Doctoral dissertation:
BEHAVIOR OF MARTENSITIC WEAR RESISTANT STEELS IN ABRASION AND IMPACT WEAR TESTING CONDITIONS

The doctoral dissertation of Vilma Ratia in the field of materials engineering entitled "Behavior of Martensitic Wear Resistant Steels in Abrasion and Impact Wear Testing Conditions" was publicly examined at the Faculty of Engineering Sciences of Tampere University of Technology (TUT) on 6th of November, 2015. The opponents were Professor **Mikael Olsson** (Dalarna University, Sweden) and Dr. **Mikko Uusitalo** (Valmet Technologies, Inc.). Professor **Veli-Tapani Kuokkala** from the Department of Materials Science at TUT acted as the Chairman.

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Wear is a complex phenomenon, which is present in both small and large scale in the industry, but also in our everyday life. Controlling the wear and the use of more durable materials can lead to economic benefits and increase effectiveness. For example, better durability of steels can lead to lower repair costs because of longer service life. Moreover, wear resistant materials enable the use of smaller material thicknesses which decreases the mass of the machinery. In transport applications this can increase the payload and reduce fuel consumption.

The ability of a material to resist wear is not an intrinsic mechanical property, since it depends on the tribosystem as a whole, which includes all the environmental and operational factors. One of the aims of Vilma Ratia's dissertation was to analyze the wear testing methods used for abrasive, impact, and impact-abrasive wear performance assessment of materials and thus to add to the current understanding of the wear testing in such conditions. In her dissertation, Ratia defined the applying conditions in abrasive wear testing methods, especially impeller-tumbler impact abrasion testing method, and considered the effect of various factors on the test results obtained with steels. The results have been used in the development of wear resistant steels in the FIMECC DEMAPP project (2009-2014).

As an outcome, she stated that wear tests enable the comparison of materials in controlled conditions, but close attention on the test procedures must be paid also when conducting seemingly robust wear tests, especially when the differences to be detected are small. The tests themselves constitute a tribosystem, which is why local changes in the conditions due to the test procedures, such as sample placement, must be properly understood in order to get reliable results. Understanding the concept of a tribosystem and the major interdependencies involved is essential for not only all wear testing methods, but also proper analysis of the experimental test results.

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