

# DELIVERABLE 3.3

## Testplan

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## 1. Introduction

Network for Innovation and Learning on Microreactor Technology (NIL-MRT) is a project aimed at establishing a networked environment for sharing information and a communication platform to discuss topics regarding microreactor technology, between students, academia, and industries across Europe. It is envisaged that the gap between research in chemical industries and European bachelor-degree level education can be reduced by developing a network for learning and innovation combined with communities for development. This will facilitate the alignment of the program curricula, the newest research development and the transformation of new ideas into SME's and industrial practice. This NIL-MRT establishment also aims to capture a wider audience outside Europe in the future.

The test plan is prepared to ensure that the aforementioned objectives of the developed networked environment are met. The features of test plan derive from the three main areas contributing to the success of the NIL-MRT web presence, i.e. the usage and usability of the developed platform/website, the educational content, and case studies regarding microreactor technology. The plan focusses on several aspects including the learning outcome for the students, the advantages or disadvantages of the NIL and the research outcome of the companies involved.

The test approach taken in relation to the NIL-RT web presence, documenting details of test activities, resourcing and schedules, will be used as a reference a test plan for a successful NIL-MRT development.

## 2. Test plan strategy

The delivery of the developed NIL-MRT web presence to the project goals is aimed to be assessed primarily by the project partners. This is the most convenient and effective way of evaluating the newly developed online platform as the project goals are clearly identified. The test features are defined to match the objectives of NIL-MRT. Three main features contributing to a successful delivery of NIL-MRT project goals are (i) the usage and usability of the NIL-MRT web presence, (ii) the online educational content on MRT and (iii) the MRT case studies. The aspects in which these features are tested are defined to benefit all target groups; most effective use of communities for students, academia and industrial professionals and most achieved learning outcome for students.

### 2.1 Usage and usability of the NIL-MRT web presence

The NIL-MRT web presence (<http://www.microreactortechnology>) was developed in order to (i) facilitate the delivery of high-quality and appealing MRT course materials, (ii) facilitate the exploration of new ideas in the field of MRT, (iii) serve as a platform for on-going exchange and generation of new ideas that encourage innovation of MRT.

The developed NIL-MRT web presence will initially be tested by the project partners on the current environment. The usage and usability of the web presence will be assessed employing a questionnaire feedback for educational and social/community purposes. The facilitation of the web environment on MRT learning will be assessed on the aspects of findability, accessibility and usability of the online educational content. The stimulation and facilitation of the web presence, on the community formation and social collaboration for MRT knowledge exchange, will be determined for the social/community purpose. The outcomes affect the judgement on the effectiveness of the developed web presence, the improvement plan for the program's sustainability, and scaling to capture larger audience. Purposely, the questionnaire will not be included as part of the website during this primary evaluation for it being in the prototyping period and the intended use being the later improvement of the web presence.

The plan to test the usage and usability of the NIL-MRT web presence after the initial evaluation, targeting at all visitors to the website including students, academia, professionals in the field and industrial partners, will be implemented once the website is finalised and launched to the public (March 2015).

## 2.2 Online educational content

The NIL-MRT web presence (<http://www.microreactortechnology>) was developed in order to (i) facilitate the delivery of high-quality and appealing MRT course materials, (ii) facilitate the exploration of new ideas in the field of MRT, (iii) serve as a platform for on-going exchange and generation of new ideas that encourage innovation of MRT.

The educational materials for MRT were developed by a collaboration between Hull University, Zuyd University and Open University of the Netherlands for bachelor's degree students. The current topics on microreactor technology were included in the online education materials (e-module), describing basic information on microreactor technology, the advantages and benefits associated with MRT and the implementation of the technology in industries. The examples of experiments performed using continuous flow chemistry were also included (both in e-module and teaching methods from Chemtrix BV) in order to demonstrate the practicality and implementation of the technology. The educational materials were also prepared to provide industrial professionals in the field of chemistry with separate lessons (masterclass) where microreactor technology was discussed by experts from leading academia and chemical industries in the field. In addition to having access to the educational module provided, the students are encouraged to use closed communities for discussing and exchanging knowledge on MRT activities.

The developed NIL-MRT web presence will initially be evaluated via a questionnaire by project partners involved in the construction of the website and its contents. The test focusses on assessing the education content for its quality, comprehensibility, usability and delivery with respect to the intended learning outcome. Information on areas required for improvement will be extracted from the initial evaluation findings. The online questionnaire is intended to be included as part of the website subscription/visit, and the feedback is analysed intermittently, to ensure that visitors are presented with useful and accessible information about MRT.

## 2.3 Two-educational related case studies

In addition to providing a platform for appealing online educational materials for MRT, the NIL-MRT web presence brings together a local community for MRT development, where practical skills and theoretical insights on MRT can be gained by members involved in the communities.

The objective of the MRT case studies is to demonstrate the potential of MRT to both students and professionals in the field of chemistry and chemical engineering. The target groups for the developed case studies are bachelor students, and laboratory technicians with no academic background. For PSIMT, the students attend their courses in parallel to their normal jobs in chemical industries. The two case studies developed at PSIMT were chosen as a means for understanding reactions performed in continuous flow miniaturized systems. The choice of reactions was considered based on their simplicity, safety, cost and facilitation to the course learning outcome.

The first draft of case studies developed by a PSIMT laboratory teacher will primarily be tested by three Chemical Engineering bachelor's students. The students will be asked to perform the reactions by following the protocol provided and give feedback on cases conducted. The students' comments on the advantages and disadvantages associated with the case studies will be taken into account for the final version of the case studies.

The evaluation of the case studies will be carried out by a questionnaire feedback from project partners. The test aspects include suitability of the reaction choices, comprehensibility and usefulness of the case studies, and the suitability for MRT practical training.

The developed case studies will also be tested with bachelor students from partnered institutes, i.e. Zuyd Hogeschool, the University of Hull, and Dublin City University, and the feedback received from the international students will be included into improvement plans for MRT case studies.

### 3. Test plan allocation

The test approach for the evaluation of the developed NIL-MRT web presence is summarised in Table 1.

**Table 1** NIL-MRT web presence test plan.

Test feature	Responsibility	Time frame
1. Usage and usability		
1.1 Web accessibility and subscription	OUNL	July 2014 – March 2015
1.2 Statistics on usage	OUNL	July 2014 – March 2015
1.3 Activities in closed communities	OUNL	July 2014 – March 2015
1.4 Initial evaluation	All project partners	September – November 2014
1.5 Online questionnaire	Willing website visitors	March 2015 – Ongoing
2. Online educational contents		
2.1 Information accessibility	OUNL, ZUYD, HULL	July 2014 – March 2015
2.2 Knowledge exchange in closed communities	OUNL, ZUYD, PSIMT	July 2014 – March 2015
2.3 Initial evaluation	All project partners	September – November 2014
2.4 Online questionnaire	Willing website visitors	March 2015 – Ongoing
3. Case studies		
3.1 Internal evaluation	PSIMT	July 2014
3.2 Exchange students	ZUYD, PSIMT	July – December 2014
3.3 Knowledge exchange in closed communities	OUNL, ZUYD, PSIMT	July – December 2014
3.4 Initial evaluation	All project partners	September – November 2014
3.5 Trans-institutional evaluation	ZUYD, HULL, DCM	December 2014 – March 2015
3.6 Online questionnaire	Willing website visitors	March 2015 – Ongoing