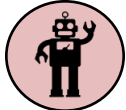






INNOVATION IN MINING

Deploying different technologies allows for common goal of increasing safety, productivity and efficiency

	TECHNOLOGIES	EXAMPLES	RESULTS
HARDWARE	 <p>Automation and/or robotic hardware</p>	<ul style="list-style-type: none"> ▪ Automated drill/haul: one worker can control several drills remotely, automated machine can operate 24/7 ▪ Drones are used to survey areas where previously inaccessible 	<ul style="list-style-type: none"> ▪ Increase safety ▪ Increase productivity ▪ Increase profitability and company's image
	 <p>3D Imaging</p>	<ul style="list-style-type: none"> ▪ 3D imaging provides the highest value within underground mining by helping miners identify bottom of mines and rock surfaces 	<ul style="list-style-type: none"> ▪ Increase safety for underground miners ▪ Increase efficiency by allowing for better mining plan
	 <p>Smart sensors</p>	<ul style="list-style-type: none"> ▪ Smart caps utilizes both hardware (sensor+ caps) angle and software (data analytics) to predict fatigue level in mine workers 	<ul style="list-style-type: none"> ▪ Increase safety by allowing mining companies to monitor fatigue level, understanding fatigue patterns and improve workplace design
SOFTWARE	 <p>Data analytics</p>	<ul style="list-style-type: none"> ▪ Big data utilizes historical data of equipment and/or company to predict e.g. energy cost saving, breakdown schedule 	<ul style="list-style-type: none"> ▪ Increase efficiency by enabling better decision making and planning process
	 <p>Internet of things (IoT)/ Virtual reality (VR)</p>	<ul style="list-style-type: none"> ▪ Remote operation centers enable employees to monitor and control aspects of operations simultaneously. 	<ul style="list-style-type: none"> ▪ Increase safety ▪ Increase productivity ▪ Increase efficiency