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

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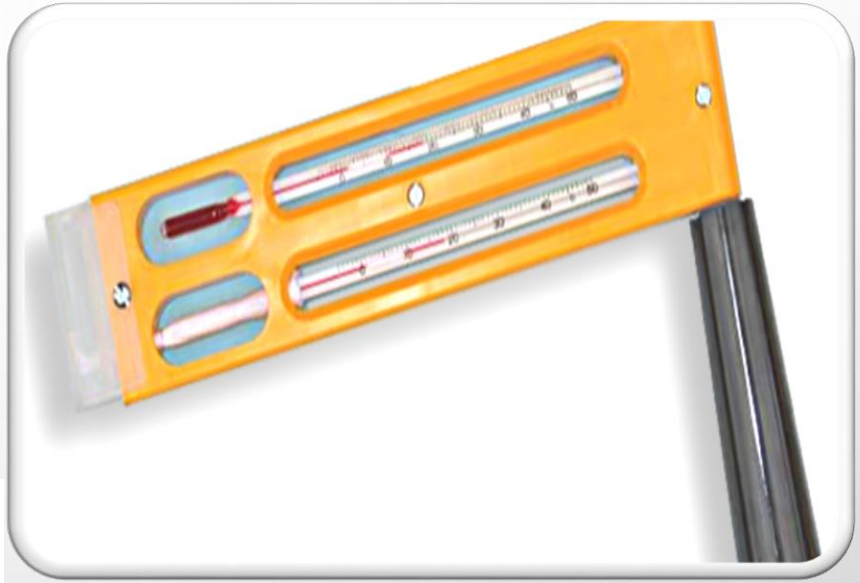
“ Wait until you go underground and you will appreciate the importance of fresh air!!!!!!!!!!!!!!!! ”

~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


33
9503


Audio OFF
6:50
A/C
AUTO
FRONT
REAR
REAR CLIMATE
69°
69°
OFF
SYNC
Radio
Player
Controls
Climate
Nav
Phone
More
A/C
AUTO


TEMP
AUTO
HEAT
COOL
DRY

- 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

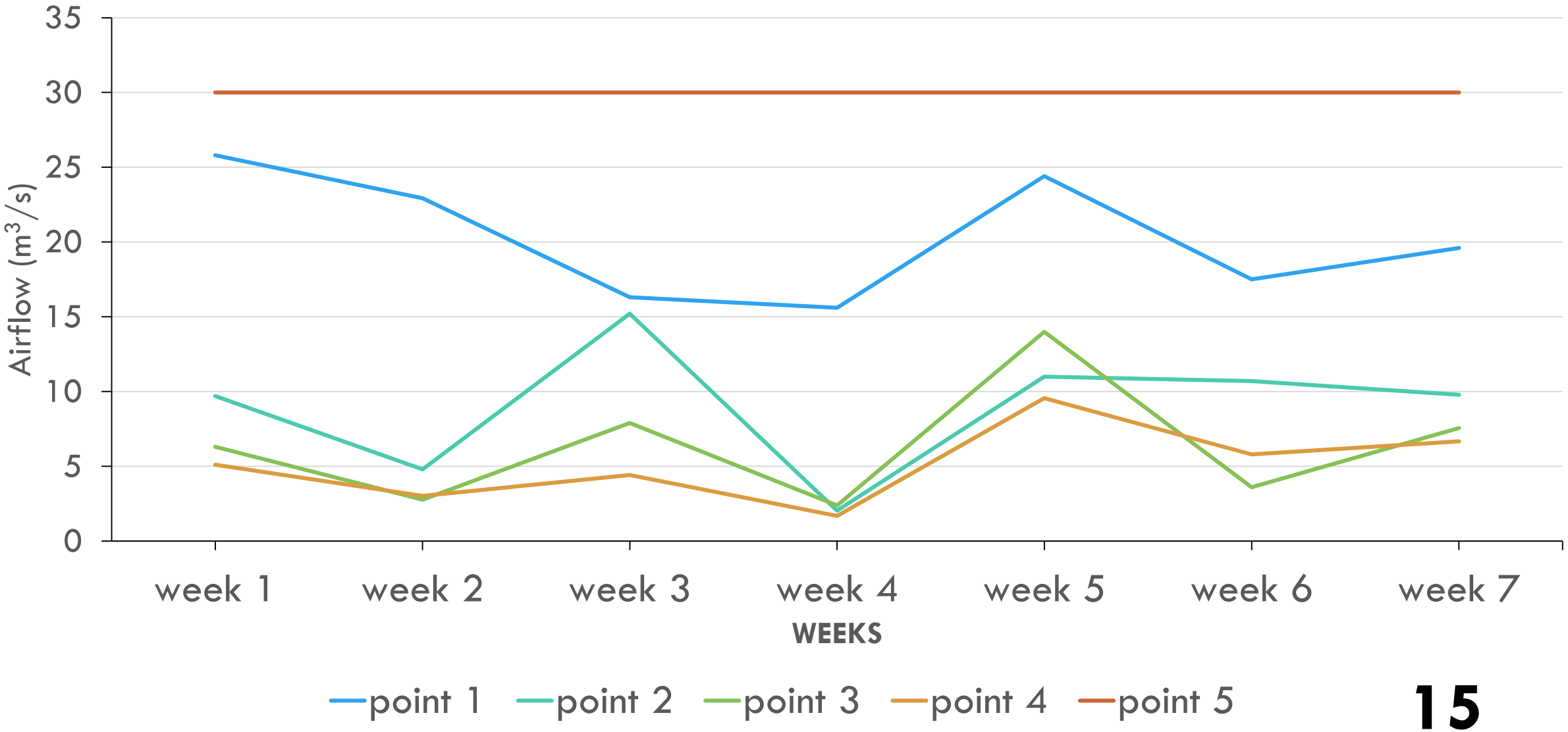
- If the ventilation surveying labour could be used for production……

- Sums up to $500 000 every financial year

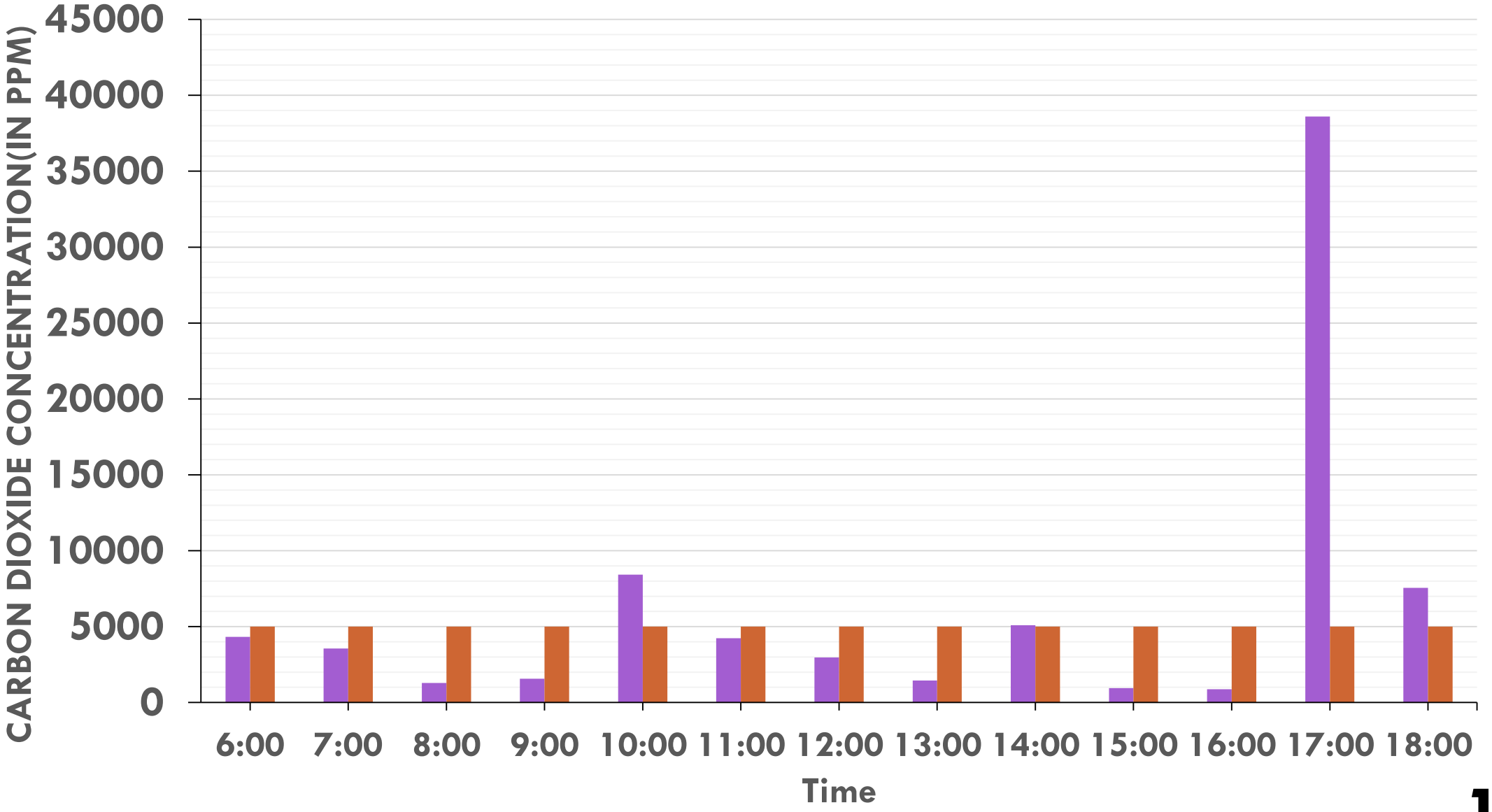
WHAT WAS DONE…

- Project understanding and planning
- Desktop study
- Ventilation surveys
- Design of the proposed system

WEEKLY AIRFLOW RECORDINGS



Hourly Carbon Dioxide Concentrations



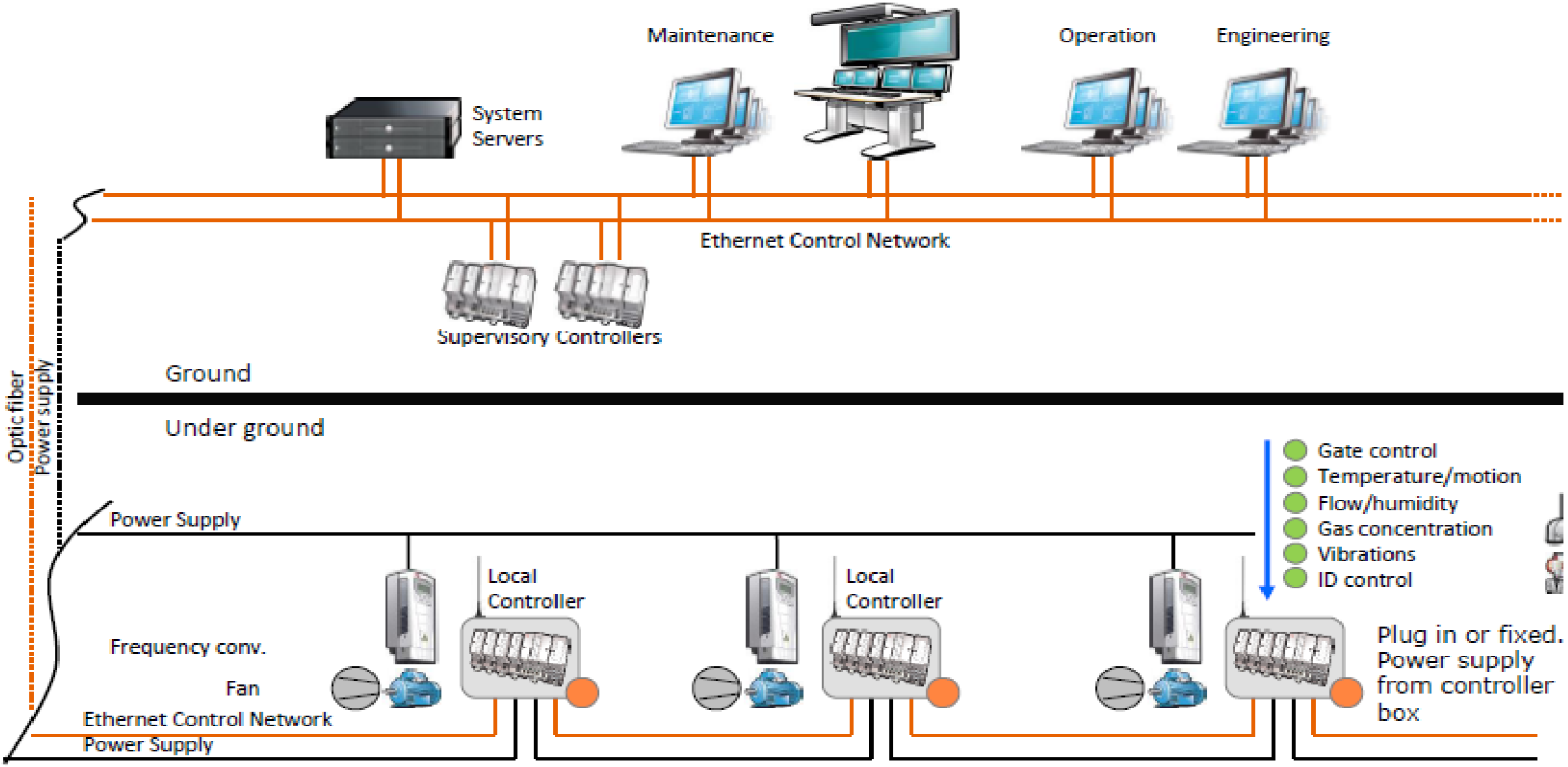
FINDINGS

- 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

HARDWARE SELECTION



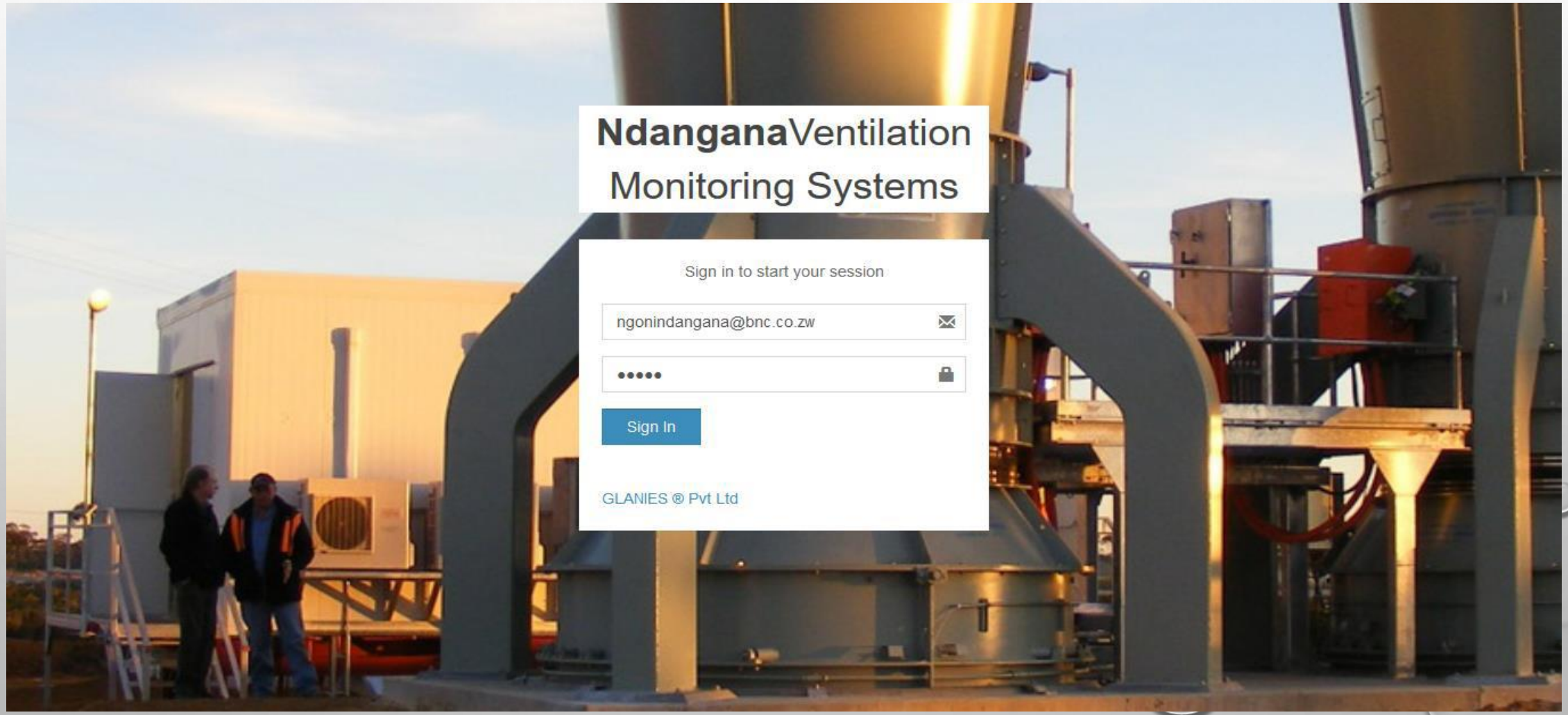
SOFTWARE DESIGN

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

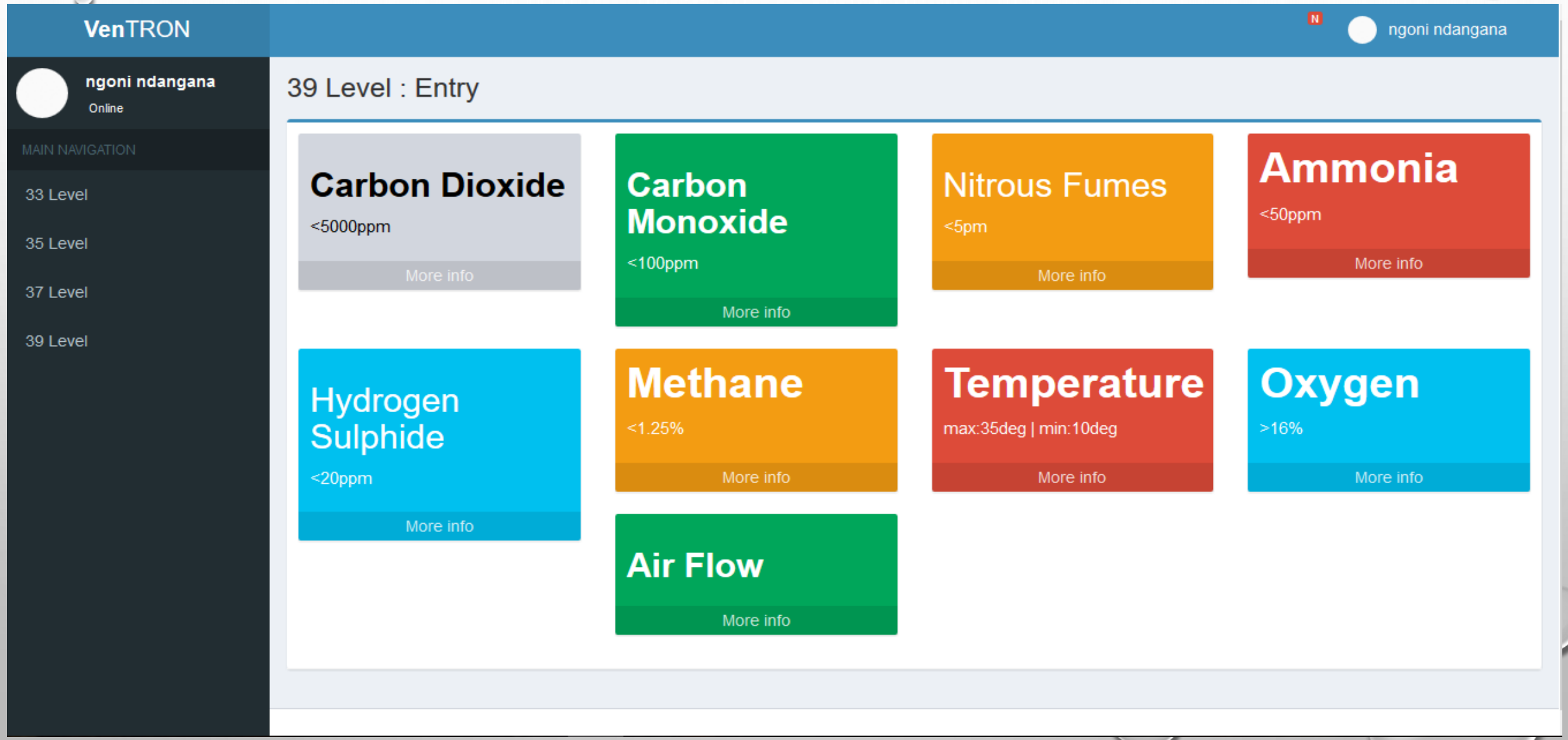
SOFTWARE DESIGN

- **PROPOSED SECURITY LOGIN INTERFACE**



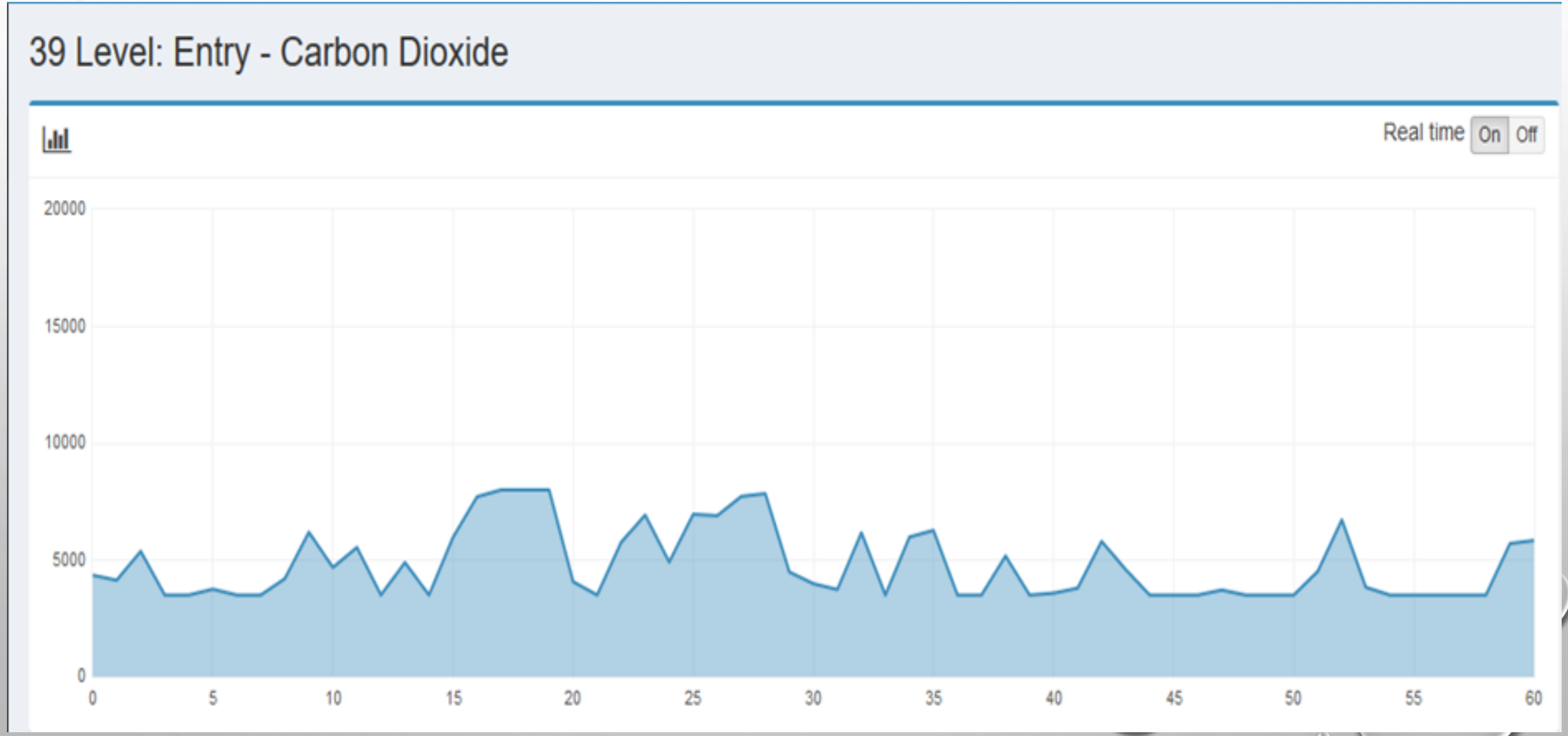
SOFTWARE DESIGN

- **PROPOSED AIR QUALITY AND QUANTITY INTERFACE**



SOFTWARE DESIGN

- **PROPOSED AIR MONITORING GRAPH**



SOFTWARE DESIGN

- **NOTIFICATIONS INTERFACE**

All Notifications

Home > Tables > Simple

#	Air Quality	Date and Time
209	Carbon Dioxide : 5080	2017-02-26 13:57:11
208	Carbon Dioxide : 5010	2017-02-26 13:57:11
207	Carbon Dioxide : 5155	2017-02-26 13:57:11
206	Carbon Dioxide : 5036	2017-02-26 13:57:11
205	Carbon Dioxide : 5387	2017-02-26 13:49:53
204	Carbon Dioxide : 5102	2017-02-26 13:49:53
203	Carbon Dioxide : 5029	2017-02-26 13:49:53
202	Carbon Dioxide : 5245	2017-02-26 13:49:53
201	Carbon Dioxide : 5526	2017-02-26 13:49:53
200	Carbon Dioxide : 5135	2017-02-26 13:49:53
199	Carbon Dioxide : 5147	2017-02-26 13:49:53
198	Carbon Dioxide : 5161	2017-02-26 13:49:53
197	Carbon Dioxide : 5159	2017-02-26 13:49:53

2:02 PM

RE-ENTRY PROCEDURE

RISKS

- MISFIRES
- GASES (carbon dioxide, carbon monoxide)

SOFTWARE DESIGN

BLAST EFFICIENCY ALGORITHM

$NH_4NO_3 + 1/3\ CH_2 = N_2 + 1/3\ CO_2 + 7/3\ H_2O + 927.0$ KCAL/KG

ANFO = NITROUS + CARBON DIOXIDE + WATER + ENERGY

=

BUT MATTER IS NEVER CREATED NOR DESTROYED…….

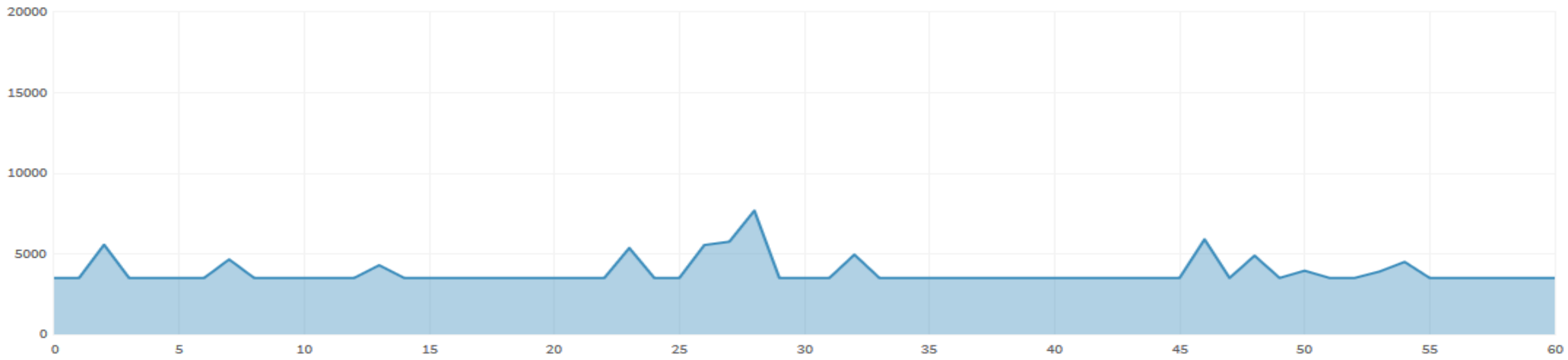
ANFO IS PROPORTIONAL TO CARBON DIOXIDE

POST BLAST ANALYSIS

- **BLAST EFFICIENCY INTERFACE**

39 Left End : Carbon Dioxide

Real time On Off



Enter amount of explosives used in Kg/s

Submit

#	Units of Explosive	Theoretical	Blast Efficiency
5	420	840000	0.872381
4	500	1000000	0.7223

Clear All

THE FUTURE

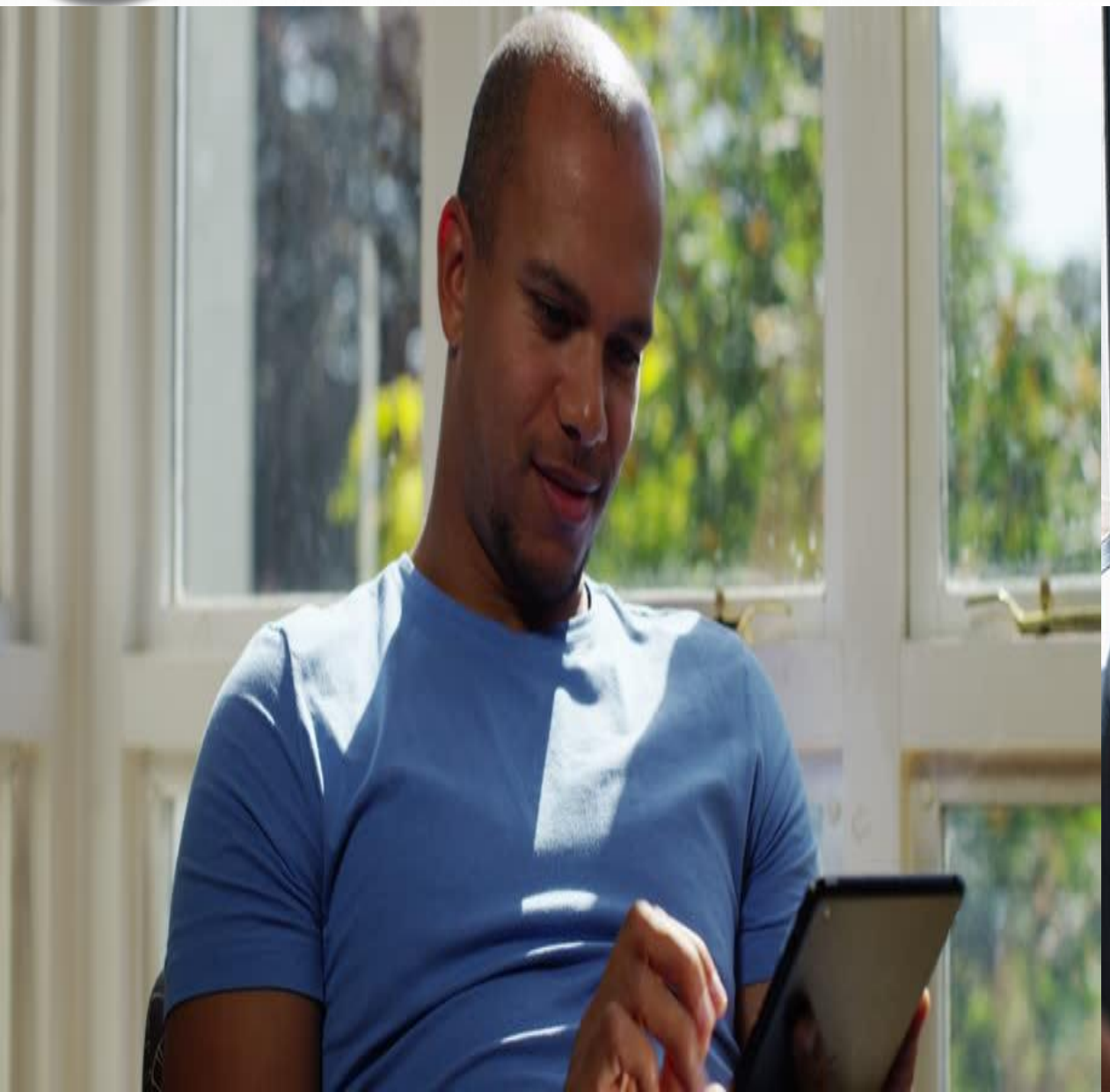
BENEFITS OF THE NEW SYSTEM

- 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!!!!!!!!!!!!!!!!!