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Abstract

Heavy fractions resulti ste treatment plants are posing very specific demands with regard to further treatment (large portions of inert and high-caloric components). Based on the current Austrian legal situation such a waste stream cannot be landfilled and must be thermally treated. The aim of this research was to evaluate if an inert fraction generated from this waste stream with advanced separation technologies, two sensor-based [near-infrared spectroscopy (NIR), X-ray transmission (XRT)] and two mechanical systems (wet and dry) is able to be disposed of. The performance of the treatment options for separation was evaluated by characterizing the resulting product streams with respect to purity and yield. Complementing the technical evaluation of the processing options, an assessment of the economic and global warming effects of the change in waste stream routing was conducted. The separated inert fraction was evaluated with regard to landfilling. The remaining high-caloric product stream was evaluated with regard to thermal utilization. The results show that, in principal, the selected treatment technologies can be used to separate high-caloric from inert components. Limitations were identified with regard to the product qualities achieved, as well as to the economic expedience of the treatment options. One of the sensor-based sorting systems (X-ray) was able to produce the highest amount of disposeable heavy fraction (44.1%), while having the lowest content of organic (2.0% $C_{biogenic}$ per kg waste input) components. None of the high-caloric product streams complied with the requirements for solid recovered fuels as defined in the Austrian Ordinance on Waste Incineration. The economic evaluation illustrates the highest specific treatment costs for the XRT (€23.15 per t), followed by the NIR-based sorting system (€15.67 per t), and the lowest costs for the air separation system (€10.79 per t). Within the ecological evaluation it can be shown that the results depend strongly on the higher heating value of the high caloric light fraction and on the content of $C_{biogenic}$ of the heavy fraction. Therefore, the XRT system had the best results for the overall GWP [−14 kg carbon dioxide equivalents (CO_2eq) per t of input waste] and the NIR-based the worst (193 kg

CO_2 eq per t of input waste). It is concluded that three of the treatment options would be suitable under the specific conditions considered here. Of these, sensor-based sorting is preferable owing to its flexibility.



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