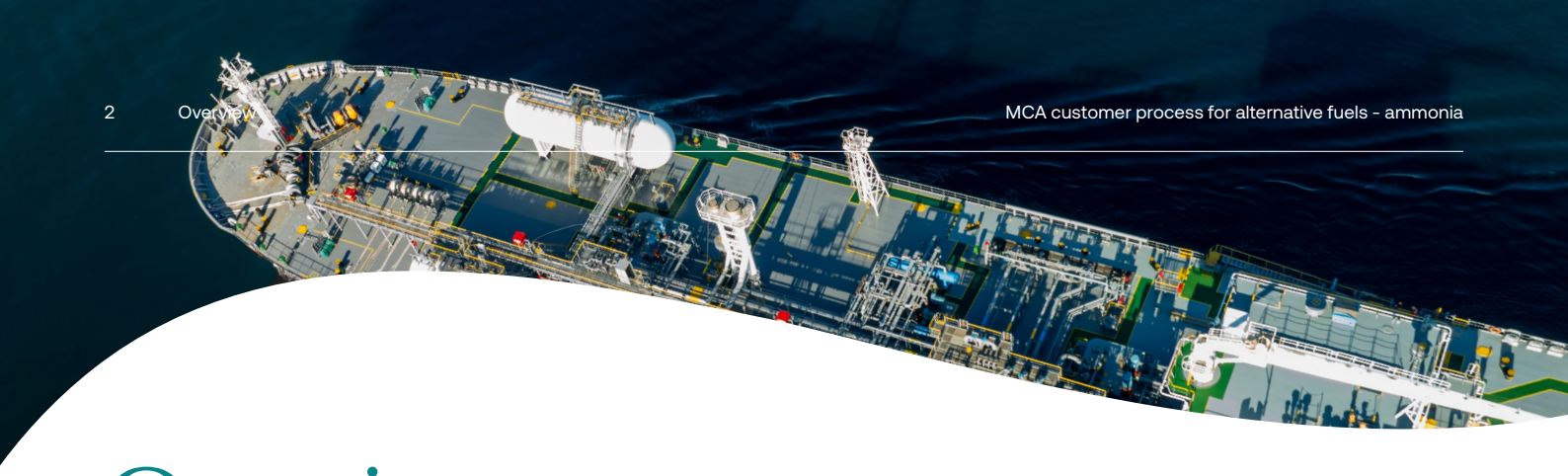
Maritime & Coastguard Agency

Safer lives, safer ships, cleaner seas

MCA customer process for alternative fuels - ammonia



Overview

Anhydrous Ammonia (Ammonia - NH3) is a light, toxic and colourless gas. Due to the chemical composition of the fuel, NH3 is considered a zero-carbon fuel with no carbon in the chemical molecule. It does have toxicity and flammability issues which require special handling for storage and transport. The fuel has been used in industrial sectors and is transported in the maritime field as a cargo.

For vessels above 500GT, the Maritime and Coastguard Agency (MCA) currently regulates vessels carrying ammonia as cargo under the International Maritime Organisation's (IMO) International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC Code). The MCA also works with operators and Classification Societies to regulate vessels using ammonia as a marine fuel, under the IMO's interim guidelines as published as part of the International Code of Safety for Ships using Gases or other Low-flashpoint Fuels (IGF Code). These are applicable through the use of the alternative design arrangement. For smaller vessels using ammonia as fuel, no prescriptive regulations currently exist and are considered on a case-by-case basis, guided by experts from MCA's Technical Operations, Regulation and Standards and Seafarer Technical Delivery teams.

Advantages of ammonia as fuel

- Ammonia is liquid at -33°C and ambient pressure which reduces the storage requirements as compared to other cryogenic fuels, such Liquefied Natural Gas (LNG).
- It has the potential to be carbon-neutral when produced using renewable energy. Low emissions compared to existing marine fuels (when viewed on a life cycle basis).
- It rapidly dissolves in water and biodegrades rapidly.
- Can be used in existing marine diesel engines by carrying out appropriate modifications, which should be duly approved by the relevant Classification Society or Recognised Organisation.
- Existing manufacturing systems exists to manufacture ammonia at scale, for example the Haber-Bosch process.
- Ammonia has been transported as a cargo by shipping since at least the 1920's with established best practices and industry standards.

Challenges associated with using ammonia as fuel

- Toxicity: requires increased safety systems, including cofferdams and inerting. The space taken by cofferdams can be a challenge for existing vessels retrofitting to use ammonia.
- Corrosive: requires specific storage and handling arrangements.
- Lower energy density compared to traditional fuels therefore requires around double the fuel tank capacity when compared to diesel. This can be a challenge especially for retrofit vessels.
- Ammonia is currently made for a large number of industrial uses. This scale of production would have to be increased to allow for the requirements of shipping on top of other sectors.
- Ammonia is currently more expensive compared to traditional fuel types.

Regulations and guidance for using ammonia as fuel

IMO have developed interim guidelines for using ammonia as fuel and these can be used by owners/operators wishing to build new vessels or convert existing vessels to run on ammonia. This guidance should be used in conjunction with IMO's International Code of Safety for Ships using Gases or other Low-flashpoint Fuels (IGF Code).

As part of the requirements, the IGF Code requires that an Alternative Design Arrangement (ADA) is submitted to the Administration to be notified to the IMO. The ADA is a risk-based design process, catered for under SOLAS, which identifies the main hazards/risks associated with the operation and mitigates them to the satisfaction of the flag administration and other stakeholders. Full guidance on the ADA process is published in MSC Circular, MSC.1/Circ.1212, and should be closely followed by owners/operators prior to submission to the MCA as part of the plan approval process. The ADA process usually requires several iterations before final sign off, the number of iterations is very much dependant on the quality and thoroughness of the submission. Owners/operators are therefore encouraged to ensure submissions are of a high standard to minimise the number of iterations required to reach approval and final sign off. Repeat and similar designs that have already gone through the ADA process, are usually signed off in a much shorter timescale.

The MCA is currently working with other member states at the IMO to further develop the interim guidelines on the use of ammonia as a fuel with the expectation of them being reviewed, finalised and adopted into the main IGF code in the future.

Ships below 500GT or not having to comply with the IGF code, can follow a similar process which is described in Marine Guidance Note 664 (MGN664). This is also a risk-based process and closely follows the ADA process already mentioned.

Crew training requirements for alternative low flash point fuels are currently covered by the IGF training requirements under the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW) which includes ammonia. The MCA is currently engaging with training providers to develop a weeklong methanol course for convention-sized vessels with initial courses expected to be launched in mid-2025. Basic training for the use of ammonia as fuel will be introduced into the UK curriculum from September 2025, as part of the new syllabus developed under the Cadet Training and Modernisation (CT&M) programme. Longer term, through the IMO, training for alternative fuels, including ammonia, will be included as part of the comprehensive review of the STCW, with a timeline expected to be 2030.

Following approval of the ADA/MGN664 and associated plans, the remainder of the process follows a conventional route through survey of the vessel, ensuring the installation is built in accordance with the approved plans, leading to final certification.

Delegated authority

As described in the previous section the process of certification is currently based around the ADA/MGN664 process, based on size of vessel.

If the vessel is to follow the ADA process, then a Recognised Organisation (RO) would usually be involved in this process. Depending on the level of involvement of the RO they might need to sign a Project Specific Agreement. This, and other specifics of any delegation, would be discussed in the initial meeting of the project. This level of delegation is highly dependent on the initiative risk of the project and the capabilities of the RO. The MCA would always retain the final approval for the project before issuing any exemption or equivalence.

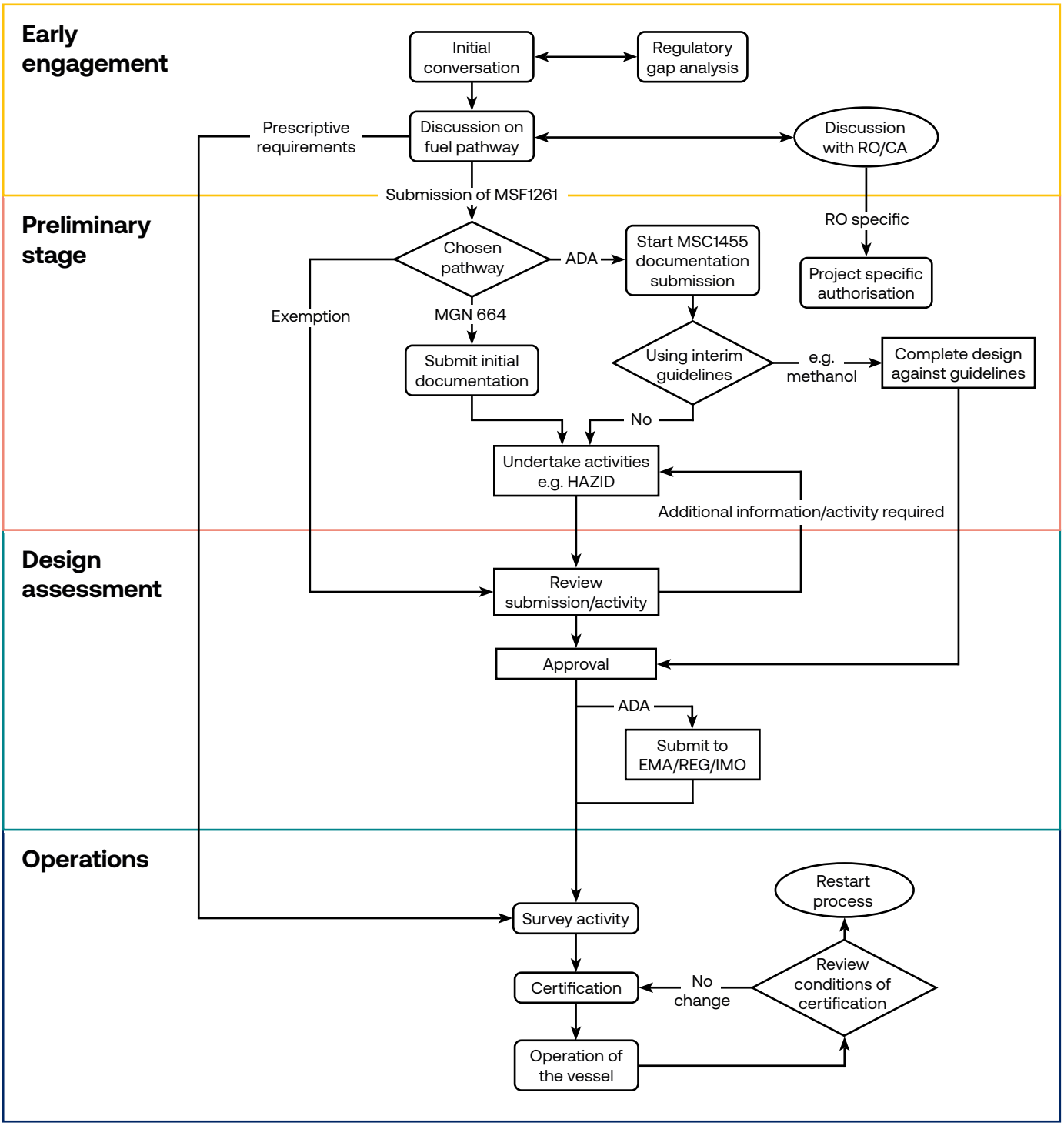
An indicative table of the activities undertaken and the responsibility is described in the table below.

Activity	Responsibility	Outcome Objective
Initial meeting.	Operator/MCA/Classification Society	Introducing the project and initial design. Discussion around approval process and timelines to reach certification.
Submission of plans including a gap analysis against the interim guidelines with any requests for exemptions, equivalencies supported by ADA and associated safety case/ engineering analysis.	Operator/Classification Society/ Specialist Marine Consultant	Demonstration of compliance against published standards, identifying gaps against those standards and, where required, provision of mitigation to support equivalent levels of safety.
Review and approval of the plans, exemptions, equivalents and ADA.	MCA	Approval allows design to be finalised and project to progress in accordance with agreed requirements. This is an iterative process.
Seafarer qualifications and training.	Operator/MCA	Specific crew training requirements associated with the operation and use of ammonia such as fuel handling will be identified.
Land based infrastructure, availability and quality of ammonia.	Port Authorities/Health and Safety Executive (HSE)/Fuel Suppliers	Operators should consult the appropriate authorities to ensure adequate infrastructure, supply and quality of ammonia exists for their areas of operation.

Timelines

Below is a diagram of the process described above with the different stages.

As can be seen much of the activity is related to activities being undertaken by the submitter. The MCA would review the outcomes of these activities within a maximum of 28 days. Due to this being a cyclic process the overall time for a project is mostly based on the quality of the application and the overall risk levels of the project. Once a project has had an initial meeting and started submissions with the MCA for a project, then better estimates for approval time can be provided.



Key contacts

Any existing customers wishing to build or convert a vessel to operate using ammonia as fuel are encouraged, in the first instance, to contact their MCA Customer Service Manager who will be able to advise further on the process and where necessary set up a meeting with MCA subject matter leads to discuss the proposals in detail.

New customers or those without a Customer Service Manager should contact:

HQSurvey@mcga.gov.uk

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