DESIGN, SUPPLY, DELIVERY, INSTALLATION, TESTING, COMMISSIONING AND PROOF OF BENEFICIAL USE OF AUGMENTED REALITY SMART GLASSES

SCOPE OF WORK

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1. BACKGROUND

The digital tools for processing and communicating with reality are evolving to the point that soon the virtual world and the real one will be fully integrated, with the boundaries between them growing thinner every day. A wide range of sectors will soon benefit from the integration of such real-time analysis to allow faster more efficient and better-informed decision-making processes.

Being a leading bulk water utility, Rand Water seeks to be on the forefront of embedding Industry 4.0 type of technologies into its operations, for reasons for increased efficiency and productivity. One of the obvious possible enhancement opportunities is the use of virtual and augmented reality.

The purpose of this proof of concept is to test feasibility and viability of an augmented reality solution for effecting improvements in Rand Water's infrastructure maintenance regime.

1.1 Statement of Work and Project Justification

Rand Water is investigating an augmented reality empowered solution for implementation and rollout.

Rand Water extracts raw water from the Vaal Dam, and then purifies and disinfects the water at the Vereeniging and Zuikerbosch Purification Stations. In the process of treating and distributing the water, numerous mechanical pieces of equipment are utilised such as pumps (for pumping raw or portable water, sludge, and chemicals), valves, actuators, conveyor belts, blowers, hoists, etc. These pieces of equipment (assets) need to be continuously monitored and maintained to ensure that they are reliable and available for service. To do this, access to on time and up to date information is important for decision making as well as undertaking the appropriate maintenance activities.

Augmented Reality (AR) and Virtual Reality Technologies brings an interactive 3D experience that combines a view of the real world with computer-generated elements. They are technologies that have been adopted to ease maintenance processes by various manufacturing and engineering companies and Rand Water wants to evaluate the applicability and benefits of this technology in its operations.

1.2 Specific benefits to Rand Water

- AR is able to speed up monitoring and controlling activities.
- AR reduces field activities costs, thanks to the possibility of employing less specialised labour;
- AR improves the decision-making process through faster interventions.

2. SCOPE OF WORK

Rand Water is looking to pilot the integration of Augmented Reality based on **wearable AR smart glasses** in its operation and maintenance of plant equipment as well as training of personnel to evaluate the benefits of the technology in its business. The solution needs to assist Rand Water in improving the ease of operating and maintaining its equipment by providing on demand information to front line staff.

The successful bidder shall design, supply, deliver, install, test, commission and prove the beneficial use of AR technology at Rand Water using AR Smart Glasses.

2.1 Maintenance

The maintenance module of the solution needs to, at a minimum, demonstrate a working proof of concept consisting of the following components;

- Access to maintenance instructions/procedures on identified pieces of equipment for the proof of concept, including video guidance (pre-recorded).
- Access to 3D/Holographic visualization for identified pieces of equipment
- Access to operating manuals in word or pdf file types
- Access to the Rand Water' CMMS (MAXIMO) to pull job cards – past and future job cards
- Video Recording and Image Capture Capability
- Connectivity and video streaming to enable remote expert support for on field workers.

2.2 Operations

The operations module of the solution needs to, at a minimum, demonstrate a working proof of concept that will enable operations to view operational parameters (status) and asset information of equipment (layered on the actual equipment) such as

- Make and Model
- Capacity
- Flows
- Temperatures
- Pressure
- Running Status/Trip Status
- Alarms
- and any other data that is logged on the SCADA system.

This can be done via a QR code system or any other unique identifier for unique to specific piece of equipment in question. Furthermore, the system needs to allow for the following

- Video Recording and Image Capture Capability
- Annotation and capture of asset information and integration into existing information
- Connectivity and video streaming to enable remote support for on field personnel.

2.3 Training

The training module of the solution needs to, at a minimum, demonstrate a working proof of concept for training purposes by

- Introducing new training approaches that make use of virtual reality in order to enable future technicians to acquaint themselves with a range of work situations and their peculiarities in a risk-free environment.
- The technology shall allow several students to participate remotely and simultaneously in each training session.

2.4 Operating a Plant

- AR step by step instructional guide for an operations personnel/engineer (3D/Holographic Images)
- Pre-recorded videos

2.5 Maintaining/Repairing Equipment

- AR step by step instructional guide for an operations personnel/engineer
- Exploded view 3D Models/Holographic Images up to a component level (Animated)
- Pre-recorded videos

3. TECHNICAL AND FUNCTIONAL REQUIREMENTS

3.1 General

- The proposed solution, in addition to the development of new graphical/3D elements, shall demonstrate the integration or pulling of information into the AR from existing asset information sources such as SCADA, GIS, CMMS (Maximo), FileNet, EPANet, inSQL etc.

- Equipped with a pair of AR glasses, an operator shall be empowered to view their work environment with a set of superimposed holograms, thus navigating an augmented reality.
- The AR Glasses shall have both hand gesture and voice control.
- Each screen that the wearer sees shall provide a holographic representation of the measurements made by different sensors, allowing the wearer to undertake quality control processes with ease.
- The operator, donning a pair of AR glasses and a tablet, shall be able to check the state of different components without the need of in-depth knowledge. This would be made possible through integration with a CMMS system that stores a repository of images from different malfunctions and detects any issues, thus dispensing with the use of technical handbooks.
- The solution shall allow the use of minimum of 50 AR markers in each plant, thereby allowing the glasses to detect each component regardless of distance, framing or pollution.
- When an anomaly is detected, the operator shall be able to take a photograph or record a video along with an explanation. This information shall be stored in the CMMS repository as part of the anomalous trend attributes for diagnostics of similar future situations.
- The full solution offering shall include the potential for monitoring facilities remotely, by engaging in real time with experts anywhere in the world who can make a diagnosis of the issues or guide the operator through the required steps to solve a critical situation.
- Contractor shall develop, test and commission all the necessary software, including models, graphics, etc. for equipment specified for the proof of concept.
- The solution should be able to integrate seamlessly with Rand Water's Microsoft Ecosystem and its applications such as MS Teams.
- The software shall come fully licensed to ensure that Rand Water is able to operate the AR solution fully, beyond the completion of the project.
- Contractor shall be available for technical support purposes for a period of 12 months after the deployment of the Virtual Reality Solution.
- Contractor to supply at least one set of critical spares for each AR Glass Set that is supplied and guidelines on the maintenance of the AR Glasses.
- All replaceable components for the glasses need to be ex stock.
- It is incumbent upon the Contractor to provide own choice of connectivity (e.g. Wi-Fi, cellular, etc.) required for implementation of the full solution.
- Owing to integration into the Rand Water operational environment, it is incumbent upon the Contractor to ensure cyber resilience of their proposed solution.
- In addition to this pilot, the contractor shall make recommendation to the possible future expansion to include AR through mobile devices (tablets, cellphones, etc).

3.2 INTELLECTUAL PROPERTY

- Rand Water shall own all equipment, models, drawings, data and AR model.

- The successful Bidder shall not reproduce, transmit or use the information supplied by Rand Water or the Rand Water Project Manager or the Rand Water Engineer for purposes other than intended.
- The successful Bidder shall limit the use of information for the POC and contractual purposes only.
- A Confidentiality and Non-Disclosure Agreement shall be signed between Rand Water and the successful Bidder to manage areas of access to data and IP as per the Rand Water Intellectual Management Policy.

4. REPORTING AND DOCUMENTATION

Before commencement, the contractor shall produce, for approval by Rand Water, a detailed method statement of how the project will be undertaken. This shall include, amongst other things;

- Design Methodology
- Expected Project Outcomes
- Quality Control
- Quality Assurance
- Review and approval gates with Rand Water
- Risk Management

On completion of the project contractor shall develop and submit a detailed report on the AR solution that has been provided. This report shall outline the following at a minimum

- Project Objectives
- Design Methodology
- Project Outcomes
- Discussion of Results
- Project financial breakdowns, including ROI calculations
- Software Maintenance and Support
- Hardware Maintenance and Support
- Software and Hardware Licences required
- Networking and connectivity requirements
- Troubleshooting
- Detailed User Guide (documented and video)
- Propose implementation protocol for full-scale roll out.

The contractor will be expected to provide extensive training for operations and maintenance personnel on the use of the devices as well as general maintenance of the hardware.