THE DESIGN OF A COMPUTERISED VENTILATION MONITORING SYSTEM AT TROJAN NICKEL MINE

BY NDANGANA NGONIDZASHE

(DEPARTMENT OF MINING ENGINEERING)
“Wait until you go underground and you will appreciate the importance of fresh air!!!!!!”

~NGONI NDANGANA
INTRODUCTION

NEGATIVE PRESSURE AXIAL FANS AT TROJAN

VANE ANEMOMETER

WHIRLING HYGROMETER
INTRODUCTION

AIR QUALITY

1. Carbon dioxide (<5000 ppm)
2. Carbon monoxide (<100 ppm)
3. Nitrous fumes (<5ppm)
4. Methane (<1.25%)
5. Hydrogen sulphide (<20 ppm)
6. Oxygen (> 16%)
7. Ammonia (< 50ppm)

➢ Temperature
➢ Humidity

AIR QUANTITY

• Air velocity
• Air flow
Trojan Nickel Mine Uses Old Methods Of Measuring Air Quality And Quantity. Because Of The Labour And Time Involved Every Section Can Be Surveyed Once Every Month.
HOW THIS IS AFFECTING US...

INEFFICIENCIES OF THE OLD SYSTEM

• FAINTING

• FATALITIES
HOW THIS IS AFFECTING US...

PRODUCTION TIME AND LABOUR LOSS

• If the ventilation surveying labour could be used for production......

• Sums up to $500 000 every financial year
WHAT WAS DONE...

- Project understanding and planning
- Desktop study
- Ventilation surveys
- Design of the proposed system
Hourly Carbon Dioxide Concentrations

CARBON DIOXIDE CONCENTRATION (IN PPM)

Time

6:00 7:00 8:00 9:00 10:00 11:00 12:00 13:00 14:00 15:00 16:00 17:00 18:00
FINDINGS

• The conditions at any instant are unique
• Reproducibility of any result is not possible
• Monthly surveys are not reliable
DESIGN OF THE NEW VENTILATION MONITORING SYSTEM

• HARDWARE SELECTION

• SOFTWARE DESIGN
SOFTWARE DESIGN

LANGUAGES USED

• HTML and CSS for the interface
• PHP as a server side scripting language
• Java script to add interactive features to the interface
• The database used is MYSQL
SOFTWARE DESIGN

• PROPOSED SECURITY LOGIN INTERFACE
SOFTWARE DESIGN

- PROPOSED AIR QUALITY AND QUANTITY INTERFACE
SOFTWARE DESIGN

- PROPOSED AIR MONITORING GRAPH

39 Level: Entry - Carbon Dioxide
SOFTWARE DESIGN

• NOTIFICATIONS INTERFACE

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RE-ENTRY PROCEDURE
RISKS

• MISFIRES

• GASES (carbon dioxide, carbon monoxide)
SOFTWARE DESIGN

BLAST EFFICIENCY ALGORITHM

\[ \text{NH}_4\text{NO}_3 + \frac{1}{3} \text{CH}_2 = \text{N}_2 + \frac{1}{3} \text{CO}_2 + \frac{7}{3} \text{H}_2\text{O} + 927.0 \text{ KCAL/KG} \]

\[ \text{ANFO} = \text{NITROUS} + \text{CARBON DIOXIDE} + \text{WATER} + \text{ENERGY} \]

ANFO IS PROPORTIONAL TO CARBON DIOXIDE
POST BLAST ANALYSIS

- BLAST EFFICIENCY INTERFACE

39 Left End: Carbon Dioxide

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THE FUTURE
BENEFITS OF THE NEW SYSTEM

- Detect air leakages
- Detect excessive gas emitting machinery
- Modelling air flow
- Monitor fan performance
- Have a computerised record of the mining atmosphere
- A finer and more accurate monthly ventilation report
- Save on labour and time
BENEFITS OF THE NEW SYSTEM

- Monitoring working atmosphere PROMOTING SAFETY
- Determine blast efficiency
- Save lives as re-entry gassing is eliminated
- Elimination of human error and result manipulation
BENEFITS OF THE NEW SYSTEM
ECONOMIC BENEFITS

• EMPLOYMENT CREATION
• INTERNALISATION OF FUNDS
• TAXES
• TECHNOLOGY

INDIGENISATION!!!!!!!
RECOMMENDATIONS

TROJAN NICKEL MINE AND THE WHOLE MINING INDUSTRY SHOULD ADOPT AND SUPPORT THE NEW SYSTEM OF VENTILATION SURVEY AND DATA STORAGE.
CELEBRATE NEW TECHNOLOGY!!!!!!!!!!!!

CELEBRATE THE FUTURE OF MINING ENGINEERING!!!!!!!!!!!!!!