

Institution of
**MECHANICAL
ENGINEERS**

**IMECHE GLOBAL ENGINEERING
DESIGN SOLUTIONS
CHALLENGE 2018**

**INGENUITY FOR THE FUTURE
CRISIS ON DRINKABLE WATER**

EXECUTIVE SUMMARY

The IMechE Global Engineering Design Solutions Challenge 2018 is an engineering design competition for Young Members of the Institution. The competition aims to address real-world problems through engineering design projects and give solutions to their related challenges. Each competing entrant/team will produce a design that should be production ready. The competitors must function as a team to design and promote their ideas, build, test and compete with a functional prototype within the limit of the competition rules.

2018 Proposed Competition Theme: Finding Solutions to the Drinkable Water Crisis

Water is life. Water is the new oil. Water is the power of mankind in the future.

Water is the driving force of all nature, unfortunately for our planet; supplies are now running dry at an alarming rate. The world's population continues to soar but that rise in numbers has not been matched by an accompanying increase in supplies of fresh water. The real problem in a larger sense is not a lack of water; the oceans are full of it. It is the shortage of water that is available, and pure enough, to drink. Just **2.5 percent** of the world's water is fresh water, and less than **1 percent** of that is accessible.

Almost all the rest is frozen in glaciers or buried deep underground. The consequences are proving to be profound. Across the globe, reports reveal huge areas in crisis today as reservoirs and aquifers dry up. More than a billion individuals, one in seven people on the planet, now lack access to safe drinking water. Over the past years, water technologists have been working hard on two big challenges: squeezing more drinkable water from the oceans of water already out there and devising new ways to use, and waste less of the water we already have. Nevertheless, there is still a great potential for improvement.



By 2025, it is estimated that two-thirds of the world's population will live in water-stressed areas, concentrated in the Middle East, North Africa, and western Asia, according to the World Resources Institute.

(Source: National Geographic)

THE COMPETITION

1. Competition Scope 2018/19

Each entrant/team will put forward an innovative idea in response to the competition objective "Ingenuity for the future crisis on drinkable water". If you would like some help identifying a topic, we have highlighted the following themes which could be interesting to focus the paper:

- Innovative approaches for generating drinkable water
- Machinery/systems for effective and efficient utilisation of drinkable water
- Efficient water management for optimum utilisation for different household needs
- Innovative techniques of water purification
- Rain water harvesting and novel engineering strategies for water saving

2. Eligibility

The competition is open to all Young Members of the Institution - affiliates, associates or any member who has been professionally registered for less than 10 years.

Submissions can be made individually or as part of a team (three people max). If entering as a team, at least one participant must be a Young Member of IMechE.

The competition opens on **21 September 2018**.

2.1. Stage One

Stage one is a written design proposal to solve the Water Crisis highlighted above. Entrants shall submit a technical paper of their designs based on the brief outlined. The five technical papers with the highest awarded judge scores will advance to the second stage. Stage one guidance is provided below in section 3 and the appendix.

A detailed and justified budget proposal must be included within stage one. Without this participants cannot be considered for stage two of the competition.

How do I enter?

- Each entrant/team must submit the Stage One technical paper to gedsc@imechenearyou.org
- Guidance for stage one must be followed and contains full entry requirements
- All entries must be accompanied with a completed and signed application form (Link)

Stage one closing date: 16 November 2018

2.2. Stage Two

The five entrants/teams that progress to stage two will have the opportunity to build their prototype. IMechE will provide a grant of up to £100 GBP per entrant/team to help with material costs for the prototype. Participants are expected to create a 10 minute video which includes a presentation and footage of the working prototype.

After stage two closes the judges will select an overall winner and runner-up. Participants will be judged on innovation, feasibility to upscale the prototype and presentation quality.

3. Judging Criteria

Both stages will be judged based on innovation, feasibility and presentation quality. A panel of judges formed by IMechE International Strategy Board will judge all entrants.

3.1. Stage One Submission - Technical Paper

- Use of appropriate design methods such as ethnography, contextual research, phenomenological/autobiographical methods, secondary research, reflection, critique, analysis, and empirical evaluation (20%)
- Clarity, credibility and real world feasibility of design focus, purpose and solution (20%)
- Originality and quality of the design solution, including claims and their supporting evidence (20%)
- Innovation within the design process (20%)
- Clarity of write-up and supplementary material (20%)

3.2. Stage Two Submission - Video

- Clarity and organization of the oral presentation (20%)
- Relevance and clarity of presentation material (20%)
- Quality of argument used to justify why the prototype is a practical design for the real world (20%)
- Quality, originality and relevance of design prototype and its working condition (40%)

4. Prize Details

After stage two has closed the judging panel will select an overall winner and overall runner-up from the five entrants/teams. Winners will be featured in the Institution News and World Bulletin newsletters, read by over 63,000 people across the world.

- Overall winner: £500
- Overall runner-up: £300
- IMechE official certificate (both)

5. Remarks

IMechE reserves the right to withhold any or all of submissions at their absolute discretion.

For Stage One Submissions:

1. Papers relating to all aspects of "Ingenuity for the future crisis on drinkable water" are welcome.
2. The language of the paper must be in English only.
3. Each paper can have a maximum of three authors.
4. Each paper must not exceed 2,000 words in length. (excluding the appendices)
5. All reports will be scanned using Plagiarism Software to ensure original content.
6. Each paper should be submitted as a single PDF.
7. Participants must include a detailed budget proposal to be considered for stage 2 (prototype build) of the competition.
8. The paper must not have been previously been published in other school or society publications.
9. All papers should be original and should not be based on existing prototypes.
10. Requirement for Prior Knowledge Survey
The teams should conduct a literature survey on prior arts, publications and patents to prove the novelty of the proposed design as a separate report along with the

Stage One Submission. This will ensure the novelty of the idea that is being submitted.

11. The paper should include reference citations which should conform to one of the generally accepted citations systems, such as the Oxford, Harvard, MLA, American Sociological Association (ASA), American Psychological Association (APA), and other citations systems
12. Guidelines for writing a technical paper is described in the Appendix A as reference.

For Stage Two Submission:

1. Entrants/teams must provide a supplementary video (MP4 file, max 10-minutes), the video should be uploaded to a file sharing platform such as Dropbox and link attached to the application form provided.
2. The video should include an oral presentation of the prototype and footage of the prototype in working order.
3. Encoded as an MP4 using the H.264 codec.
4. Resolution of at least 1280 x 720px or higher.
5. We strongly recommend 16:9 aspect ratio.
6. You must have obtained permission of any people featured in the video or their parents/guardians if children under 16 are featured.
7. You must be the sole owner of copyright in all videos entered.
8. All videos submitted may be shared/reproduced on the Institution's social media, webpages, marketing and other publications without the payment of any royalty fee.
9. Submissions must include the names of all participants.

Competition key milestones:

Milestone	Date	Comments
Competition Launch	21 September 2018	
Stage 1 Technical Paper Submission Deadline	16 November 2018	
Stage 1 winners announced	November 2018	Stage one winners will progress to stage two of the competition.
Stage 2 Launch	November 2018	Grant funds transferred to Stage two participants
Stage 2 Video Submission Deadline	Feb 2019, TBC	All submissions made and competition closed.
Overall Winners announced	Feb 2019, TBC	Prize money transferred to winning teams

APPENDIX A - GUIDANCE FOR STAGE ONE SUBMISSION

Title

The paper title should accurately describe the focus of the design presented.

Abstract

A brief description of the design and proposed solution, with a summary of the approaches taken within the design process. It should also include the problems being solved, and main claims for the proposed solution with evaluation results. The abstract is used to help the reader quickly ascertain the paper's purpose. It should be between 250-300 words.

Introduction

A good introduction describes the overall issue being addressed and why it is important; and states the scope and goals of the work; provides background material to bring the intended audience up to speed, and orients the reader by outlining the organizational structure of the paper.

Body

The body of the paper should include a detailed and structured description of the work suggested, including (as appropriate) methodology, assumptions, hardware, observations and analysis. The information presented must be self-contained (in the sense that the reader is not assumed to have read prior papers) and provide an appropriate level of detail for the intended audience. Define all terms at first usage and apply them consistently.

No specific heading titles are mandated, but common examples include Methods, Results, and Discussion.

Conclusions

The summary and/or conclusions are counterparts to the introductory statements: there was a specific problem, an investigation was conducted, these results were obtained, and this is what it means. The section may also suggest future follow-up work. Every technical paper should have a summary, but the nature of the paper may make conclusions inappropriate.

Acknowledgements

Acknowledgement of any assistance drawn from outside the team (advisors, faculty, domain experts, existing solutions, users, etc.)

Citations

All citations should be complete and consistent. Check the final bibliography carefully and make sure to use the generally accepted citations systems, such as the Oxford, Harvard, MLA, American Sociological Association (ASA), American Psychological Association (APA), and other citations systems. **All reports will be scanned using plagiarism software to ensure original content.**

Appendices

Any bulk of information that interrupts the flow of thought in the paper would best be placed in an appendix. Examples include large tables, large images, or long mathematical derivations. Multiple appendices can be included and are titled sequentially as follows: Appendix A: Title, Appendix B: Title, etc.

A detailed budget proposal to build the prototype must be included in the Appendices for participants to be considered for stage 2.