

NAWTEC 15 Keynote Speaker Abstract

Conversion Technologies – The Challenges for the MARTIN Reverse-Acting Grate System

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Thermal treatment of waste differs significantly from the combustion of regular fuels due to the fluctuating and unpredictable composition of the fuel. It is therefore necessary to develop processes with safe process engineering technology that guarantee the treatment of waste in accordance with ecological and economic constraints in addition to complying with international legal requirements. Various important factors have to be considered: not only the reduction of the volume and mass of waste and the destruction and separation of pollutants, but also the efficient energy production (electricity and district heating) and the guaranteed treatment of all waste. In order to comply with strict Japanese regulatory policies, particularly with regard to residue quality and overall output of organic substances, grate technology was modified by means of downstream melting processes that are intensive in terms of maintenance, energy and resulting costs. While vitrification of bottom ash and fly ash does improve quality and provide additional recycling possibilities, it has not proven sustainable. Conversion technologies using separated high-temperature processes make integrated production of granulated slag possible. Large market shares in Japan were gained as a result. However, practical experience in largescale plants has shown serious drawbacks with regard to availability, profitability and process safety. The use of alternative waste conversion technologies failed on the German market due to massive technical problems and considerable financial losses for all those involved.

In comparison, thermal treatment of waste using a grate-based system has gained acceptance as the preferred system for sustainable treatment of waste world-wide. The reason for this is that the energy content of the waste is utilized and that quality products and residues are produced. In addition, modern flue-gas treatment processes reduce gaseous emissions to a minimum. Nevertheless grate-based processes must also keep pace with international requirements by further innovative development. MARTIN GmbH has been working on optimizing MARTIN combustion and grate systems for years. Primary and secondary measures were tested in laboratories and on a semi-industrial and industrial scale, and have been successfully implemented in thermal waste treatment plants. There have been substantial developments in various fields: combustion control using an IR camera to determine the fuel bed temperature; NO_x reduction by means of flue gas recirculation concepts and the optimization of overfire gas distribution; the SYNCOM and SYNCOM Plus processes as well as treatment and recirculation of residues with the recovery of recyclables. MARTIN®, MARTIN reverse-acting grate®, SYNCOM® are registered trademarks in some countries.

Through its agitating motion towards the front grate end and thorough mixing of the fuel, the MARTIN reverse-acting grate always ensures good thermal protection for the grate bars. The combustion control system makes automatic adjustments to deal with different heating values and can therefore be used to thermally treat the most varied fuels. Tests carried out on fuels with high heating values have shown that no water cooling of the grate bars is necessary. In view of the continual depletion of raw materials, sustainable processes for the recovery of recyclables are increasingly becoming more important. In response to this need, MARTIN GmbH has tested cost-effective, process-integrated methods. The process of selective zinc recovery from the acid-scrubbed fly ash of thermally treated waste is one example of recovering economically profitable heavy metals. Dry ash discharging makes it possible to separate metals by type and to selectively separate highly polluted bottom ash fine fraction. The MARTIN discharger also ensures the continuous and safe discharge of bottom ash under these conditions of use.

The SYNCOM process, whereby underfire air is enriched with oxygen, reduces flue-gas flow and increases fuel bed temperature. On the one hand, this improvement in bottom ash quality can be attributed to waste burnout and thereby a reduction in residues of organic pollutants and, on the other hand, to improved leaching properties achieved by enhanced sintering. The first industrial-scale implementations of the SYNCOM process in Europe (Arnoldstein) and Japan (Sendai) have undoubtedly proven their functionality over several years of smooth, continuous industrial operation.

Although higher fuel bed temperatures in the SYNCOM process result in improved bottom ash sintering, testing demonstrated varying leaching behaviour according to grain size fraction. Separating grain sizes < 2-3 mm can considerably improve the leaching properties of bottom ash granulate. In the SYNCOM Plus process, the SYNCOM process is complemented by downstream wet-mechanical treatment of bottom ash and a system for returning the fine fraction with the boiler ash to the combustion process for sintering and the destruction of organic substances.

The presentation describes experience with conversion technologies in Japan and Europe, the developments in MARTIN technology in response to changing requirements as well as the use of the SYNCOM process and results from tests on the SYNCOM Plus process.

Ralf Koralewska has an Aviation and Aerospace Engineering degree from the University of the Armed Forces, Munich. Environmental Technologies post-graduate studies and PhD from the Technical University of Munich. Since 1999, project engineer for R&D department, MARTIN GmbH Ralf has worked as project engineer for many national and international technical projects. He has published papers and made presentations at international conferences at meetings with MARTIN partner companies in France, USA, and Japan.