Jobbnorge ID: 279848
Deadline: 5/25/2025
Website: http://www.ntnu.no
Scope: Fulltime
Duration: Temporary

The Department of Mechanical and Industrial Engineering has a vacancy for a

PhD Candidate in Fracture and Fatigue of Barrier-Protected Steel in Hydrogen Gas Environments

This is NTNU

NTNU is a broad-based university with a technical-scientific profile and a focus in professional education. The university is located in three cities with headquarters in Trondheim.

At NTNU, 9,000 employees and 43,000 students work to create knowledge for a better world.

You will find more information about working at NTNU and the application process here.

Video: https://youtu.be/Xt-yHCN5QS0

About the position

Are you motivated to take a step towards a doctorate and open up exciting career opportunities? As a PhD Candidate with us, you will work to achieve your doctorate, and at the same time gain valuable experience that qualifies you for a further career in higher education and research, in and outside academia.

A PhD position is available at the Department of Mechanical and Industrial Engineering with the Materials & Manufacturing research group.

Your immediate leader will be the Head of Department. You will be supervised by Associate Professor Nima Razavi.

About the project

Hydrogen embrittlement poses a major challenge to the safety and reliability of hydrogen infrastructure, as it interacts with metallic materials exposed to hydrogen gas, reducing their strength, ductility, and resistance to fatigue and fracture. This is especially critical for pipelines and storage vessels, where hydrogen can penetrate metals, leading to premature failure.

The **ReSIstH2 project** is working to develop advanced metal barriers that improve the durability of hydrogen infrastructure. To address hydrogen embrittlement, metal barriers—such as aluminum alloys and austenitic stainless steels—are employed to prevent hydrogen ingress and protect the structural integrity of carbon and low alloy steels. To ensure their effectiveness, the project investigates how these barriers interact with hydrogen—studying uptake, diffusion, and mechanical performance—while also optimizing cladding and lining techniques for improved resistance to hydrogen degradation. Ultimately, this research aims to contribute to safer and more sustainable hydrogen storage and transport solutions.

As part of this effort, the **PhD research** focuses on the fatigue and fracture behavior of these metal barriers in hydrogen environments. Through a combination of experimental testing, theoretical analysis, and numerical simulations, the study aims to characterize the failure mechanisms of base steels and barrier-integrated alloys. A key goal is to refine experimental methods for evaluating fatigue-fracture behavior in hydrogen-exposed materials, helping to develop stronger and more reliable hydrogen-resistant structures.

This position is financed by the Research Council of Norway's Knowledge-building Project for Industry, on Robust metal barriers for Safe use of Hydrogen Infrastructure (ReSIstH2) in a collaboration between SINTEF, NTNU and industrial partners Equinor, Hydro, Nexans, Bergen Engines, and Prodtex.

Duties of the position

- Mechanical characterization (such as tensile, fracture and fatigue tests)
- microstructural analysis of the selected alloys in the project
- application of advanced damage detection methods for structural integrity assessment
- Complete the doctoral education until obtaining a doctorate
- Carry out research of good quality within the framework described above
- Academic publications and popular science dissemination

- Participate in international activities such as conferences and/or research stays at foreign educational institutions
- Co-supervision of master students on the topic of the PhD project

Be prepared for changes to your work duties after employment.

Required selection criteria

- You must have an academically relevant background within Mechanics of Materials
- You must have a Master's degree in Mechanical Engineering, Material Science or equivalent. Your course of study must correspond to a five-year Norwegian course, where 120 credits have been obtained at master's level. Master's students can apply, but the master's degree must be obtained and documented before starting the position.
- You must have a strong academic background from your previous studies and have an average grade from your Master's degree study, or equivalent education, which is equal to B or better compared to NTNU's grading scale. If you do not have letter grades from previous studies, you must have an equally good academic foundation. If you have a weaker grade background, you may be considered if you can document that you are particularly suitable for a PhD education.
- You must meet the requirements for admission to the faculty's Doctoral Programme
- Excellent written and oral English skills
- Documented strong background in experimental mechanics, solid mechanics and mechanics of materials
- Documented excellent track record of academic achievement

PLEASE NOTE: For detailed information about what the application must contain, see paragraph “About the application”.

As a result of the new Act relating to universities and university colleges with associated regulations of 01.08.2024, NTNU has, during a transitional period (for decisions on employment in recruitment positions before 1 August 2025), chosen to use the terms of employment in the old regulations of 31 January 2006 no. 102 on terms of employment for positions such as postdoctoral fellow, research fellow, scientific assistant and specialist candidate

Preferred selection criteria

- Good knowledge and experience in mechanical testing of materials or components
- Good understanding fatigue and fracture mechanics
- Knowledge of metallography and material science would be given additional credit in evaluation
- Experience in using Finite Element Codes such as ABAQUS, ANSYS, etc. for numerical analysis
- Ability to conduct high quality research and publish results in acknowledged peer-reviewed conferences and journals
- Good oral and written presentation skills in Norwegian/Scandinavian

Personal characteristics

To complete a doctoral degree (PhD), it is important that you are able to:

- Work independently
- Work in a structured way, set goals and make plans to achieve them
- Present and discuss your research with other professionals
- Get involved and contribute constructively with feedback
- Work constructively under pressure or in the face of adversity
- Show curiosity and a strong motivation for the subject
- Analyze data, assess different perspectives and draw well-founded conclusions
- Be flexible and open to adjusting the plan for the project as needed
- Enjoy interdisciplinary research
- Strong interest in conducting experimental and numerical research

Emphasis will be placed on personal qualities.

We offer

- An exciting job with an important mission in society
- Developing tasks in a strong and international professional environment
- Career guidance and follow-up during the PhD period
- Open and inclusive working environment with committed colleagues
- Working capital that can be used to implement the project
- Mentor programme as a new employee at NTNU
- As a public employee, you have favourable benefits as a member of the Norwegian Public Service Pension Fund (SPK)

You will be employed as a PhD Candidate at NTNU and will have access to employee benefits and discounts.

Diversity

Diversity is a strength, and at NTNU we aim to be an employer that reflects the diversity in society and that makes use of the potential of the population's collective skills. Our vision is Knowledge for a better world and our values are creative, critical, constructive and respectful. We believe that an organization that is equal, diverse and gender-balanced is essential for us to achieve our goals.

We strive to attract employees with different skills, life experiences and perspectives to contribute to even better problem solving of our societal mission in research and education.

If you think this position is relevant and interesting, we encourage you to apply, regardless of gender, functional ability and cultural background, or whether you have been out of work for a period of time.

At NTNU we want to increase the proportion of women in scientific positions. We have a number of measures to promote equality.

Salary and conditions

In the position of PhD Candidate, code 1017, your gross salary will normally be NOK 536 200,- per annum depending on qualifications and seniority. A 2% statutory contribution to the State Pension Fund is deducted from the salary.

The employment period is 3 years.

For employment as a PhD Candidate, it is a prerequisite that you gain admission to the PhD programme in Engineering within three months of your employment contract start date, and that you participate in an organized doctoral programme throughout the period of employment.

The position is conditional on external funding from the research council of Norway for the ReSIstH2 project.

As an employee at NTNU, it is important that you keep yourself up to date with academic and organizational changes and adapt to them.

For the necessary academic and social interaction, it is a prerequisite that you are physically present and available to the institution on a daily basis.

The appointment is carried out in accordance withthe principles of the State Employees Act, and Export control(legislation that regulates the export of knowledge, technologyand services). Candidates who, after assessment of the application and attachments, are considered to bein conflict with the criteria in the latter act, will not be able to be employed.

About the application

The attachments (including a description of your scientific work) must accompany the application as these documents form the basis of the application assessment. The documents must be in English.

Please note: the application will only be assessed on the basis of the information we have received by the application deadline. Therefore, make sure that your application clearly shows how your skills and experience meet the criteria described above. The application and all attachments must be sent electronically via Jobbnorge.no. If you are invited to an interview, you must bring certified copies of certificates The application must include:

- Transcripts and diplomas for Bachelor's and Master's degrees
- CV
- Copy of Master's thesis. If you have recently submitted your Master's thesis, you can attach a draft of the thesis. Documentation of a completed Master's degree must be presented before taking up the position.
- Research Plan (at least two pages, maximum four)
- Short letter of motivation (400 words/1 page)
- Possibly publications or other relevant research work (the candidate’s contribution to each work must be clarified (performed tasks and percentage of contribution))
- Possibly certificates
- Name and contact information of three referees, their relation to the applicant, and their recommendation letters for your application for this position (Note: the referees will also be directly contacted for shortlisted candidates for the position)

If all, or parts, of your education has been taken abroad, we also ask you to attach documentation of the scope and quality of your entire education, both Bachelor's and Master's education, in addition to other higher education. If your institution uses “diploma supplement” (normal for most European institutions), you must attach this. A description of the documentation required can also be found here. If you already have a statement from Norwegian Directorate for Higher Education and Skills (HK-dir), please attach this as well.

Joint works will be considered. If it is difficult to identify your contribution to joint work, you must attach a brief description of your participation.

When assessing the best qualified, we emphasize necessary qualifications such as education, experience and personal suitability. Motivation for the position, ambitions and potential for research will also count when assessing the candidates.

NTNU recognizes a wide range of academic contributions and has committed itself to The San Francisco Declaration on Research Assessment and CoARA (responsible assessment of research and recognition of a greater breadth of academic contributions in accordance with NTNU's social mission).

General information

A public list of applicants with name, age, job title and municipality of residence is prepared after the application deadline. If you wish to be exempt from entry on the public applicant list, this must be justified. Assessment will be made in accordance with current legislation. You will be notified if the exemption is not granted.

If you think this position looks interesting and in line with your qualifications, you are welcome to apply.

If you have any questions about the position, please contact Associate Professor Nima Razavi, email: nima.razavi@ntnu.no.

If you have any questions about the recruitment process, please contact HR Consultant Hedda Winnberg, email: hedda.winnberg@ntnu.no.

Application deadline: 25.05.2025

For practical information about working at NTNU, please visit this webpage.

The city of Trondheim is a modern European city with a rich cultural scene. Trondheim is the tech capital of Norway with a population of 200,000. The Norwegian welfare state, including healthcare, schools, kindergartens and overall equality, is probably the best of its kind in the world. Professional subsidized day-care for children is easily available. Furthermore, Trondheim offers great opportunities for education (including international schools) and possibilities to enjoy nature, culture and family life and has low crime rates and clean air quality.

NTNU - knowledge for a better world

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The Norwegian University of Science and Technology (NTNU) creates knowledge for a better world and solutions that can change everyday life.

Department of Mechanical and Industrial Engineering

We educate graduates who can create new products, operate and maintain products, and manage projects. The Department has a variety of bachelor's and master's degree programmes. We conduct wide-ranging research in fields such as technology, energy, product quality and development, and productivity. The Department of Mechanical and Industrial Engineering is one of eight departments in the Faculty of Engineering.

Additional information

Place of service:

Richard Birkelands vei 2B 7034 Trondheim (Trondheim Municipality)