN THE PRODUCTION OF ADVANCED MATERIALS AND LIGHTWEIGHT PRODUCTS FOR THE SUSTAINABILITY OF THE COAL INDUSTRY

The goal of this study is to provide a thorough review of alternative coal products that can be produced in large quantities from coal waste from alternative technologies or ones being developed.

This includes activated carbon, carbon fibre, coal composite for building components, and graphitised products made from carbon etc.

Carbon-based materials are becoming more important across industries. However often the most important question when developing new processes is whether coal can be used as a good carbon source.

Even though the world is advocating a low-carbon economy, the more renewable gadgets we make, the more carbon we consume.

The following objectives will provide detailed information on alternative carbon-based products from coal:

- Review literature on current areas of research on alternative uses of coal in South Africa and across the globe, with reference to the activities and new technologies developed by EU-funded research on just transition and coal use in the future.
- Review existing technological alternatives and the cost implications of these technologies as available in the literature.
- Review applications and technologies that are already commercialised or under development and can be adopted locally based on the quality of our coal.
- Recommend process scale options, with the cost of those processes as a key factor in our recommendation.

UPGRADING OF COAL WITH THE AID OF A KNELSON CONCENTRATOR

The aim of the project is to determine if a Control Variable Discharge (CVD) Knelson concentrator can be commercially used to upgrade fine coal.

The objectives of this study will be to determine:

- The resource available to be treated.
- The optimum size range (-1mm to 0.1 and -0.1), feed capacity, etc. to be used in the comparison of the Knelson Unit at the University of Pretoria (UP) CVD tests.
- The evaluation on the efficiency of the process for grade and yield.
- The scale-up of the process – test on an industrial unit UP or alternative at FLSmidth.
- The evaluation of the economics of the process.



Upcoming Events

Coaltech
The Coaltech Research Association NPC

Colloquium

31 May 2024

Save the Date











Attendance is FREE

Exhibitor Opportunities

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