



To: DE Wrigley
Manager – Occupational Environment

From: JJ Dekker
ESH Manager – Occupational Hygiene

Subject: Evaluation of LiquiCell Dust Scrubbing System

Air & Allied Technologies were visited on 30 August 2002. The purpose of this visit was to conduct an on-site evaluation of the LiquiCell Dust Scrubbing System.

1. FINDINGS

1.1 System (See Appendix A for detail specifications and operating methodology).

Air filtration capacity	=	6,1 ± 10% m ³ /s
Water consumption	=	150 l/min or 2,5 l/sec
		Water can be re-circulated by using slurry pump.
		Water replacement frequency and make-up water requirement is dependent on size of sump and inlet dust load.
Fan motor	=	37,4 kW
Estimated pressure	=	2 kPa
Inlet and outlet diameter	=	Can be 570mm or 760mm. Flange manufactured to AngloGold specification.
Main LiquiCell diameter	=	900mm
System length	=	2 750mm

1.2 Cost (See Appendix A for detail)

LiquiCell	=	R 112 900	ex V.A.T.
Slurry pump	=	R 22 062	ex V.A.T.
Fan	=	R 66 417	ex V.A.T.
TOTAL	=	R 201 379	ex V.A.T.

1.3 Dust Filtering Efficiency

A dust sample from Great Noligwa Mine was utilized to conduct on-site tests. This sample consisted of dust collected both before and after an existing fabric dust filter unit (**i.e. the dust collected after the filter bags consisted of dust that were not effectively filtrated by the filter bags**).

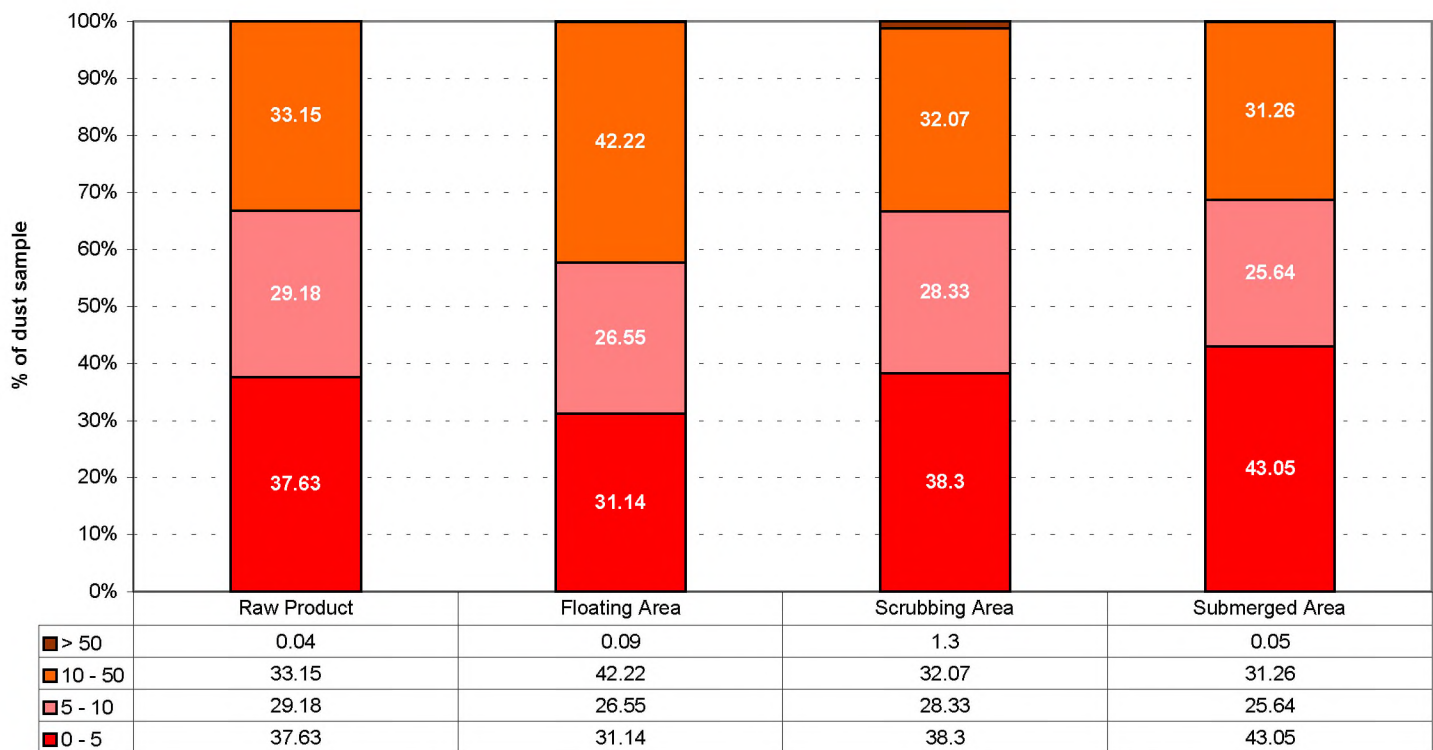
The sample dust was allowed to enter the LiquiCell System and samples were collected (within 2 minutes of the test being completed) of the dust:

- entering the system,
- in the floating area,
- in the scrubbing area,
- in the submerged area.

Particle size analysis of the samples were conducted by Malvern Instruments (see Appendix B) and revealed that:

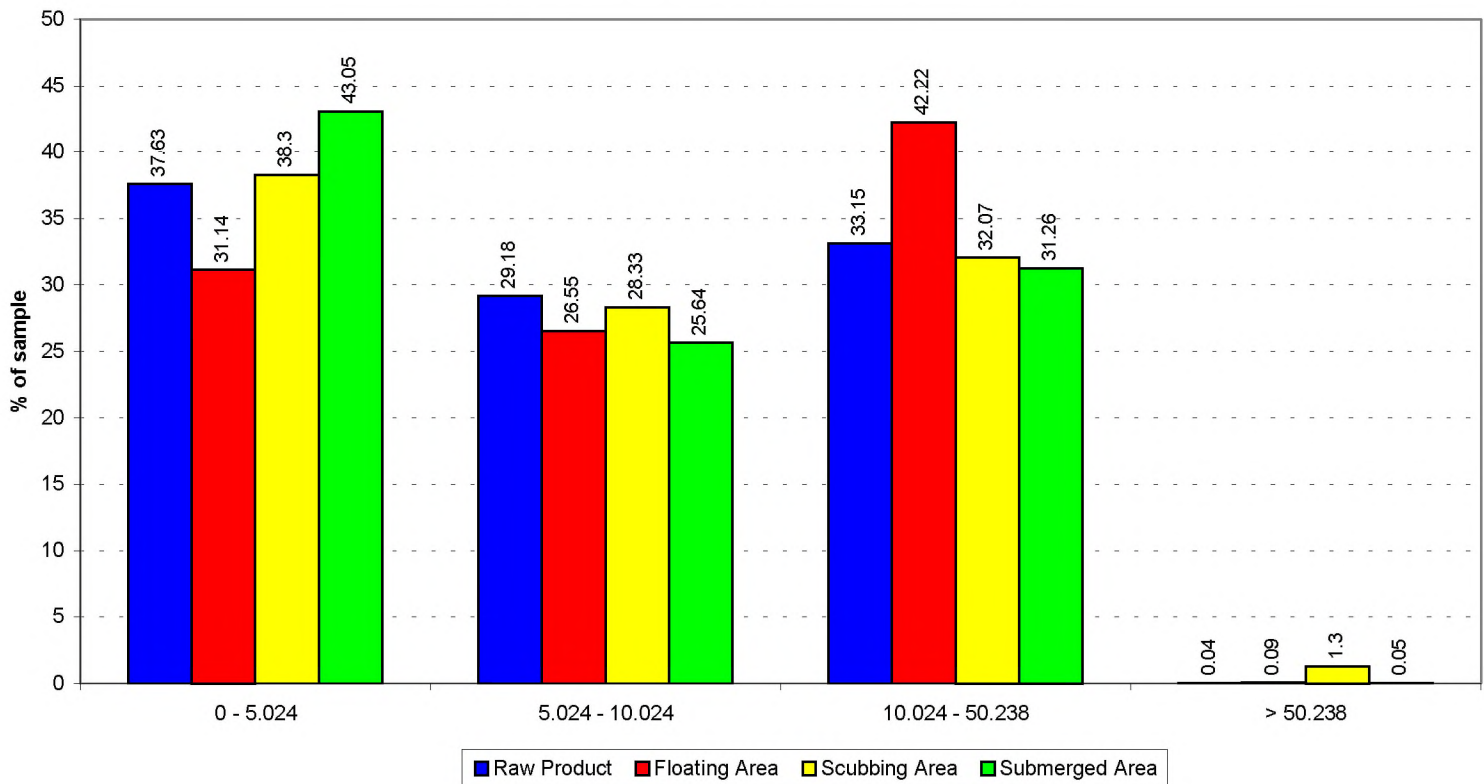
- The LiquiCell System was able to effectively filtrate dust particles of any diameter (Graph 1). Of particular importance is the fact that the system was able to filtrate the respirable dust, not filtered by the currently utilized fabric bag dust filter.
- It is suspected that the system even filtered impurities contained in the filter media (water). This is suggested by the increase in $> 50 \mu\text{m}$ particles (1,3 %), when compared to the sample dust of 0,04 % (Graph 2).

Liquicell Scrubbing System - Efficiency
Dust particle distribution (micro meter diameter)



Graph 1

Liquicell Scrubbing System - Efficiency
Dust particle distribution (micro meter diameter)



Graph 2

2. CONCLUSIONS / RECOMMENDATIONS

From the results (contained in this report) it is evident that this system is far superior to the currently utilized fabric dust filter installations.

It is therefore recommended that a “test plant” be purchased installed at Great Nologwa Mine. This is required to perform more extensive tests with regard to:

- Filtering efficiency,
- Optimum size of sump when exposed to fluctuating dust loads,
- Extend of maintenance program required (i.e. slurry pump, fan, cleaning of sump, etc),
- Determination of make-up water requirements, and
- Financial feasibility of replacing all currently installed fabric dust filter installations with this type of dust scrubber.

3. IMPORTANT NOTE

Adequate Technology and Innovation funding is available to purchase both the LiquiCell and the Slurry pump. Currently utilized axial flow fans are unable to operate at 2 kPa. Alternative funding to purchase a fan, capable of handing 6 m³/s at 2 kPa (±R 67 000), must be identified.

APPENDIX A

Anglo Gold Private Bag X 5010 Vaal Reef

2621 Our ref. 08/221/02

2nd September 2002

Attention : Kobus Dekker

Dear Sir,

Re : Liquicell Scrubbing System

Thank you for your valued enquiry for the design, manufacture, supply and thereafter the commissioning of a Liquicell scrubbing system as discussed with you.

Furthermore, thank you for taking the time to come out and test our Liquicell unit.

System Capacity

Your system has volume requirement of 6.1cu.M/sec or 22,000cu.M/hr.

System Flexibility

Through the design of the Liquicell system, the above volume could vary by up to 10% either way without affecting the efficiency of the system.

Liquicell System

The Liquicell system has a number of advantages :-

1. Space Requirement

The Liquicell system fits directly into a duct system which would normally be required in any event taking the polluted air to a normal scrubber. This unique system does away with the need of a scrubber thereby saving the amount of valuable space that would be required for a normal scrubber installation system.

2. Efficiency

The scrubber efficiency allows the system to operate at points where normal scrubbers are ineffective. In your instance, tests will be undertaken on our pilot plant in order to ascertain the exact efficiency of the system using your specific dust. However, on the standard tests undertaken, the Liquicell system is capable of filtering product down to less than one micron. Sample curves of the above is included herewith.

3. Maintenance

The Liquicell system has no moving parts whatsoever. If the system is used with a thickener, an outside pump is used for the reticulation of the liquor. If the Liquicell system is used with liquid going directly to the water treatment plant, there are no moving parts within the system.

4. Cost Effectiveness

Compared to standard scrubbing systems and certainly compared to standard Baghouse systems, the cost effectiveness from a capital point of view as well as from a maintenance point of view of the Liquicell system is a major advantage in the purchasing of the equipment.

5. How it Works

A section of duct can be removed from an existing system, or a duct system connected directly into the Liquicell. The diameter of the Liquicell is approximately 40% larger than the standard duct system and varies in length from 1200mm to approximately 5 meters. This is the entire size of the Liquicell system.

Air entering the Liquicell passes through a water sheet which is created without a nozzle. The sheet is created through splash spray technology which assure complete wetting of the entire cross face area of the Liquicell system. The air / dust / water mixture moves into the Vena Contracta and immediately into an expansion chamber where a tremendous haphazard movement of the mixture assure that all dust particulate is entrenched in the liquor droplets. The mixture which now consists of clean air and polluted liquor, moves through a static turbine where the liquor and dust is removed radially from the linear movement of the air out of the Liquicell scrubber and into the duct or the fan. The liquor / pollutant is collected in a sump built under the Liquicell system. Concentric centrifugal forces are used for the removal of the liquor/pollution.

At this stage, the liquor can either be taken directly to a water treatment plant or passed to a thickener type settlement tank.

6. Slurry Pot

A slurry pot will be supplied which will allow for the drain off of settled material directly to your drains whilst reticulating cleaner liquor from a height above the settling points. The slurry pot will measure 1M in diameter x 1M in height or alternatively can measure 1,5M long x 500M wide x 1M high depending on your requirement.

7. Structural Work

The system will be structured from ground level on its own steel structure with the **settlement tank included or without the settlement tank** for liquor to be taken straight through to your water treatment plant.

8. Clean Out Ports

The Liquicell is fitted with clean out ports so that all parts of the Liquicell system can be accessed should clean out be required.

9. Specification

Model Number 220

Cu.M/sec (Air) 6

LiquiCell Volume (Liquor) 9 cu.M/hr

Head 7 Bar

Make up Liquor 200 //hr

Pressure Drop at 2,000 below sea level 4 kPa

Estimated Air Density 1.34 kg/cu.M

Fan Size (AAC Specification) RC30

1000C/0,90 – SI – C14

Motor Size (AC Specification) 37.4 kW *

Coupling Direct Coupled

Price LiquiCell R112,900 – 00 ex V.A.T.

Price Pump @ 3% Slurry R 22,062 – 00 ex V.A.T.

Price Fan R 66,417 – 00 ex. V.A.T.
Plant Volume 22,000cu.M/hr
Inlet/Outlet diameter 570mm
Main Diameter 900mm
System Length 2,750mm
Pump Capacity 9 cu.M/hr.
Pump Pressure 7 bar
Estimated Pressure over Liquicell System
and Design parameters 2 kpa
* Dependant on final system (duct work) and design.

10. **Standard Conditions of Sale**

Our prices are subject to our Standard Conditions of sale enclosed herewith.

11. **Delivery**

Delivery can be made 6 – 8 weeks from date of official order.

LiquiCell will be supplied with matching flanges.

Trusting the above is per your requirements and assuring you of our utmost co-operation at all times.

I remain,
yours faithfully,
Lourens v.d. Westhuizen
Sales Engineer
Cell.: 082 802 1486

APPENDIX B

