

# AMC Surface SRU<sup>TM</sup> reduced site footprint on privately owned land

## CASE STUDY

The tropical and mountainous conditions of the Morobe Province, Papua New Guinea presented numerous challenges to the drilling operator, including poor site access on steep terrain, minimal space for drilling operations and overflowing sumps due to heavy rainfall.

### Background

An AMC customer was carrying out exploration coring on privately owned land in the Morobe province of Papua New Guinea (PNG). Operations were challenging due to the tropical and mountainous conditions – access to site, preparation of ground sumps and overflowing sumps caused by heavy and frequent rainfall, were all contributing factors. Other challenges included storage and removal of cuttings from site, core condition and the cost of treating mud.

AMC proposed a trial of its AMC Surface Solids Removal Unit<sup>TM</sup> (AMC Surface SRU<sup>TM</sup>) to eliminate the need for open ground sumps, reduce mud usage and reduce the volume of cuttings.



### Results

- \$28,000 net savings per rig per month
- Sumps no longer required
- 93% reduction in mud volume
- 74% reduction in mud costs
- 96% reduction in mud waste cartage
- 98% reduction in cuttings volume.

*\*Rental is not included as rates may vary depending on the terms of the contract.*

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## TRIAL OVERVIEW

Date	April – May 2013
Location	Morobe Province, Papua New Guinea
Activity	Exploration – coring
Access / drill pads	Small drill pads, nested on the side of hills with limited and challenging access. Conditions were often treacherous due to heavy and frequent rainfall
Drill hole information	PQ3 to 400 metres, then NQ3 to 700 metres
Mud information	SODA ASH, AUS GEL™, AUS TROL™, PAC L™, BIOCID G™, EP BIT LUBE™ and KLATROL™ were used. Three sumps were available (approx. 4m x 3m x 2m and 72,000L). One sump was used for storing contaminated mud; the remaining two were used for cleaning and cuttings removal
Water	Abundant water supply due to daily rainfall and feeds from river systems
Geology	Moderately broken sediments, brecciated siltstone and common siltstone / sandstone / mudstone
Minerals	Gold.



## Mud Costs Reduced by \$500 Per Shift

The customer's mud costs were elevated due to the volume of water in the ground sumps and water losses (approximately 1,500L – 2,500L per shift) caused by the geology downhole. High levels of pyrite were also encountered, which affected mud properties.

Approximately 5,000L of mud was needed (3,000L within the unit and 2,000L of hydrated mud on standby) when using the AMC Surface SRU™, versus some 21,600L when using ground sumps. Mud costs reduced by approximately 74% or AU\$500 per shift.

The graphs below illustrate the considerable reduction in mud required when the customer utilised the AMC Surface SRU™.

## Sumless Technology Eliminated the Need for Sumps

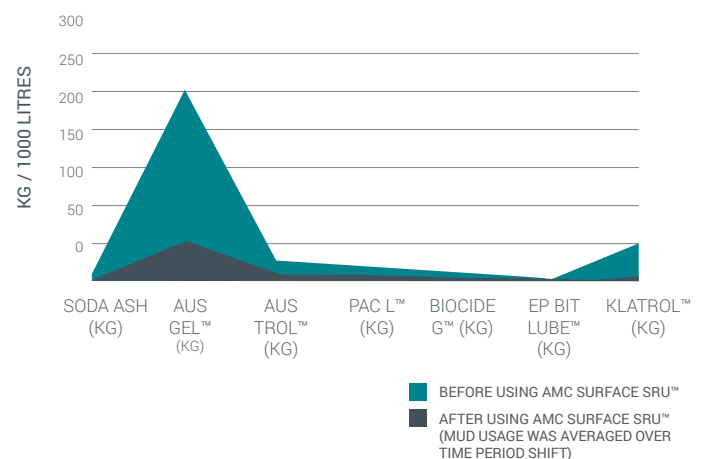
Digging traditional ground sumps is not feasible, or in some cases, is not possible due to the small size of the drill pads and steep terrain in PNG. The AMC Surface SRU™ overcame this challenge by successfully replacing the need for 3 x 24,000L mud sumps.

If the unit had been used from commencement of the project, the size of the site footprint and impact on the environment would have been significantly reduced. The AMC Surface SRU™ also reduces the contamination risk to local water ways and drowning risk to wildlife.

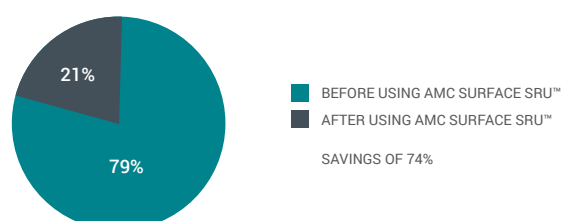


The total volume of mud reduced by 93% from 72,000L to 5,000L.

Mud Usage Per Shift



Cost Per Metre (Based On Av. 12 Metres / Shift)



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## Downhole Water Loss Reduced – Savings of \$100 Per Rig Per Shift

The AMC Surface SRU™ trial rig was losing approximately 1,500L – 2,500L of water per shift, due to the geology downhole.

The trial demonstrated downhole fluid losses were easier to identify when using the AMC Surface SRU™, which enabled the drilling crew to reduce or stop water losses quickly. Reduced water usage achieved a mud savings of at least AU\$100 per rig per shift. 98% Reduction in Cuttings Volume

Large volumes of liquid cuttings were being transported via truck to an earthen sump where they were treated. This process was costly, time consuming and was considered a safety risk due to the conditions.

The unique high speed centrifuge design and closed-loop system of the AMC Surface SRU™ removed cuttings efficiently. When 14,000L of mud from the sumps was circulated through the unit, it produced 10 x 25 litre pails of cuttings and reduced cuttings volume by 98% (14,000L to 250L).

The consistency of the cuttings changed from a fluid to a paste, 70% solid and 30% water, reducing the cost and time associated with cartage and disposal.



Dry and stiff cuttings after using the AMC Surface SRU™.

## 96% Reduction in Water Cartage

The AMC Surface SRU™ significantly reduced water cartage and associated costs. Assuming an average drilling time of five weeks for an 800 metre hole, water carted would be 90,000 litres. When the AMC Surface SRU™ was used, only 3,000 litres were required.

	Per rig without AMC Surface SRU™	Per rig with AMC Surface SRU™
Mud carting from hole	18,000L 2 – 3 times per week and 2 – 3 loads	3,000L (volume capacity at the end of hole)

## Mud Kept at Optimal Conditions

The AMC Surface SRU™ successfully removed solids from the mud and kept it at optimal conditions during the trial. The table below shows mud properties remained consistent – indicating the unit removed undesirable cuttings, yet did not remove polymer.

A good clean mud keeps the bit-face clean and increases the rate of penetration.

### Summary of Rheological Properties of Mud

	Rheological properties of mud from collar	Rheological properties of centrate from AMC Surface SRU™
Viscosity	35 – 37 secs	35 – 37 secs
Rheology 600rpm (cPs)	13 – 17	12 – 19
Rheology 300rpm (cPs)	8 – 10	8 – 12
Plastic viscosity (cPs)	5 – 7	3 – 7
Yield point (lb / 100ft <sup>2</sup> )	2 – 5	1 – 6
Specific Gravity (SG)	1.04 – 1.06	1.02 – 1.05
Filtrate (ml, 30min)	12 – 16ml	12 – 16ml
Sand content	0.25 – 0.75%	Nil

## Reduced Wear and Tear

Clean mud in good rheological condition is essential for the successful completion of a drill hole and to minimise the wear on drill bits and other drilling equipment. The AMC Surface SRU™ unit's closed-loop system kept the mud clean, resulting in a cleaner back end assembly and less wear and tear to drill components.

## Clean Core Achieved

Before the trial, geologists reported the core was covered in silt and was difficult to clean after retrieval. After using the AMC Surface SRU™, core retrieved directly from the core barrel was clean and free of particles and silt.



Clean core retrieved from the hole after using the AMC Surface SRU™.

## Project Outcome

The AMC Surface SRU™ successfully replaced the need for 3 x 24,000L sumps during the trial, reduced mud usage by 93% and reduced the volume of cuttings by 98%. The trial also demonstrated considerable environmental and economic benefits for the customer – estimated to be a net saving of \$28,000 per rig per month.

The trial demonstrated the AMC Surface SRU™ has the ability to replace the need for traditional mud sumps, which significantly reduces the site footprint and impact on the environment. Without sumps, the risk of spills and leakage during heavy rainfall, causing contamination to the local environment and waterways was minimised. Such an outcome is vital when drilling on private or environmentally sensitive land or difficult terrain such as experienced with this project.

The logistical costs and challenges associated with transporting high levels of consumables and waste in steep and treacherous terrain was significantly reduced when using the AMC Surface SRU™.

The trial also demonstrated savings to the operator including reduced equipment wear and tear and rig downtime due to maintenance as a result of the mud being kept in optimal condition during drilling operation.

## Key Benefits for Drilling Company

- Reduced water consumption and cartage costs
- Reduced mud usage and associated costs
- Reduced slurry volume, waste cartage and disposal
- Identification of lost circulation quickly for immediate action
- Reduced wear and tear on drill components
- Reduced logistical costs and related risks
- Improved on-site health and safety, reducing risks associated with open sumps.

## Key Benefits for Resource Company

- Increased drilling productivity
- Reduced project costs, including water consumption and mud usage, and associated costs
- Minimised environmental contamination risk
- Drilling programs can expand to previously inaccessible areas
- Facilitated access to environmentally sensitive or remote drill sites
- Improved productivity extended drill program, additional 15 holes completed in project time frame
- Improved relationships with private land owners.

## Further Information

For more information about this case study, please contact [amc@imdexlimited.com](mailto:amc@imdexlimited.com) or your local AMC representative.

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