

AMC HP SRU™ limits environmental impact at remote site.

CASE STUDY

Accessibility and environmental impact presented an expensive challenge for the customer's exploration drilling project, remotely located in South Australia's Flinders Ranges. AMC's Heli-Portable SRU™ (HP SRU™) was trialled to minimise site footprint and reduce operational costs at the steep and densely vegetated site.

Background

The customer's diamond drilling operation remotely located in the Flinders Ranges, South Australia. The site was not accessible by road and only a small footprint for drilling was available due to the steep hills and dense vegetation. All operational equipment needed to be air lifted to site, an expensive logistical challenge for the drilling company.

Compact Site Set Up – Footprint Reduced by 70%

When using the AMC HP SRU™ the site set up includes the unit, drill rig and a water storage tank for water supply. A traditional set up requires at least three low rise mud settling tanks, the drill rig and a water storage tank. During the trial the footprint of then AMC HP SRU™ was 8.7 m² (including workspace), compared to a footprint for traditional mud settling tanks of 31 m² (including workspace).



Results

- \$9,100* total savings per hole/rig (8 day trial period)
- Up to \$4,000 savings in mud waste disposal
- \$2,500 savings from reduced environmental costs
- \$1,800 savings from increased operational efficiencies
- 79% reduction in mud usage
- 60% reduction in water usage
- 70% reduction in drilling footprint
- 20 minutes set up time.

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

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TRIAL OVERVIEW

Date	May 2014
Activity	Exploration drilling – one rig
Location	South-eastern edge of the Flinders Ranges, South Australia
Access / drill pads	Limited access – inaccessible by road. Minimal drilling footprint, approximately 15 x 6 meters surrounded by vegetation
Drill hole information	A PDC drill bit was used to 100 m, then HQ to the target depth of 450 m
Mud information	CR 650™, foam and lubricant – mixed in the HP SRU™ mixing tanks
Cuttings management	Captured from HP SRU™ chute in bulk bags and heli-lifted from site
Water	Good quality potable water was pumped from a water truck 3 km uphill via poly-pipe. It was then stored in a 10,000 L tank next to the drill rig
Geology	Variable black shale and conglomerate.



Engine
(580 kg)



Centrifuge
(672 kg)



Mixing tanks
(384 kg)



Base frame including hydraulics
(650 kg)

Lift, Swing and Placement – Ready for Operation in 20 Minutes

AMC HP SRU™ is very light, highly mobile and was installed for operation with only four heli-lifts. Each piece of the unit has been designed to fit quickly and easily together – no aligning of nuts and bolts is required. Following delivery at the trial site, the unit was operational within 20 minutes. The four components of the AMC HP SRU™, each weighing less than 700 kg each, fitted together easily on the base frame. Colour coded hoses and assembly guides also ensured the unit was easily assembled.



Lift and swing the AMC HP SRU™ into place in difficult sloped terrain.

Supless Technology Efficiently Removed Cuttings

The AMC HP SRU™ removes cuttings via the centrifuge. The drier sludge (~65 - 70% dry) is then collected in bulk bags directly from the unit's chute for removal – no double handling is required. In contrast, the traditional set up includes three low rise settling tanks. Once the tanks are saturated with cuttings, the cuttings are shovelled into bulk bags and heli-lifted for disposal.

The volume of the cuttings from the settling tanks is larger; as they contain more water than cuttings from the centrifuge, resulting in additional and costly heli-lifts for disposal (heli-lifting is approximately \$2,000 per hour).



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Consistent and Optimal Mud Properties

Maintaining adequate mud viscosity is essential for completing a hole successfully. Steep terrain, uneven tanks and limited power supply enhance the challenges of effectively mixing mud on site. The HP SRU™ mixing tank, hopper and agitator overcome these challenges making it easier and more efficient to mix mud and maintain optimal viscosity.

During the trial the unit demonstrated its ability to remove cuttings, keep a consistent viscosity and reduce the mud weight or specific gravity (SG). The table below sets out the properties of the mud taken from the collar and after it had been processed by the centrifuge (centrate).

MUD PROPERTIES

Viscosity of water (sec/quart)	26	SG of water	1.00
Viscosity of mud (sec/quart) from collar	35	SG from collar	1.04
Viscosity of mud (sec/quart) from HP SRU™ centrate	35	SG from centrate	1.02

Significantly Lower Cost of Sludge Disposal

During the trial, the mud was mixed inside the HP SRU™ using the agitator and hopper, then pumped downhole and returned and cleaned via the centrifuge. Waste had to be transported from site by helicopter, with each lift carrying a maximum of 700 kg.

Once reaching the end of hole, 900 L of left-over volume of mud needed to be disposed of, which would require two heli-lifts. Without the HP SRU™, approximately 7,000 L of left over mud. This quantity of mud waste would require ten heli-lifts.

Environmental Benefits

Using the AMC HP SRU™ helped benefit the environment by reducing the drilling footprint, saving water, reducing the volume of waste cuttings and disposal and eliminating the risk of contamination to the immediate environment in the Flinders Ranges.

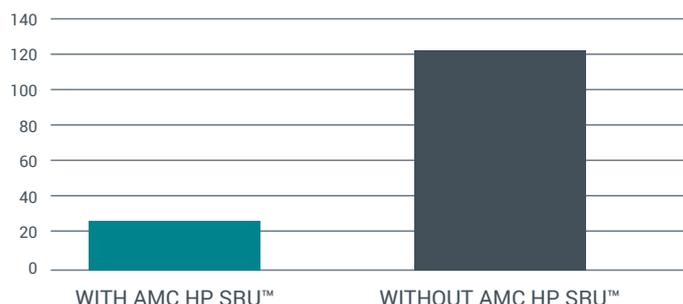
Operational Efficiency (KPIs)

During the trial optimal mud conditions and a cleaner drill bit reduced the number of rod trips. The unit has also demonstrated a reduction in stuck pipes, corrosion on the swivel and bean pump, together with savings on rig downtime, improving productivity.

Mud Costs 79% Lower Per Day

The HP SRU™ and the traditional site set up both enable mud to be recycled via a turbo pump from the collar returning to the SRU or settling tanks. The mud is then processed by the centrifuge or settling method before being reused down hole. During the HP SRU™ trial mud costs per day were approximately \$25.80. Without the unit mud costs were estimated to be \$121.25 per day a saving of over \$750 during the 8 day trial period.

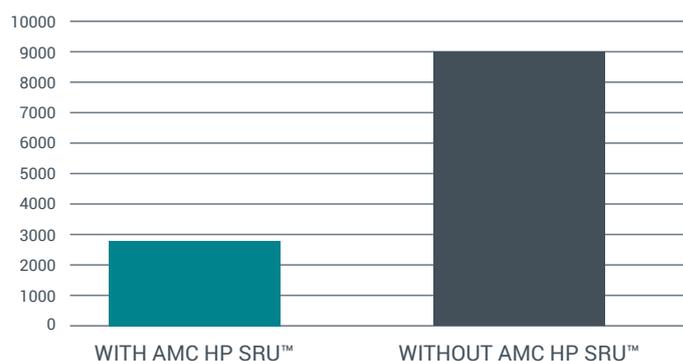
Litres of Mud Used Per Day



Water Usage Reduced by 60%

During the trial water usage was important as it had to be pumped up hill and stored. When using the HP SRU™ the drill rig used approximately 2800 L of water per day comprising 950 L within the unit's tank, plus additional water needed for losses down hole. Without the HP SRU™ three tanks plus additional water for losses would be required, totalling approximately 9000 L per day.

Litres of Water Used to Reach Target Depth 450 m



“Everyone was impressed with the SRU, including the Mines Department who did an inspection the week before drilling finished. I would certainly use the SRU for any further helicopter supported drilling programme.”

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\$9,100 Total Savings Per Hole/Rig (8 Day Trial Period)

The AMC HP SRU™ delivered significant savings across a number of different areas as outlined below.

ESTIMATED SAVINGS (BASED ON 8 DAYS TO REACH TD)	SAVINGS PER HOLE / RIG
Water usage	60% reduction
Mud usage	\$800
KPI and meters drilled – rod trips, maintenance and reparations	\$1,800
Environmental – site rehabilitation	\$2,500
Disposal of waste mud – additional heli-lifts	\$4,000
Approximate savings per hole / rig*	\$9,100

**Does not include rental of the HP-SRU as the terms of the contact vary depending on the project.*

Project Outcome

AMC's Heli-Portable SRU™ was developed to enable customers operations to continue at remote or inaccessible locations. The unit also enables exploration projects to be carried out on a minimal drilling footprint and reduces environmental impact.

Feedback from the trial confirms the drillers, geologist and helicopter pilot were impressed with the unit – particularly its four-part design, which fits easily together without having to align nuts and bolts.

The geologist on site indicated that he would use the HP SRU™ again as it was easy to use, resulted in less spillage and overflows, produced drier cuttings and the drillers enjoyed using the unit.

The trial demonstrated a significant reduction in the environmental footprint including water usage, clearing of vegetation and digging of earth sumps.

Key Benefits for Resource Company

- Lower overall project costs
- Minimises impact on the environment
- Easier access to site / smaller site footprint – improves relationships with landowners
- Lower costs associated with managing sump / site rehabilitation
- Reduced water wastage – depending on the amount of mud left after TD potential savings on heli-lifts for disposal.

Key Benefits for Drilling Company

- Quick and easy installation, ready for operation in 20 minutes
- Reduced water consumption
- Reduced mud usage and associated costs
- Reduced slurry volume, waste cartage and disposal and associated costs
- Increased KPIs and metres drilled
- Reduced wear and tear on drill components
- Improved bit on bottom time
- Less rod trips, pulling and reaming
- Ability to effectively mix mud on site
- Improved on-site health and safety, reducing slips and hazards due to mess, mud and water.

Further Information

For more information about this case study, please contact amc@imdexlimited.com or your local AMC representative.

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