

## Conference report

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# Green is the future of chemistry: report of Taminco's second Green Footsteps Event at the i-SUP 2012

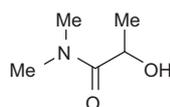
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At the third edition of the international conference “Innovation for Sustainable Production 2012” (i-SUP 2012) in Bruges (Belgium), Taminco's second Green Footsteps Event was held (May 7, 2012) [1]. The aim of this meeting is to create an open innovation platform in order to stimulate creative thinking in Taminco's business areas where green chemistry principles have a significant impact. Such principles have already been integrated in Taminco's current business strategy and are introduced at the early stages of the product/process development cycle. However, research in green chemistry and engineering is still gaining momentum and new important discoveries are made rapidly [2]. This event gave a nice platform to discuss the trends which are both of interest in academia and industry.

The event was opened by Dr. Peter Roose, Director Research and Business Development at Taminco. The core competence of Taminco (The AMINE COmpany) is the production of alkylamines and their derivatives, which are relevant in a wide array of specialty applications, such as personal and homecare, environmental, agricultural, pharmaceutical and industrial segments [3]. Dr. Roose explained that for this year's event, three focus areas were selected, which could stimulate Taminco's core activities.

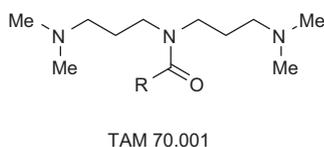
The use of sustainable solvents was the first focus of the event. Solvents are massively employed in the chemical industry and can make up more than 80% of the material usage in the manufacturing of Active Pharmaceutical Ingredients (API) [4]. Solvent selection guides are published by several companies and provide a tool to replace solvents which possess undesirable toxic effects [5]. One group of solvents which have particular reprotoxicity issues, are the so-called dipolar aprotic solvents, such as *N*-methyl pyrrolidone (NMP), dimethyl formamide (DMF) and dimethyl-

acetamide (DMAc) [6]. However, these solvents are particularly useful to dissolve highly polar compounds (so-called “brick dust”) which are otherwise insoluble in any other solvent. Moreover, such solvents display certain characteristics which are beneficial for nucleophilic substitution reactions and cross-coupling chemistry [7]. Replacing these solvents has been particularly challenging and is in certain cases not possible. Dr. Roose announced that Taminco is currently working on the development of new amide-based solvents with the same solvent properties as NMP, DMF and DMAc, which show no reprotoxicity effects. One example of a renewable solvent is dimethylactamide, which is based on the biocompound lactic acid. Dr. Roose also detailed that two alternatives to NMP are currently in the pipeline, which have equal performance, but demonstrate no toxic effects. Details about their structure were not disclosed in the presentation however he assured that these will be reported soon.



*N,N*-dimethylactamide

A second aspect that was covered in the Green Footsteps Event was the development and identification of a new generation of green surfactants. Adjuvants, such as tallow amine ethoxylates (TAE) and nonylphenol ethoxylates (NPE), are typically used to enhance the desired effects of herbicides by improving their solubility and penetration capacity. Although they are considered as inert with regard to pesticide activity, these compounds are difficult to degrade in natural environments and are shown to be endocrine disrupting chemicals (EDC). Such EDCs interfere with activity of the hormone system, leading to tumor formation and developmental disorders [8]. Taminco has developed a new adjuvant, TAM 70.001, which demonstrates an effective plant protection, uptake and translocation profile combined with an excellent biodegradability.



A third area involved the development of novel biomodulators, in order to stimulate and protect crops and animals in a sustainable fashion. Taminco developed Tenaz Rice as a novel foliar fertilizer, which can be applied in the cultivation of rice. Tenaz Rice is a patented formulation of bio-available and soluble orthosilicate and provides increased yield (Figure 1), more resistance to diseases and is free of any toxic residues [9].

Within the framework of these focus areas, three invited lectures were given by presenters from academia as well as industry.

The first lecture was presented by Dr. Andrew Hunt, who is a scientific leader for natural solvents and biolubricants at the Green Chemistry Centre of Excellence (University of York, UK). His talk dealt with the current limitations of natural and bio-derived solvents. One of his key messages was that green solvents might be indeed useful, but that they have to fit in desired reaction needs, e.g., solvent polarity.

The next lecture was given by Prof. Dr. Theo A. Niewold, Professor Nutrition and Health at KU Leuven (Belgium). He discussed the consequences and limitations of new biocompatible molecules which influence animal physiology. There is an increasing demand from governmental instances to reduce the amounts of antibiotics in animal production. However, such antibiotics are very cheap and reduction will only be feasible when the alternatives are as effective and cost-efficient. Poten-

tial alternatives for traditional antibiotics can be found in plants and plant extracts. These natural sources contain anti-inflammatory compounds and are perceived as green.

The final presentation was provided by Dr. Andre Convents. He is a section head for open innovation consumer modeling and sustainability at Procter & Gamble. He discussed the importance of life cycle assessment in product development at Procter & Gamble, in order to detect potential bottle necks in the process. This allowed for an overall reduction of the footprint of the product. In his talk, he also mentioned the importance of so-called sustainable innovation products, such as smart packaging, to reduce the amount of plastic and design of new surfactants to allow laundry washing at ambient temperatures in order to reduce energy impact.

The event was concluded with an award ceremony which rewarded promising research by MSc or PhD students with special merits in regard to the categories identified by Taminco. A cash prize of 1000 euros was involved and was aimed to be an incentive to continue the work in this field. Adriaan van den Bruinhorst (Eindhoven University of Technology, Netherlands) received the prize in the category "Green Solvents" with a paper about "Processing lignocellulosic biomass utilizing low transition temperature mixtures". The Taminco Green Footsteps Award in the category "Plant Biomodulators" was awarded to Françoise Bafort (University of Liege, Belgium) for her work on "The lactoperoxidase system, a soft chemical method to control potato late blight". In the category "Animal Biomodulators", Farshad Goodarzi Boroojeni (University of Berlin, Germany) received the award for his paper about "Replacement of corn in the diet of broiler chicken using foxtail millet produced by two different cultivation strategies".

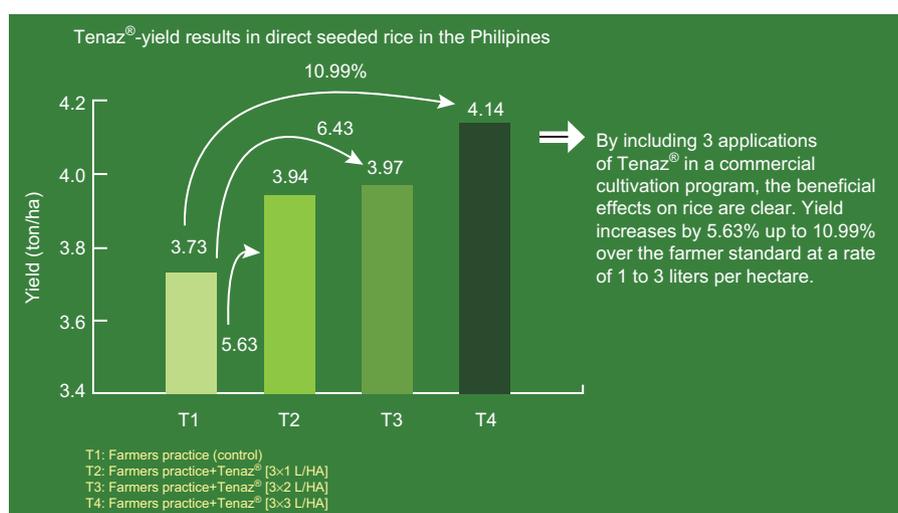


Figure 1 Yield increase per hectare for the cultivation of rice in the presence of Tenaz (results reproduced with permission of Taminco).



Overall, the Taminco Green Footsteps Event provided a platform to discuss novel research developments in the area of green chemistry and engineering. The success of the event demonstrates that such research is indeed in the focal area of many researchers from both industry and academia. Therefore, such initiatives should be embraced and encouraged in the future, since they really bring together profit/product-oriented research in industry and fundamental research on an academic level. Stimulating research collaborations between industry and academia can be initiated on such events and therefore, we hope that Taminco continues these Green Footsteps series in the next years.

## References

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