HEXAGON
PPM

CASE STUDY

ESKOM, MATIMBA POWER PLANT, SOUTH AFRICA

Key Facts

Company: Eskom

Website: www.eskom.co.za/

Description: Eskom was established in South Africa in 1923 as the Electricity Supply Commission. In July 2002, it was converted into a public, limited liability company, wholly owned by the South African government.

Eskom is one of the top 20 utilities in the world by generation capacity (net maximum self-generated capacity: 41.2 GW). Eskom generates approximately 95 percent of the electricity used in South Africa and 45 percent of the electricity used in Africa. Eskom directly provides electricity to about 45 percent of all end-users in South Africa. The other 55 percent is resold by redistributors (including municipalities).

Industry: Energy

Country: South Africa

Products Used:
SmartPlant® Fusion
Leica TruView

DIGITALIZING ONE OF THE LARGEST POWER PLANTS IN THE WORLD

Pilot project shows how to handle brownfield projects more efficiently

IDENTIFYING GOALS

Eskom owns and operates the Matimba Power Station in South Africa's Limpopo Province. Designed to generate 4,000 MW, Matimba – the Tsonga word for "power" – is the largest direct dry-cooled power station in the world with six 665 MW turbo-generator units. The adjacent Grootegeluk colliery has sufficient coal reserves to guarantee Matimba a minimum lifespan of 35 years, extending to a possible 50 years at 2,100 - 2,130 tons of coal per hour.

Construction on Matimba began in 1981, so most of the original engineering documentation was delivered in paper form. With decades of lifespan ahead, Eskom was acutely aware of the need to overcome the challenges associated with the current state of engineering information:

- Unintelligent formats such as scanned documents, PDFs, and images
- Duplicated documents scattered across multiple, often unofficial storage locations
- Lack of integration and linking between information assets
- No validation of the quality of information
- Limited access to documentation

KEY BENEFITS

- Rapid capture of large volumes of legacy data and documents
- Intelligent organization of information for more efficient brownfield operations and management
- Rapid creation of document structures, tag structures, plant structures, and cross-references for easy retrieval and navigation of content
- Capture of 'as-is' plant configuration via laser scanning to provide intuitive, photo-realistic user interface

SERVICES USED

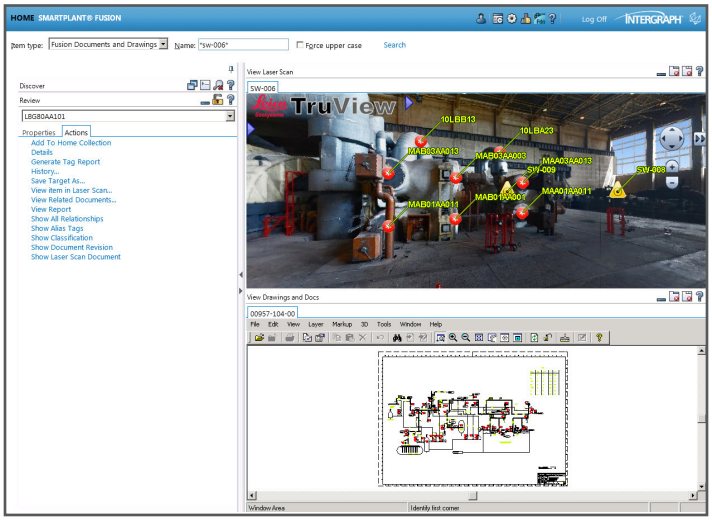
- Accenture Digital Plant Refresh Service
- Intergraph South Africa (ISSA) consulting and implementation services

Such unstructured information poses significant challenges to the efficient execution of operations, maintenance, and reliability work processes. This led to Eskom embarking on a special digital plant refresh proof-of-concept project for Matimba, executed jointly by:

- Hexagon PPM is supported by ISSA, for use of SmartPlant® Fusion, the solution for capturing, organizing, linking, and visualizing large volumes of engineering data and documents
- Accenture for analysis and processing of documents
- Leica Geosystems for a laser scanning creation of photorealistic TruView

The project goals were defined as follows:

- Identify and locate 500-1,000 documents of various formats that describe a specific turbine unit from a set of about one million documents
- Extract tag numbers from the documents identified
- Create document-to-tag relationships
- Create Leica TruViews and hotspot those TruViews with tag locations and names
- Find and navigate documents, tags, and TruViews via established relationships



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OVERCOMING CHALLENGES

Analysis and Processing of Documents

The project was scoped by identifying critical equipment, which was defined as producing 70 percent of the yearly engineering, maintenance, and operations cost. Based on this definition, 20 percent of the equipment in the unit was deemed critical.

A very large number of files had to be analyzed in order to eliminate documents not related to the critical equipment. This was conducted in two parts: first by analyzing the directory structure and file types, and second by applying filters based on file-naming patterns against a list of relevant tags. At this point, the quantity of files was reduced by 90 percent.

The remaining 10 percent of the files were processed by SmartPlant Fusion, which has dedicated drawing readers and document readers that extract metadata from native CAD files, Microsoft® Office files, etc., as they are loaded into the system. Image files, such as BMP or unintelligent PDF files, were first processed by optical character recognition (OCR) scanning to convert the images into readable text. Afterwards, these documents and the metadata extracted from them were also loaded by SmartPlant Fusion.

Laser Scanning and Creation of Photorealistic TruViews

In parallel to the document analysis and processing activities, the scoped area of the Matimba plant underwent 3D digital scanning using a Leica Geosystems High Definition Survey (HDS) laser scanner. Leica Geosystems' ScanStation P20 captures millimetrically accurate data up to 120m from the scanner at up to one million points per second in a full 360° by 270° field of view. This allowed for rapid, accurate asset mapping. Simultaneously, HD images were taken at the same locations with the scanner's on-board camera. Leica Geosystems' TruView technology overlays the laser scan point cloud with these HD images to produce measurable, photo-realistic "as-is" representations of plant assets. Next spatial bookmarks – or geotags – were created in the TruViews. When loaded into SmartPlant Fusion, the TruView images provide an ultra-intuitive way to navigate the plant. Documents and data related to tagged equipment can be accessed simply by clicking on the geotag in the TruView image.

The SmartPlant Fusion Process

The files and TruView images collected in the above steps were rapidly loaded into SmartPlant Fusion. Based on user-defined rules and templates, files were organized into a single, structured environment with rapid search and intuitive navigation. All files in SmartPlant Fusion are linked back to the originals, so no changes were made to original files or their storage locations.

With all the files now easily accessible, it was discovered that some files had multiple copies and revisions. SmartPlant Fusion identifies copies and offers utilities to allow users to identify the master file that best represents the current plant configuration. First, through a quick review of thumbnail images, some of the obviously outdated copies could be eliminated from reference. For the remaining candidates, a more detailed review was conducted using SmartPlant Fusion's specialized workbench for side-by-side or overlay comparison.

To determine which document best reflects the current configuration, the laser scans were referenced via TruView side-by-side with the drawings and documents, in many cases eliminating the need for a plant walk-down.

Once the masters have been identified, the last step in the SmartPlant Fusion process is to examine the contents of each file, extract intelligence, and establish further links and cross references to create a single point of access to all engineering documentation.

REALIZING RESULTS

At the end of a four-week project, the document and data scenario for the scoped area at Matimba had changed significantly:

- The documents that were previously stored in multiple silos were now integrated and linked
- Information that was formerly locked within the documents was now accessible and searchable
- Plant documentation could now be viewed and accessed via a photorealistic image of the plant

Now, a maintenance technician who needs access to plant documentation related to a specific piece of equipment can simply navigate through the HD laser scan, visually identify the equipment, click on the geotag, and have immediate access to all of its related information. If the technician accesses a P&ID, for example, the technician can further navigate to other relevant tags and access information simply by clicking on hotspots within the P&ID. In other words, all available tags, documents, and tag/document relationships are available in an integrated, intelligently navigable system.

MOVING FORWARD

The project has given Eskom a real-world example of the process required to digitalize a brownfield plant asset. The SmartPlant Fusion environment enables Eskom's end users to access plant documentation much more quickly and simply than ever before. The project has also shown Eskom how data and documents can be uplifted incrementally into their fully managed engineering data warehouse, SmartPlant Enterprise for Owner Operators. Using this newly digitalized plant documentation, the preparation of turnarounds and other brownfield projects will become significantly easier.

ABOUT HEXAGON

Hexagon is a global leader in digital solutions that create Autonomous Connected Ecosystems (ACE). Our industry-specific solutions create smart digital realities that improve productivity and quality across manufacturing, infrastructure, safety and mobility applications.

Hexagon's PPM division empowers its clients to transform unstructured information into a smart digital asset to visualize, build and manage structures and facilities of all complexities, ensuring safe and efficient operation throughout the entire lifecycle.

Hexagon (Nasdaq Stockholm: HEXA B) has approximately 19,000 employees in 50 countries and net sales of approximately 3.5bn EUR. Learn more at hexagon.com and follow us @HexagonAB.