



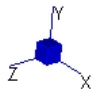
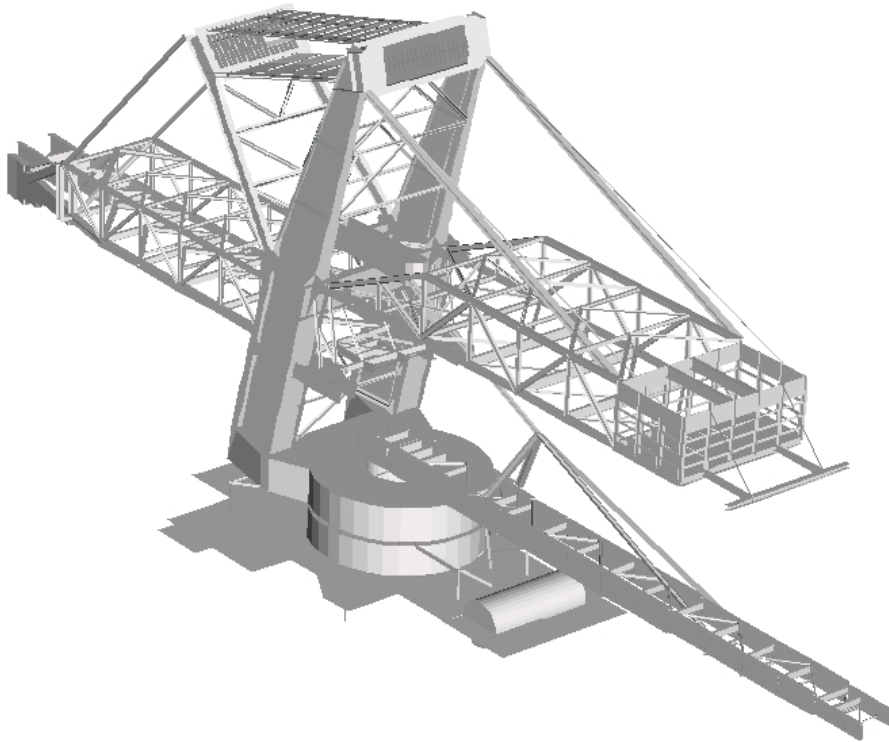
FAARMS : Facilities and Asset Risk Management System

Abstract: Large structural bulk material handling machines such as Stackers and Reclaimers exposed to external environments deteriorate structurally as they age. The application of an Asset Management Plan provides the framework to review the condition and design of such machines. Included in many plant's business plan is the need to provide a safe working environment and to maintain the primary assets of the business. The scope of activities and decisions made to manage the implementation of the plan is carried out by a small dedicated core team who ensure quality and cost effective performance.

Apart from offering Finite Element design capabilities, our service range includes devising cost effective, value-added refurbishment, upgrades and life extension options and strategies. We devise refurbishment strategies based on the following objectives:

1. Minimise Refurbishment Costs and Disruptions to Operations.
2. Reduce Future Maintenance and Operating Costs.
3. Reduce Spares Inventory and Improve Reliability of Parts Replacement Schedules.
4. Reduce Risk of Operational Failure.
5. Increase Design Life of the Structure.

In addition, we offer services in forensic failure investigation and reconstruction, advanced structural analysis, machine condition monitoring, risk assessments, and audits.



Key Services

We provide a range of services from pre-feasibility studies, detailed design through to the operation life of mining and process equipment. Our key services include:

Refurbishment, Upgrades and Life Extensions

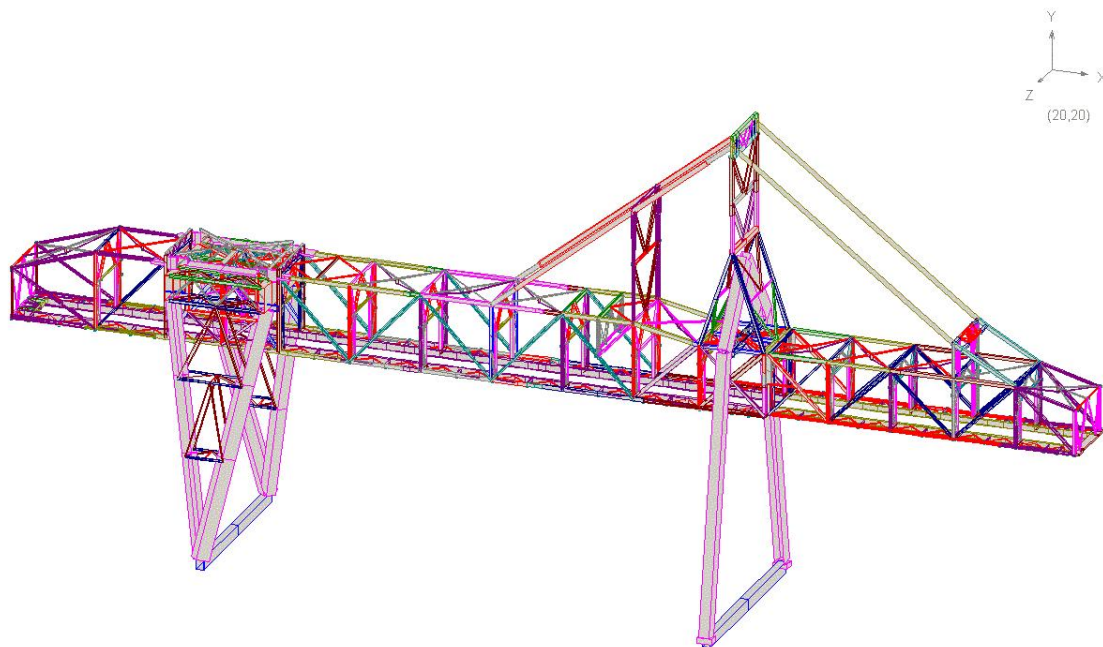
- Assessment of remaining life of structures subjected to fatigue loading.
- Development of refurbishment and life extension strategies.
- Verification and optimisation of proposed modifications and upgrades.
- Re-Qualification of existing structures.
- Structural adequacy assessments in compliance with International Codes.

Forensic Investigation and Reconstruction

- Failure investigation and reconstruction.
- Identification of probable failure modes and root causes of failure.
- Assess compliance with codified requirements.
- Informed consideration of design-related aspects.
- Independent expert witness services.

Machine Condition Monitoring and Instrumentation

- Site inspections of infrastructure (scheduled or following unexpected/extreme loading events).
- Identification of inspection-critical ("high-risk") regions within structures.
- Development of maintenance and inspection programmes.
- Structural condition monitoring, resolution and optimisation of structural performance issues.
- Data analysis and characterisation of structural behaviour and response.

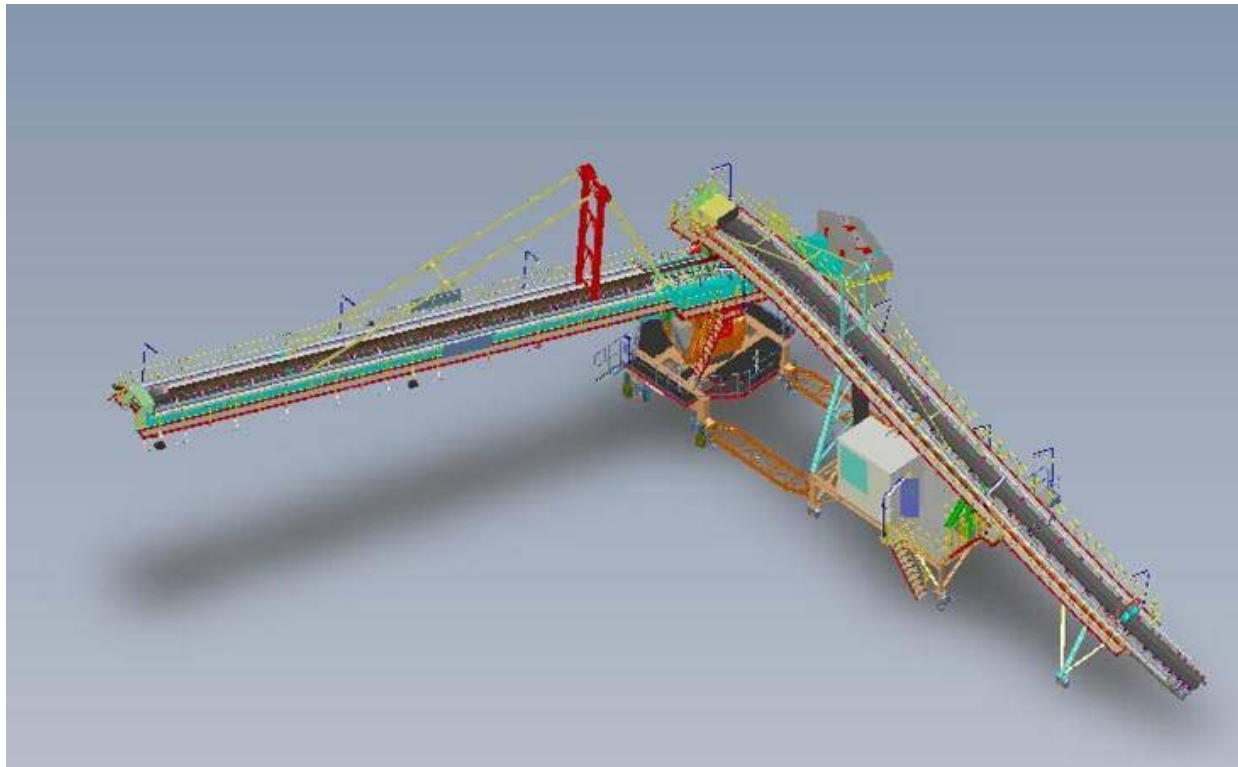


Advanced Numerical Modelling of Structures

- Linear and non-linear Finite Element Analysis (FEA) of complex dynamic structures.
- Fracture Mechanics and Fatigue Analysis.

Safety/Risk Engineering

- System Safety and Safety Engineering.
- Safety Case preparation (Capability Case).
- Hazard Analysis and Management.
- Development and support of Risk Management Systems (RMS) and Risk Management Plans (RMP).
- Risk and Reliability Engineering.
- Fire and Explosion Modelling.
- Independent Safety Advisor/Audit.
- OH&S Compliance.





Audit Service

- Independent design audit service.
- Safety audit services.

Non Destructive Testing

Every good maintenance manager knows that inspection is crucial to their preventive maintenance program. A well thought out inspection plan incorporating nondestructive and visual examinations can have many benefits including:

- Increased equipment service life through the detection of problems while they are still small and repairable.
- Reduced downtime through the inspection and repair of equipment during scheduled shutdowns.
- Increased safety through the regular elimination of potential hazards.

Our range of NDT Services includes:

- Visual Inspection
- Magnetic Particle Inspection
- Liquid Penetrant Inspection
- Ultrasonic Inspection
- Hardness Testing
- Corrosion/Thickness Surveys

Since all our inspections are under the direction of a Professional Engineer, we can provide solutions when problems are encountered. Whether your project is large or small, we can help define the inspection parameters according to your needs and to the governing standards and regulations. We can also oversee larger jobs, providing the technical link between you and your NDT contractor. We will ensure that the job is done according to the specifications and we can provide objective evaluation of inspection results when differing opinions exist.

Visual Inspection Services

We provide skilled inspectors qualified to meet your needs and our QC / QA program can be customized to your specifications or we can assist in determining the extent of inspection by developing an Inspection and Test Plan complete with hold points at critical stages of fabrication. A typical plan may include any of the following:

Qualifications

- Witness welder qualification testing

Fabrication

- Ensure qualified fabrication personnel are used and that fabrication procedures are followed correctly
- Verify material test reports and proper flow of materials
- Visually inspect production weld quality and overall workmanship
- Examine bolting installation and perform torque testing
- Audit fabricator's quality control department
- Conduct inspections both in the fabricator's shop and at the erection site.

Pre-Fabrication

- Review of drawings & specifications
- Determine extent of nondestructive testing required
- Develop or review welding procedures and verify adequate equipment

Post Fabrication

- Confirm that "as built" dimensions match drawings and document variances
- Perform / oversee nondestructive testing and verify results
- Perform / oversee coating inspections and verify results
- Observe product shipping and receiving operations

The final inspection and test plan, as well as all test results, are reviewed by a professional engineer certified to level three for visual inspection.





Expediting and QC/QA Services

You can't always be on site to ensure that your project is going according to plan. That's where our experienced team can help. Our QC / QA inspectors are available for projects lasting from weeks to years.

We are experienced with most major BS, EN, DIN, ASME, AWS, and API standards as well as some international standards.

We tailor your project inspection requirements to fit your needs. Common functions include (but are not limited to):

- a. Track project progress and inform owner of status using reports and photos
- b. Liaise with the owner, authorized inspector, production foreman, and other parties
- c. Develop and implement an Inspection and Test Plan
- d. Ensure incoming material and subassemblies are according to specification and are traceable throughout the fabrication process
- e. Develop or review welding procedures and verify adequate equipment
- f. Witness welder qualification testing and ensure that fabrication procedures are followed correctly
- g. Visually inspect production weld quality and overall workmanship
- h. Confirm as-built dimensions match drawings, document variances & NCR's
- i. Coordinate non-destructive testing and review results
- j. Observe product shipping and receiving operations
- k. Audit fabricator's quality control department and activities
- l. Prepare final quality documents for hand-over to the owner

Welding Engineering

Welding is a specialized process with many variables affecting weld quality and economy. To consistently ensure the best weld at the lowest cost, welding procedures must be developed and optimized for use. The benefits we offer are:

Structural Steel Fabricators

Structural fabricators / erectors require certification under relevant codes. We provide the welding procedure specifications (WPS's) and data sheets (WPDS's) needed for certification. For processes and welding joints that are not pre-approved, we can also prepare and supervise procedure qualification reports (PQR's).

ASME Fabricators

Companies welding on pressure vessels, piping, and other related equipment need to take specific quality control measures according to ASME codes. We can prepare the WPS, weld the test coupons, and provide the approved lab results after testing. We can also supervise welder testing, inspect the finished work and document all fabrication and/or repair welds to meet the requirements of the governing authorities.

Faster Results, Less Cost

Our knowledgeable welding engineers and technologists can quickly supply the solutions you need for a fraction of the cost of developing them in house. Furthermore, you keep your personnel doing chargeable work, reducing downtime during the development phase.





Predictive Maintenance

Predictive maintenance techniques are highly regarded as the most effective means of assuring equipment reliability, efficiency, and cost effectiveness. We help you meet these objectives by providing the following services:

Vibration Analysis:

Useful on rotating or reciprocating equipment such as compressors, fans, motors, gearboxes, generators, mixers, etc. In a single visit, this technique can pinpoint the source of vibration so that the problem can be corrected. Potential sources include defective or worn bearings, faulty winding in electric motors, loose components, resonance (common in newly installed machines), unbalanced fans or blowers, dirt build-up on fan blades, misaligned shafts, improper machine base, etc.

Laser Alignment:

Laser precision ensures that your drive shaft is correctly aligned with the driven shaft at bearing housings, pumps, gearboxes and fans. Accurate alignment provides reduced friction, extended bearing & shaft life, reduced vibration, reduced energy cost and reduced maintenance costs.

Oil Analysis:

Oil is the lifeblood of machinery and, similar to blood tests at the doctor, oil analysis provides valuable information about the condition of the machinery. Degradation of hoses, filters, gearboxes, pumps, seals, air intakes, engine blocks, and of the oil itself can all be assessed in a single, inexpensive test.

Ultrasonic Testing:

It would be nice to remove and examine all your shafting to ensure that critical equipment won't break down unexpectedly, but this is unfeasible. Using ultrasound, we can test your shafting in-situ to locate any fatigue cracks that can lead to equipment failures without warning.

Predict Downtime:

We can set up a periodic test schedule for each of these services. We store your machinery data for future trending. By examining trends in the test results, it is possible to predict remaining equipment life and when downtime should be scheduled - Before it schedules you!

