

Swedish work about development of materials in contact with drinking water

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During its distribution from waterworks to consumers, drinking water will come into contact with a range of materials which may potentially impact its quality through release of different substances. As toxic substances may present a risk to human health, this issue has gained a lot of attention in Sweden; examples of lead release from brass faucets and bisphenol-A from relining has been highlighted lately. To address these challenges without forgetting the more traditional reliability aspects, Swerea KIMAB started in 2013 a network for materials in contact with drinking water. It has today around 30 stakeholders representing material producers and users, trade associations, scientists, approval organs and government agencies. The network functions as a platform for information dissemination, experience and knowledge exchange and for starting-up common initiatives. Two examples are the 3-year Nordic project "*Material and product innovation through knowledge based standardization in drinking water sector*" and a study comparing Nordic assessment method for brass products (NKB4) with the rig testing according to ISO 15664.



Travaux suédois concernant le développement de matériaux entrant en contact avec l'eau potable

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Pendant sa distribution, de la station hydraulique jusqu'aux consommateurs, l'eau potable entre en contact avec un large éventail de matériaux pouvant potentiellement influencer sa qualité en raison de la libération de différentes substances. Des substances toxiques étant susceptibles de présenter un risque pour la santé humaine, ce point fait l'objet d'une attention accrue en Suède. Des cas de libération de plomb de robinets en laiton et de bisphénol A de regarnissages ont dernièrement été mis au jour. Pour aborder ces défis, sans pour autant oublier les aspects de fiabilité plus traditionnels, Swerea KIMAB a créé en 2013 un réseau pour les matériaux entrant en contact avec l'eau potable. A l'heure actuelle, il se compose d'environ 30 parties prenantes représentant des producteurs de matériaux et utilisateurs, associations professionnelles, scientifiques, organes d'approbation et agences gouvernementales. Le réseau est une plateforme de diffusion d'informations, d'échange de connaissances et expériences et de lancement d'initiatives communes. Comme exemple, nous pouvons citer le projet nordique de trois ans intitulé « *Material and product innovation through knowledge based standardization in drinking water sector* » et une étude comparant la méthode d'évaluation nordique pour les produits en laiton (NKB4) aux dispositifs d'essai conformément à la norme ISO 15664.



Schwedische Arbeit über die Entwicklung von Materialien mit Trinkwasserkontakt

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Bei der Verteilung vom Wasserwerk zu den Verbrauchern kommt Trinkwasser mit einer Reihe von Materialien in Kontakt, die potenziell geeignet sind, seine Qualität durch die Freisetzung verschiedener Substanzen zu beeinträchtigen. Da toxische Substanzen ein Risiko für die menschliche Gesundheit darstellen können, hat dieses Thema in Schweden viel Aufmerksamkeit erhalten. In letzter Zeit fanden die Beispiele der Freisetzung von Blei aus Messingwasserhähnen und von Bisphenol-A aus dem Relining von Rohren besondere Aufmerksamkeit. Um diesen Herausforderungen zu begegnen, ohne die herkömmlicheren Aspekte der Zuverlässigkeit aus den Augen zu verlieren, hat Swerea KIMAB im Jahr 2013 ein Netz für Materialien ins Leben gerufen, die mit Trinkwasser in Kontakt kommen. Dieses Netz vereint heute etwa 30 interessierte Parteien, unter ihnen Materialhersteller und -nutzer, Branchenverbände, Wissenschaftler, Prüfstellen und Regierungsstellen. Das Netz fungiert als Plattform für Informationsverbreitung, Erfahrungs- und Wissensaustausch und den Start gemeinsamer Initiativen. Beispiele sind das auf drei Jahre angelegte skandinavische Projekt „Material- und Produktinnovation durch wissenschaftliche Standardisierung im Trinkwassersektor“ und eine Studie, die die skandinavische Methode für Messingprodukte (NKB4) mit dem Versuchsaufbau gemäß ISO 15664 vergleicht.



Background

Swerea KIMAB has worked with materials in contact with drinking water from several perspectives, such as welding, joining, status assessment and failure analysis of large-diameter pipes, modeling of copper release from pipes to drinking water, the effect of chlorine disinfection on plastic pipes, rig testing of materials for drinking water, investigating lead release from brass to drinking water, method development to assess materials in contact with drinking water, failure analysis of components in drinking water systems, etc.

There is found to be a lack of knowledge, both within the industry and the water suppliers, as well as within research, about the health effects of materials in contact with drinking water, and how the corrosion aspects affect the health issue. New materials and technologies are being introduced to the market, and the responsibility for the health assessment is undefined. Today there is no organization responsible for the assessment of materials in contact with drinking water in Sweden. There is a range of approvals and methods, and no consistency in the application. Meanwhile, consumers are gaining more and more knowledge about the potential risks related to materials in contact with drinking water, leading to an increased demand for safe materials. As the question about health effects from materials in contact with drinking water was brought up by media, there was a demand for knowledge and recommendations, both from the public, but also from the producers and the water suppliers. However, these types of recommendations were not to be found.

Another current issue is the approval processes for materials in contact with drinking water. The approval processes varies between countries, and in many cases it is not clear whether or not the approval test procedures correspond to actual field conditions. A lot of work is going on in Europe to implement new test procedures, at first hand though the 4MS group. This influences dramatically the Nordic material producers and will also influence the approval processes in Scandinavia. For example, there is only one German actor today who is allowed to test and approve materials according to 4MS, and the lead-times for testing are very long at the moment (6-12 months wait to test a material and 6 months operation time) and this causes a bottleneck in the material development which is a business problem. Thus, it is important to find a common Scandinavian stand-point in order to influence the development of EU-standards. Products and materials for drinking water applications are a core business for

a number of Scandinavian producers, and it is essential for these companies to have a common Nordic material and product approval system, in accordance with European and international systems.

In order to effectively work with the development of materials in contact with drinking water, evaluation and development of testing and the development or adaptation of appropriate rules and regulations, it is necessary that the Nordic countries work together and also work proactively with other European groupings, primarily the 4MS group. The Nordic countries would have large advantages to share experience and would be a much stronger actor if they could act commonly in European discussions. There is a need for a Nordic collaboration platform with representatives from Sweden, Finland, Norway and Denmark, bringing together testing and R&D organizations, government agencies and industrial representatives from Scandinavia, in order to take a holistic approach to materials in contact with drinking water.

Materials in contact with drinking water is a topic that concerns many different organizations and professions. From the water producers responsible for the treatment of water in the waterworks and the assemblers responsible for choosing materials, to the material and product developers, designing new products for drinking water distribution, the house owners responsible for the materials in the buildings, and the toxicologists evaluating potential health effects after consumption of the drinking water. Previously, there has been little or no communication between the different actors.

Swerea KIMAB made a focused initiative to gather actors within materials in contact with drinking water, to share the current knowledge, and to identify needs and areas for development. This initiative was started in 2011, with funding from the Swedish Innovation Agency Vinnova and the Nordic Innovation.

Objective

The aim of the initiative has been to raise the level of knowledge in Sweden and the Nordic countries about health effects from materials in contact with drinking water, and create a base for knowledge exchange between actors within the field of drinking water and materials. This work has been done through two different collaboration forms; the Swedish *Network for materials in contact with drinking water* which was initiated in 2011, and the *Nordic collaboration*, initiated in 2013.

Swedish network for materials in contact with drinking water

The Swedish network was founded in order to provide a platform for information dissemination, experience and knowledge exchange and for starting-up common initiatives. The aim was to form a broad collaboration, to increase the knowledge working as a basis for applying for research funding, both nationally and internationally. Members represent material and product producers, water distributors, researchers, assessment organizations, etc. The relevant authorities are not participating in the network, but attend meetings and participate in discussions.

The network is administrated by Swerea KIMAB and targets companies, governmental agencies and organizations that work with issues related to materials and/or drinking water, for instance, drinking water suppliers, assemblers, producers of materials or products or others with interest in the field. A first network has been started in 2011 and members represent all of these categories. The Swedish *Network for materials in contact with drinking water* was initially funded within Vinnova's "*Challenge driven innovation*" while it is now fully financed by member companies.

The seminars are held in Stockholm, Sweden two times per year and topics such as current research, legislation and future demands are discussed. As an example, international experts from Germany and the Netherlands have presented the current situation in their respective countries, the Swedish National Board of Housing, Building and Planning have presented their view on the responsibility for materials and products in contact with drinking water now and in the future, material experts have presented how to perform adequate testing of materials, etc.

Actors in the water sector have jointly developed a national established strategic research and innovation agenda for the water sector in Sweden - Water Vision - for sustainable water services for good health and good environment. Swerea KIMAB have contributed, representing the *Network for materials in contact with drinking*

water, and raised the issue of health effects related to materials in contact with drinking water, which is now a prioritized topic.

Nordic collaboration

The *Nordic collaboration* is a three year project funded by Nordic Innovation's "*Material and product innovation through knowledge based standardization in drinking water sector*". Within this project the state of the art in the Nordic Countries will be evaluated regarding materials used for drinking water applications, water quality and its possible impact on materials, as well as legislations, rules and responsibilities in the different countries.

A common overhaul of the 4MS work will be performed regarding its relation to rules, legislation and practices in the Nordic countries. The current approval systems in the Nordic countries are reviewed and it will be suggested how an authorization model in line with the CE marking system could be developed.

Common laboratory capacities in the Nordic countries for testing and acceptance of materials in contact with drinking water will be evaluated, and an action plan will be set up to establish accredited laboratories for the different test methods. In addition, a mapping of technical competences and strengths in the different countries and research organizations involved will be made and a model to define how to best use the common competence for a Nordic development of the area materials in contact with drinking water will be presented.

Within the project, there will also be reviewing of opportunities for funding of joint research projects.

Result/Outcome

The outcomes of the initiative are:

- *Evaluation of test methods for assessment of lead release from brass to drinking water*, scientific paper presented at Eurocorr 2013
- Nordic collaboration project within "*Material and product innovation through knowledge based standardization in drinking water sector*"
- Materials in contact with drinking water is considered a prioritized topic for research within the Water Vision R&D agenda for the water sector.
- Organization of a seminar at Vattenstämman (Swedish Water and Wastewater Association's annual national meeting), with information about the current knowledge about materials in contact with drinking water and related health issues
- Two panel discussions with the National Board of Housing, Building and Planning, with attendance of international experts, representatives from water distributors, etc
- Three seminars within the Swedish network for materials in contact with drinking water
- Meetings between international experts in the 4MS group and Swedish authorities and assessment organizations, where a dialogue have been started about how to assess materials in contact with drinking water with respect to their health and environmental effects.

The general outcome of the projects is that the knowledge about health related issues regarding materials in contact with drinking water have been raised within Sweden. Furthermore, a Nordic collaboration has been initiated where research needs, competence and lab facilities are coordinated, in order to optimize the use of research resources within the Nordic countries.

Discussion

The outcome of the initiative has been a raised level of collaboration between actors that normally does not collaborate, and a joint view of the needs. The general level of knowledge about materials in contact with drinking water has been raised. The work is promoting a proactive approach from the material producers and water distributors, where potential issues are addressed and prevented, rather than solved in retrospect. This includes both the health effects of the materials and the durability of the system, which both has to be considered when discussing corrosion related issues.

Several needs have been identified, for example the need for material recommendations for water distributors, based on scientific data, as well as parametric values and relevant test methods for the material and product producers to certify their materials.

The participation of the governmental agencies has been highly appreciated, as well as the opportunity to access a platform for discussion.