V Strength

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VANITEC
TRANSFORMING POSSIBILITIES

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Steel Customer Outreach Program

How many steel melting shops are there? How much steel does each make? How much vanadium does each consume, and why? And, most importantly, what support does each need from the vanadium industry to make the best use of vanadium in their products? These are the core questions for a NEW Vanitec sponsored study on Vanadium Consumption in Steel, called SEARCH.

Vanitec has a long and proud history of funding technical research and development projects to help steel producers use vanadium alloying effectively. Many of these projects involve collaboration between researchers in steel companies and universities, and the results are routinely published in journals and at conferences. By definition, these activities are relatively few in number and the objectives are narrowly focussed to solve specific technical questions. Moving forward, Vanitec plans to broaden the scope of its technical support to the steel industry within a more inclusive programme called TRANSFORM, which will consist of four workstreams, the first of which is SEARCH. The second workstream called SUPPORT will develop a global network of V supporters.

An initial SEARCH feasibility study carried out in Q1 2017 has revealed some interesting preliminary findings;

- The study included a sample of steel producers located in North America, Europe and China, and many of the companies were willing to share data (covering the period 2012-2016) with the project team.

- The quality of the data exceeded expectations in some cases, and provided opportunities for more detailed study.

- Some clustering of specific consumption levels (kgV/tonne steel) was observed for mills with similar processes and products. However, there were more outliers than expected, with some process-product segments showing significant mill to mill variation.

- Consumption trends over the 5 year period revealed interesting variations, some related to known causes, and others requiring further study.

This short study offered tantalising glimpses of the potential to better understand the use of vanadium in steel at a mill level, and enable comparisons within and across peer groups. Following this success, the Vanitec Directors recently approved moving forward with the full project which will expand to include a much larger number of steel companies across the globe. Vanitec would like to thank all companies that have provided data so far, and invite all steel companies to collaborate in this exercise. All contributors can be assured that all data will remain confidential within the SEARCH project team. For further information about the project and how to contribute please email david.milbourn@vanitec.org.

"Vanitec remains committed to serving all our members through aggressive advocacy of the benefits and need for increased consumption of Vanadium in steel, titanium, chemicals & energy storage."

- John Hilbert, CEO

Vanitec Hosts Annual Meeting in Cape Town

The 92nd Vanitec Meeting, hosted by Glencore, took place in Cape Town, South Africa 5&6 April 2017.

After a beautiful sunset dinner overlooking the beach in Camps Bay, South Africa, Vanitec members got down to work on important Health, Safety, and Environment (HSE) and Market Development Committee (MDC) meetings earlier this month.

The Directors formally welcomed several new members who have joined Vanitec since our last meeting including Full Members Bear Metallurgical and Bushveld Minerals and Associate Members Atlantic, Gildemeister, PVH Storage, QEM, and U308. Also approved were new projects on 500 MPa Rebar in China, V Microalloyed DP9080 Development, and the extension of the TRANSFORM project.

Susan Visser of Glencore was re-elected and Alexander Erenburg of Evraz was first time elected as Directors. Malcolm Curror of Bushveld Minerals will continue on as President of Vanitec.

The 93rd meeting will take place 10&11 October 2017 at the Sheraton Skyline Hotel at Heathrow Airport in London, UK.

Advanced High Strength Steel Research

Advanced High Strength Steel (AHSS) sheets are currently the fastest growing materials in the automotive body in white sector. Their superior strength and formability allows the direct substitution of older High Strength Low Alloy (HSLA) parts with reduced gauge components resulting in substantial weight savings at an equivalent or improved functionality.

Vanitec has sponsored a two year R&D project at the CanmetMATERIALS laboratory in Hamilton, Ontario to study the influence of Vanadium additions in ultra-high strength (> 1 GPa) DP steels. The project has just finished and the results will be presented in a paper at the AIST conference on New Developments in AHSS (to be held in Keystone, Colorado later next month.)

This work showed that, when correctly utilized, vanadium plays a significant role in shaping the microstructure and the mechanical properties of these alloys. For example, under industrial processing conditions the mean ferrite grain size of cold rolled and annealed strips can be refined by a factor of ~2.5x and the cooling rate required to form martensite after annealing reduced (due to improved hardenability).

Natural Resources Canada

Canada

Compared to a reference alloy, the net result is a Dual Phase steel which is stronger at low martensite fractions and weaker at high martensite fractions i.e. the mechanical properties are much less sensitive to industrial processing conditions.

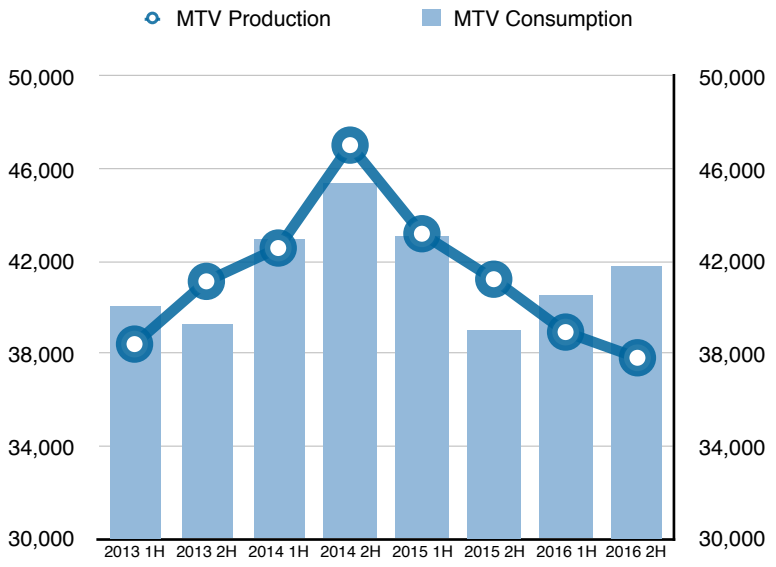
Microalloying with Vanadium has thus resulted in a *more robust product*. The project also showed that the formability of the new alloys is improved, due to the strong grain refinement and reduction in the difference in strength between the ferrite and martensite phases.

The technology developed in this study has generated interest from Stelco Canada and a 1 year joint Stelco Canada/Vanitec/ CanmetMATERIALS project has been launched with the objective of designing and testing improved robustness hot and cold rolled Vanadium DP980 grades to be produced on Stelco's CAL/CG facilities in Ontario. This new project will begin this month.

MTV 2016: Production Declines Continue; but Consumption Rebounds

In its reporting, Vanitec defines vanadium production as MTV in all oxides produced, plus MTV in other V-compounds not produced via oxide route, plus MTV FeV not produced via V_2O_x-route. The data is not disseminated by Vanitec nor used for any purpose other than compiling overall statistics for the vanadium industry.

Detailed information such as individual region production, consumption and specific consumption rates are available to Vanitec members only. If you are interested in joining Vanitec as a full or associate member please contact us at info@Vanitec.org.



2nd Energy Storage Committee Meeting Set

The 2nd Vanitec Energy Storage Committee (ESC) meeting will be held in Manchester UK immediately following the conclusion of the International Flow Battery Forum (IFBF) on Friday, 30 June, 2017 from 08:00 to 13:00 with lunch provided from 13:00-14:00. The meeting will also take place at the IFBF location Mercure Manchester (UK) Picadilly Hotel. There is no cost participate in the meeting, Vanitec is an IFBF sponsor and is hosting the Thursday evening Brewery Tour and dinner.

The draft agenda includes a vanadium market update on production and demand, research advances on the vanadium flow batter, new potential sources of vanadium, a health safety and environmental briefing, discussions on standards and promotion, and a panel discussion on issues restricting growth of the vanadium flow battery. If you are interested in participating in the 2nd Vanitec ESC meeting please RSVP to Vanitec CEO John Hilbert at john.hilbert@vanitec.org. Additional agenda suggestions are welcome.

Members

AMG Vanadium, Inc.

Atlantic Vanadium Pty Ltd.

Australian Vanadium

Bear Metallurgical Company

Beijing Zhongkaihongde Technology Company

Bushveld Minerals Limited

Chengde Iron & Steel Group Co Ltd

China Iron & Steel Research Institute Group

Duferco S.A.

Evraz NTMK

Evraz Vanady Tula

Gildemeister Energy Storage GmbH

Glencore plc

Largo Resources Ltd.

Mustavaaran Kaivos Oy

New Zealand Steel Ltd.

Panzhihua Iron & Steel Group

PVH Storage

Queensland Energy & Minerals Pty

Treibacher Industrie AG

U308 Corp

UPCOMING EVENTS

2nd Vanitec Energy Storage Committee Meeting

Manchester, UK
30 June 2017

Intl. Symposium on Advanced High Strength Sheet Steels

Keystone, USA
30 May 2017

North American Ferroalloys Conference

Chicago, IL USA
7-8, September 2017
Vanitec Members get 15% discount: register at this **LINK** and use code VANITEC17

93rd Vanitec Meeting

London, UK
10 & 11 October, 2017

Vanitec CISRI VTC Holds 5th Annual Experts Meeting

The Vanitec - CISRI Vanadium Technology Center (VTC) held its fifth experts meeting on 3 March 2017 in Beijing, China.

The meeting was kicked off by Prof. Zhang Yongquan, the director of the VTC Expert Committee at CISRI. 24 representatives including 17 VTC Experts from vanadium producers, steel companies, industry associations, and research institutions and Dr. Yu Li of Vanitec attended the meeting.

Professor Yang Caifu, the director of the VTC, made a presentation on Vanitec Project V145: “China HRB Rebar Standard Revision”. Pangang presented a VTC research project, “Development of High Strength and Weather-proof Z Beam”. A new proposal on developing V-N normalized steel plate given by Prof. Wang Ruizhen of CISRI was discussed. Mrs. Chen Jie of Central Research Institute of Building and Construction was invited to give a presentation on “Development and Prospect of Steels for Steel Structure Buildings”.

Mrs. Chen Jie indicated that during China's 13th Five Year Plan (2016-2020) period, China will promote steel structure buildings and by the year 2020, consumption of steel for steel structure buildings will increase from current level of 50 million tonnes/year to 100 million tonnes/year. The main steel grades for the steel structures will upgrade from the current Q345 + Q235 to Q345+Q390 and there will be a good opportunities for vanadium microalloyed steels. The VTC’s “Five-Year Plan” on R&D and promotion of vanadium technology in China steel industry was also discussed by the delegates at the meeting.

Vanadium Award Announced

The Institute of Materials, Minerals and Mining (IOM3) has recently announced that Vanadium Award for 2016 goes to B. Hutchinson, D. Martin, O. Karlsson, F. Lindberg & H. Thoors of SwereaKIMAB, Sweden and R. K. W. Marceau & A. S. Taylor of Deakin University, Australia for their paper “Vanadium Microalloying for Ultra-high Strength Steel Sheet Treated by Hot-dip Metallising”, published by the Materials Science and Technology, 4 October 2016.

Ultra-high strength martensitic steel sheets are increasingly being used in automobile body construction to achieve significant improvements in crashworthiness and auto-body weight reduction. The aim of this work was to investigate the possibilities of manufacturing ultra-high strength steels suitable for coating with existing hot-dip lines.

This work has demonstrated that vanadium, when in combination with raised nitrogen content, helps to resist the effect of tempering so that a larger proportion of the initial strengthening is preserved after the galvanising cycle, giving tensile strength levels exceeding 1000 MPa.

The authors concluded that microalloying with vanadium is a very promising approach in the development of corrosion resistant ultra-high strength steel sheet products.

IOM3 will hold its annual awards ceremony on Tuesday, 11 July 2017 at the Institute (297 Euston Road, London) and Vanitec members are welcome to join us for this event. The Vanadium Award recognizes the most outstanding paper in the metallurgy and technology of vanadium and its alloys.

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Vanitec is a technical and scientific committee (The Vanadium International Technical Committee), which brings together representatives of companies and organisations involved in the mining, processing, manufacture, research and use of vanadium and vanadium-containing products.

The objective of Vanitec is to promote the use of vanadium bearing materials and thereby to increase the consumption of vanadium across the range of steel, titanium and chemical applications.

Vanitec strives to provide those with a vested interest in Vanadium – users, educators, students, producers – convenient access to research, events, resources and publications regarding Vanadium.