The Production Performance Measurement for the Incineration Plants Using a Russell Multi-activity Network DEA Model

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Abstract

The advantage of incineration is that it does not require as much space to dispose of refuse as other treatments like landfills and dumping do. On the other hand, it has the disadvantage of producing toxic ashes or air pollution during the incineration process, which can cause environmental hazards. Thus, measuring and monitoring the efficiency of incinerators can help incinerator operators and policy makers detect management problems and improve the operation of the incinerators. This study proposes a Russell multi-activity network data envelopment analysis (RMNDEA) method to appraise how incineration plants in Taiwan perform. Sample data from 2006 are used to examine the tradeoff between efficiency enhancement and reduction of environmental externality. The respective efficiencies of the waste treatment and electricity production for an incinerator are also assessed in a unified framework. Empirical results indicate that it is more important to improve the efficiency of waste treatment activity than electricity production activity to improve the overall performance of Taiwan's incinerators. Ownership, location and length of operations do not affect plants' performance in general. Therefore, the improvement has to come from careful monitoring of each process of the waste treatment operations.

Keyword：Multi-activity Network Data Envelopment Analysis, Incinerator, Russell Measure, Undesirable Outputs, Directional Distance Function