

# AXIOM operations 10 million hours without a lost time accident occurring

By **Dave Mason, AXIOM**

## SUMMARY

- **AXIOM Overview & Mission:** AXIOM is a joint venture between Amentum, Mott Macdonald, and Assystem, providing nuclear design and engineering services to Sellafield Ltd. It aims to improve safety, risk reduction, and lifecycle value-driven design, particularly within the nuclear decommissioning sector.
- **Safety & Governance:** AXIOM has a strong safety culture, with 10 million accident-free hours, health & safety forums, and ongoing engagement. Projects are rigorously assessed for risks, and mitigation strategies are embedded into design processes.
- **Health & Wellbeing Initiatives:** AXIOM has implemented employee assistance programs, mental health support, and wellness initiatives, including surveys, a wellbeing forum, and a focus on improving working patterns post-COVID-19.
- **Notable Projects & Innovations:** Key projects include the Box Encapsulation Plant (BEP), which handles hazardous nuclear waste with robotic systems, and the Ventilation Extract System Upgrade, which uses laser scanning to improve safety and reduce risks during plant upgrades. Additionally, AXIOM has developed a new process for managing asbestos contaminated with alpha radiation.

## 1. INTRODUCTION

### 1.1. AXIOM Background

AXIOM is an unincorporated Joint Venture (JV) made up of three major engineering contracting companies each with complementary capabilities and skills. The companies involved are, Amentum, Mott Macdonald and Assystem.

Together we supply nuclear design and engineering services to Sellafield Limited (SL), expertise that is crucial to achieving both the objectives of the alliance and the wider objectives of Sellafield Ltd and the Nuclear Decommissioning Authority (NDA).

The Sellafield nuclear licensed site in Cumbria has been at the forefront of the UK nuclear industry for 75 years, originally focused on producing plutonium for Britain's atomic defence programme, it holds 85% of the UK's nuclear waste and has the most diverse range of nuclear facilities on a single site in the world [1]

Located on the West coast of Cumbria, situated on a footprint of 2 square miles, the site employs 11,000 people has a 100-year mission with safety, security and sustainability remaining its top priorities. Playing a vital role in the local economy, 3 in 5 local jobs are dependent on the site. Sellafield's importance to the nuclear industry, the local community and the UK cannot be understated and attracting, retaining, and developing talent is crucial for Sellafield's mission: "Creating a clean and safe environment for future generations".[2]

AXIOM's partners have excellent nuclear pedigrees, proven expertise and successful track records across the UK nuclear fleet and related nuclear industries. AXIOM provides process, mechanical, civil structural and architectural, electrical, instrumentation, control and safety capabilities to support Sellafield Ltd. As well as having dedicated teams working for Sellafield Ltd, each has immense reach-back capability into parent organisations for knowledge, expertise and innovations gained from within, and external to, the nuclear industry.

Throughout the lifespan of AXIOM, there have been around 600 people directly engaged on project delivery and further support being employed through our supply chain. We have a strong track record of supporting strong relationships with our supply chain and this includes health and safety.

This year AXIOM reached the milestone of working 10 million hours without a lost time accident occurring.

This record has spanned thirteen years and revenues of £801million. AXIOM has involved team members from all the partners and supply chain working on projects to deliver risk reducing engineering solutions whilst operating in a highly safe design environment.

### 1.2. AXIOM Mission, Vision and Values

AXIOM's single purpose is to deliver a step change in safe, efficient, end-state focused design services through collaborative working, aligned objectives and stakeholder accountability.

AXIOM and our DSA Partners have a shared long-term vision of the future where, working as Strategic Partners, Sellafield Ltd, AXIOM and the Progressive Alliance form an integrated design community that will measurably change design service outcomes to be lifecycle value-driven, ensuring solutions accelerate hazard and risk reduction, improve the performance of production operations and reduce lifetime costs.

At the core of our projects are four values – Safe Outcomes, Joint Work Planning, Collaborative Working and West Cumbria and Risley Focused. Health and Safety falls under the Safe Outcomes value.

Working collaboratively has been the key to achieving a mature and effective Alliance, but most importantly allow all parties within AXIOM to succeed and achieve the accident-free performance.

AXIOM has a Health and Safety Lead All partners participate in health and safety activities, at the core is the safety forum, meeting to ensure best practices, learning from experience and Governance issues are shared and implemented across all projects and partner activity.

Additionally, to ensure all our stakeholders are engaged with our health and safety processes, we hold a supply chain health and safety forum ensuring learning is shared as widely as possible. To ensure this learning is reaching all supply chain businesses, we also issue quarterly safe shares based on AXIOM learning, external industry learning or from input by the supply chain organisations.

### AXIOM Organisation

The AXIOM Executive Board is in place to ensure all aspects of Governance and oversight is conducted effectively and in line with the Vision and Mission of AXIOM and its partners. The Board is made up from all three partner organisations and has representation from the client Sellafield Ltd as well as the AXIOM Programme Director, who is responsible for the overall delivery and management of the projects being undertaken.

The Board meets monthly and reviews Health and safety performance and ensures that all aspects of risk is being considered and remedial action is taken. The responsibility for this then falls to the Programme Director.

The Programme Director then manages the AXIOM Lead Team

who are responsible for the day-to-day management of project delivery, which includes health and safety.

Health and safety are then managed through each project either through the Project Manager or engineering Manager, depending on the nature of the project. This flow of responsibility is clear and transparent, and everyone knows the part they play in both the day-to-day occupational health and safety and the latent risk mitigation they implement in their designs.

Three flow down KPI's have been set as key deliverables within AXIOM:

- Leadership Engagement – Each member of the lead team must deliver 15 hours of health and safety engagement over the year, extra to their normal health and safety activities.
- Delivering Benefits – AXIOM must produce at least twelve delivered benefits that are specifically focussed on health and safety.
- Forum Attendance – All partners must have representation at all forums to ensure best practice and learnings are shared back into all partner organisations.

Over the last three years, AXIOM have delivered around £31million of cost savings to Sellafield Ltd through their innovation. Throughout all these cost savings, health and safety is a key element, with risk mitigation forming part of the benefit assessment.

## 2. PROJECT HEALTH AND SAFETY ARRANGEMENTS

As part of our Governance process, projects are assessed for their impact, including health and safety, financial and project management. This process we use is known as the Joint Governance and Assistance Review and is carried out with the client to ensure all aspects of risk are considered. The process is a formal part of the Business Manual. This has proven successful in identifying risk early on and allows the projects to populate their risk registers early and identify risk mitigation strategies. This is used to identify potential



**Figure 1. These are the teams who participated in the early career's health and safety competition. Brought together from all the partner organisations.**

design issues and solutions as well as occupational health and safety risks, such as driving and travel risks.

The items identified on the risk register are transferred into the design and further discussion is undertaken with the project teams to determine risk reduction and mitigation. On many projects where relevant, this residual risk is taken to contractors to discuss construction risks and to assess the constructability of the design. Learning and feedback is then fed back into the project and in some cases the design modified. Once risks are identified, they are managed either directly by the project or with the support from the health and safety lead.

### 3. ENGAGEMENT AND LEARNING

Ensuring all AXIOM employees are informed and kept up to date with learning from experience and general training is a vital part of maintaining a positive culture. In order to ensure this is as effective as possible, a number of activities are undertaken;

- We have held an annual health and safety conference for the last six years, the conference lasts for a week and is a mixture of internal and external speakers utilising virtual and face to face sessions. Last year's conference hosted around 200 people per session. All the virtual sessions were recorded and uploaded to our learning management system for access by those who couldn't make the session and for broader learning.
- To encourage future generations and to improve the knowledge of our early career employees we have for the last two years run a competition for teams to enter and present based on a theme. This year's competition was based on 50 years of the Health and Safety at Work Act, with the theme 'From cloth caps to hard hats and beyond'. The winning teams won vouchers and have presented at several forums to share their learning and journey.
- Sharing best practice and learning across the partner health and safety leads and the design safety leads is carried out through several forums, focussing on occupational safety, wellbeing and the third specifically on design safety. Members of the forum are drawn from across all the AXIOM partners and into the broader DSA. Agendas vary according to partner priorities, external events or learning that has been shared with us.
- Coffee morning drop-in sessions are held virtually six times a

year and are focussed on sharing health and safety information and learning to attendees in an informal style. Subjects have included external learning from incidents such as the Titan submersible and more design focussed subjects such as the Construction Design Management Regulations.

- Focussed design safety training sessions are run in addition to the areas described above, these have included people and vehicle interfaces, wellbeing in design and falls from height. An annual programme is agreed, and the sessions open to all employees across AXIOM, the three partners and broader across the Sellafeld network.
- All meetings are opened with a wellbeing or safety share, this helps to encourage open communication and the sharing of personal experience.

#### 3.1. Mental Health and Wellbeing

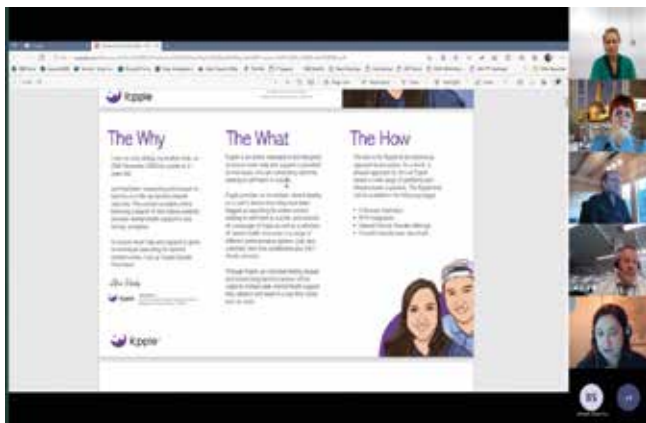
Like most organisations, COVID 19 had a huge impact on the working patterns and arrangements. During this time the mental health of our employees has been affected, during lockdown and since. This motivated AXIOM to work on a strategy to identify and improve the wellbeing of our employees and further into the supply chain network:

- All three partners have employee assistance programmes in place to support employees, we have extended this, and all partner programmes are free to use by contractors, agency staff and if needed supply chain employees. This has helped everyone access support when and if they need it.
- Project mental health and wellbeing surveys are carried out regularly and help to identify issues or where intervention might need to be improved. On one occasion, some serious issues were identified, and project wide improvement plan was implemented and helped support the project and improve employee wellbeing.
- All partners have networks for Mental Health First Aiders and are accessible to everyone regardless of employer or project.
- AXIOM led a wellbeing forum to support mental health issues across all the stakeholder organisations.

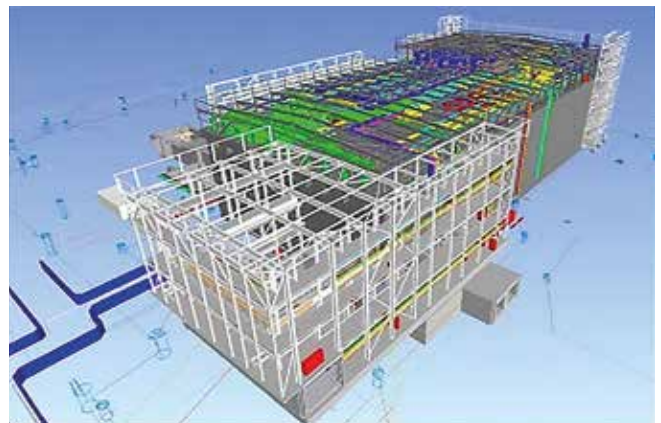
### 4. EXAMPLE AXIOM PROJECTS DELIVERED

#### 4.1. Box Encapsulation Plant (BEP)

The Box Encapsulation Plant is being constructed on the Sellafeld Limited site in Cumbria. The project is an integral part of the Magnox Swarf Storage Silo Program addressing the cleanup of



**Figure 2.** This screenshot is from the H&S Conference last year and the presentation was from the R:pple suicide prevention founder Alice Hendy.



**Figure 3.** Outline drawing of BEPPS DIF





**Figure 4. Test storage box successfully being lowered into the vault**

one of the most hazardous legacy facilities on the site. When complete, the BEP is expected to treat nuclear waste, immobilize it, and prepare it for long-term storage. In addition, the plant may also process waste recovered during the decommissioning of other significant facilities.

The solution was to re-purpose and enhance the existing Box Encapsulation Plant and the Box Encapsulation Plant Product Store buildings on the Sellafield site – the Direct Import Facility was added to receive waste retrieved from PFCS.

The Box Encapsulation Plant and the Box Encapsulation Plant Product Store was originally designed to support retrievals from the Magnox Swarf Storage Silo (MSSS), the First-Generation Magnox



**Figure 5. An inactive transport package in the Direct Import Facility**

Storage Pond (FGMSP) and the Pile Fuel Cladding Silo (PFCS).

The new Box Encapsulation Plant Product Store – Direct Import Facility (BEPPS DIF), will provide safe and secure storage for up to 100 years, and will initially receive Intermediate Level Waste in 3 metre cubed steel boxes from PFCS on the Sellafield site.

#### **4.2. BEP Robot Training System (RTS)**

Due to the hazardous nature of the waste materials, the plant features a series of robotic systems that are designed to handle and encapsulate these products. These robots must be operated from a remote environment to avoid operators being exposed to radiation and other hazards.



**Figure 6. View of the robot training set up**



**Figure 7. VR Image of the robots**

The Box Encapsulation Plant Robot Training System (BEP RTS) provides a computer-based simulation training system. The BEP RTS is used to train Nuclear Operators and Instructors to use the BEP Kuka Robots in a computer simulated virtual environment prior to physically handling the robots on the BEP project. The robotic systems are complex and use a series of joysticks and modes to undertake their tasks. The BEP RTS provides a training facility where operators can learn how to use the equipment without repercussion and gain valuable time and experience that will develop their abilities in a safe environment. This provides a facility that can be used for training whilst the actual facility is operating and minimizes risks of any damage or problems being created with hazardous wastes in the real environment.

The BEP RTS provides a series of activities and setups that start with simple movements and then escalate in difficulty.

This will enable operators to develop their skills incrementally and become proficient, providing a resilient skill base of competent personnel for the Operations Team.

#### **4.3. Ventilation Extract System Upgrade**

We have built up an entire configured baseline of the area of Special Nuclear Materials including known and previously unknown hazards from an inspection and survey campaign and are entering on our Building Information Model. This was used by carrying out laser scans of the areas, surveys and remote inspections which have contributed to:

- Overall project risk mitigation and reduction on the plant and project, details coming out of the laser scans have allowed engineers to remotely assess designs safely.
- Hazard removal strategy; aiding route design and access.
- Conversion to an animation to demonstrate constructability in a heavily constrained area, including clash checking of installation, therefore reducing the need to physically enter the areas, reducing radiological risks to engineers.
- Detailed and improved preconstruction information.
- Improved standards for the CDM health and safety file.
- Visual risk / hazard burndown graph



#### 4.4. Asbestos Risk Reduction

We have developed a process for managing Alpha radiation contaminated asbestos. There is no existing process for this across the NDA estate. It has pulled together all stakeholders from the Asbestos and air fed suit workers arenas and forged and agreement of practices, PPE, area preparation, monitoring, clean up and waste packaging and disposal. This process has been accepted by Sellafield Ltd stakeholders and has been discussed with the Office for Nuclear Regulation (ONR) to agree how they formally endorse for use and wider roll out. This is currently for Asbestos cement board (non-licensable), but we want to progress for all types of asbestos.

#### 4.5. Containment Wall Project

Use of non-typical containment system for C5/C2 boundary installed in a complex, congested high hazard plant. Substantiated by a full-scale test rig, which was also used to engage contractor and construction to collaboratively develop installation methodologies and installation verification sheets used during construction to underpin safe installation and substantiate product in lieu of active commissioning which was not As Low As Reasonably Practical (ALARP).

Project Objectives:

- Containment boundary, fire rated and provides contamination and degradation protection until 2077 – enabling current and future maintenance and decommissioning activities
- Maintain differential pressure across the current boundary to control the existing contamination footprint
- Deliver an integrated construction strategy and programme to minimise disruption to critical plant operations and other project implementation workfaces

The Solution:

- Design and installation of 150 metres of a new, 5 metre high, robust fire-resistant boundary providing contamination containment
- Vent system incorporating 44 containment filter banks managing ventilation airflows
- Modification and installation of radiological monitoring equipment (contamination detection) and fire alarm system
- Modification and re-routing of mechanical services
- Reconfiguration and removal of infrastructure items within the building

#### 5. CONCLUSIONS

AXIOM's collaborative approach, built on the expertise of its partner organizations and a strong commitment to safety, has positioned it as a key player in supporting Sellafield Ltd. in its mission to safely manage and decommission the UK's nuclear legacy. Through its unwavering focus on health, safety, and innovation, AXIOM has not only contributed to the successful delivery of complex projects but has also established a culture of continuous learning and improvement. With its track record of over 10 million accident-free hours, groundbreaking risk mitigation strategies, and innovative solutions like the Box Encapsulation Plant and Ventilation Extract System upgrades, AXIOM continues to demonstrate its leadership in nuclear engineering services. Moving forward, AXIOM's dedication to enhancing safety, promoting wellbeing, and driving cost-effective solutions will remain integral to its success and its critical role in the future of nuclear decommissioning.

#### REFERENCES

- [1] Government Information: Government of the United Kingdom. Sellafield Ltd. Gov.uk, <https://www.gov.uk/government/organisations/sellafield-ltd/about>.
- [2] Christian M, Commercial Waste Quotes blog: Christian, M. Sellafield. Commercial Waste Quotes, <https://www.commercialwastequotes.co.uk/blog/sellafield/>.

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David Mason is the Founder and Director of DMA Safety Management Ltd, trading as Inspire Safety, a consultancy delivering strategic health and safety leadership across high-hazard sectors including nuclear, defence, and construction. A Chartered Member of IOSH and CMI, he has held senior roles at Travis Perkins and Electrocomponents PLC, where he led global safety transformations across 27 countries. His career began with British Nuclear Fuels Ltd at Springfields as an apprentice, completing his time in the design offices and then transferring to Sellafield, culminating in the role of Assurance Manager for Windscale Operations. He has supported AXIOM and the DSA for the last seven years supporting all the partner organisations.

