A Series of Steel Art by Masanori Sukenari

My Home or My House

The expression “my home” has imperceptibly passed out of use. Is the shell of a snail its home or its house? Even when the snail has passed by, its beautiful gyrations remain.

Masanori Sukenari: Born in 1960 in Fukuoka Prefecture, Mr. Sukenari graduated from the Department of Painting, Musashino Art University. He then received a Steiner scholarship to study abroad at the Akademie der Bildenden Kunste Munchen in Germany for the academic year 1993-94. Subsequently, he remained in Germany where in 1997 he held a private exhibition entitled “OPERA.” Following this, he held a private exhibition at the “House of Art” in Czechoslovakia in 2003, participated in the Sixth Shanghai Biennale in 2006, and in 2007 received the “Communications Special Award of the Ermanno Casoli Art Prizes.” In 2002, he assumed his current post as part-time instructor at Tokyo Zokei University.

In this issue

Feature Story

Awarding of the Production Prize of the Okouchi Awards

The Challenge of Achieving Zero-emissions for Iron- and Steelmaking Dust

Operating Roundup

Strengthening Automotive Steel Pipe Business in Indonesia

PT. Indonesia Nippon Steel Pipe has decided to increase its production capacity by building another plant at a site adjacent to the existing plant.

Coated Sheet Joint Venture in Mexico

Nippon Steel and Ternium SA (Mexico) have agreed to form in Mexico a joint venture to manufacture galvanized and galvannealed steel sheets.

Recycling Steel Mill Dust into Direct Reduced Iron

Nippon Steel and Kobe Steel, Ltd. have announced that they plan to begin construction of a plant to recycle steel mill dust into direct reduced iron.

Regular Subscription

If you have received the web-version of Nippon Steel News, you are already a registered subscriber, thus no new registration is required.

Associates who wish to become subscribers are requested to click on the icon to complete and submit the registration form.
Awarding of the Production Prize of the Okouchi Awards

The Challenge of Achieving Zero-emissions for Iron- and Steelmaking Dust

Nippon Steel, jointly with Nippon Steel & Sumikin Stainless Steel Corporation, received the 56th Production Prize of the Okouchi Awards (2009) for developing a dust recycling process that utilizes rotary hearth furnaces (RHFs). The two companies developed the world’s first technology to recycle the dust generated in iron- and steelmaking processes by employing rotary hearth furnaces and successfully devised a company-wide system for achieving zero dust emissions.

The Okouchi Awards were established to commemorate the excellent contributions of the late Dr. Masatoshi Okouchi (1978-1934), a prominent Japanese physicist. The awards are given by the Okouchi Memorial Foundation to reward outstanding achievements in the fields of production engineering and advanced production systems. The significant savings in resources and energy and the high productivity achieved by the RHF-based dust recycling system developed by Nippon Steel and its increasing adoption as well have received high marks, and it is these high performances that have led to the company’s current recognition.
Total Recycling of Dust Generated in the Iron- and Steelmaking Processes

In the iron- and steelmaking processes, dust (5% of which is iron) is an inevitable byproduct. This dust contains highly volatile zinc and other impurities in addition to iron oxide and carbon. As a result, when the dust is recycled as is, highly volatile zinc and other impurities are circulated and further condensed within the iron- and steelmaking processes. Accordingly, when by-product dust is recycled as an iron source, it is necessary to remove the zinc and other impurities.

Nippon Steel promoted technological development aimed at adapting rotary hearth furnaces (RHFs) for dust recycling operations, with the result that practical applications of dust recycling equipment started in 2000 at the company’s Kimitsu and Hirohata Works. Operational improvements have been added, and currently seven RHFs are in operation at the steelworks of Nippon Steel and Nippon Steel & Sumikin Stainless Steel. To that end, Nippon Steel has devised a system that can recycle all the dust generated throughout the company’s steelworks.

This highly energy efficient process recycles low-grade iron dust as an iron source by separating and recovering reduced iron and crude zinc oxide using the internal high operating temperature of the RHFs. In addition, this process offers high environmental safety and resource savings, has resulted in stable production and high productivity through the establishment of stable operation technologies, and has been extensively adopted by steelworks in Japan and abroad. These advantages and features have been highly valued, leading to the current receipt of the Production Prize of the Okouchi Awards.
In the dust recycling process, dust is formed into agglomerated products. These agglomerated products are subjected to reduction reaction at high temperatures and speeds within the RHFs in order to gasify highly volatile zinc for recovery and to recycle the contained iron in the form of direct reduced iron (Fig. 1). However, a number of technical tasks remain incomplete—difficulty in producing agglomerated products and instability in the reduction reaction of the agglomerated products.

In the newly developed dust recycling process, the agglomerated dust products, including iron oxides and carbon, are subjected to reduction treatment employing RHFs (maximum internal furnace temperature: 1,400°C). The process consists of the following four major technologies.

• **Adjustment of dust composition**
  Analytical and mixing technologies for the dust with fluctuating physical properties and compositions in order to realize appropriate agglomerating conditions

• **Three kinds of dust agglomerating technologies**
  Realization of stabilized treatment and high productivity by choosing the optimum agglomerating technologies in conformance with the physical properties of the material dust

• **Technologies for appropriate iron oxide reduction and zinc removal**
  Technologies that promote a high zinc removal rate and produce agglomerated reduced iron suitable for use in various melting processes—highly flexible reduction technologies for producing high-strength reduced iron for use at blast furnaces, for achieving high metallization rates for ferrous material melting furnaces, and for the reduction of difficult-to-reduce dust containing Cr

• **Technologies for stable operations**
  Technologies to allow high operation rates: refractories with a long-service life, measures to treat substances that adhere to furnace hearths, and waste-gas treatment equipment

Supported by these technological developments and the establishment of a dust treatment technology for use with RHFs, Nippon Steel has successively devised a system that can recycle all the dust generated throughout the company and achieve zero dust emissions.
Increasing Transfer of Technology to Steelmakers in Japan and Abroad

Seven RHFs for dust recycling are in operation at the Kimitsu, Hirohata and Hikari Works of Nippon Steel and Nippon Steel & Sumikin Stainless Steel. The dust recycled at these steelworks in 2008 totaled 890,000 tons, yielding energy savings equivalent to 60,000 kl of heavy oil and a 160,000-ton reduction in CO₂ emissions.

The technology for using RHFs to recycle dust has been transferred to many companies. One RHF, for example, was constructed at Asahi Industries Co., Ltd. of Japan in 2008, one at China Steel Corporation of Taiwan in 2008, and another at Maanshan Iron & Steel Co., Ltd. of China in 2009, and three at POSCO of Korea in 2009.

The potential worldwide total of recycled dust is estimated at several hundred million tons. Nippon Steel will promote the recycling of such useful metals as iron, zinc, chromium and nickel by expanding the diffusion of the RHF dust recycling process to promote recycling-oriented societies and the preservation of the global environment.