

## An Innovative Boiler Cleaning Method Using a Rotary Cable Swivel Tool

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### Abstract

The boiler generating bank (convective) sections of waste to energy boilers are commonly found to be very limited in regards to personnel access. The Miami-Dade County Resources Recovery Facility has had a challenge in the past to effectively clean this section of the boiler either on line or within a timely manner during outages.

In 2003 the company used a new innovative method for cleaning this section off line. The boilers were 100% clean in 1/2 to 1/3 the usual time. The new method involved high-pressure industrial water blasting as typically used, with the exception of the water delivery device/system.

Normally the water delivery method involves personnel placed in the boiler with hand held high-pressure water lances. They require confined space monitoring, lighting, scaffolding, proper air supply, frequent breaks, rain suits, full face shields and other PPE for safety

inside the boiler. These factors combined with the limited space severely constrain the personnel and their effectiveness when using the water lances. Cleaning is compromised and has led to poor effectiveness and long duration cleanings. Explosives have also been tried to help augment cleaning.

The new method used in 2003 involved no personnel in the boiler. Instead, for the water delivery system, a support cable is erected across the boiler upon which a rotary cable swivel tool (CST) is mounted. The tool has connections for high-pressure water and plant air and a simple winch for traversing the tool across the furnace.

Very effective cleaning was accomplished from drum to drum, a distance of 20 feet (6.1 m). Depending on the application, the water pressure can be adjusted for maximum effectiveness. The air pressure is also adjusted to control the speed at which the rotary nozzles spin to best match the fouled conditions. The orientation and number of nozzles is also optimized for each application.

This paper details the results of using the rotary Cable Swivel Tool (CST) in the generating bank section of the boilers and discusses related operational and maintenance benefits.

## Introduction

The Miami-Dade County Resources Recovery Facility is 4,200 tons (3,810 tonnes) per day combined waste to energy and waste processing plant. The plant services the greater Miami – Dade County Florida area by processing approximately one third of the 3.5 million tons (3.2 million tonnes) of waste generated.

The 40-acre (16.2 hectares) site began operations in 1979 and has been retrofitted three times. The first retrofit was completed in 1989, which involved changing the waste processing system from a wet to a dry process. This retrofit also included a total rebuild of all 4 boilers, re-using only the existing steam and mud drums and most of the existing structural steel. [1]

The second retrofit completed in 1997 involved upgrading the trash processing system. This retrofit allowed commercial and wood waste including yard waste to be processed into a biomass fuel and a high-grade soil for recycling. This retrofit boosted the facility processing capabilities to over 1.2 million tons (1.1 million tonnes) per year, making it the largest in the world. [2]

The third retrofit completed in 2000 involved complying with the Clean Air Act Amendments (CAAA) of 1990 and meeting more stringent air emissions limits. It involved upgrading the air quality control system by replacing the existing Electro Static Precipitators

(ESP's) with Spray Dryer Absorbers (SDA's) and Fabric Filters (FF) as well as retrofitting the boilers. The boiler retrofit work included a new Over Fire Air (OFA) system, a new Selective Non Catalytic Reduction (SNCR) DeNOx system, and new propane gas startup burners. See Fig. 1 for a site plan.

The boilers have experienced a change with regards to boiler fouling since being retrofitted. Prior to 1997 the boilers ran fairly clean and no outside additional cleaning methods were required. Although some fouling caused minimal gas flow channeling and increased flue gas flow velocities, it was sporadic and no immediate impact on operations was perceived.

After the trash processing system retrofit, the boilers began experiencing more frequent more severe fouling to the point that operations could not maintain a balanced draft furnace without reductions in load. Outside assistance was then sought for cleaning. Several methods were tried with varying but mostly limited success prior to the use of a new method, the rotary Cable Swivel Tool (CST).

## Boiler Description

The facility has 4 identical boilers, originally supplied by Fives-Cail Babcock in 1977. They were demolished, re-designed and rebuilt by Zurn Industries during the first retrofit in 1989[1]. They are Refuse Derived Fuel (RDF) fired, balanced draft, natural circulation boilers. They incorporate a welded membrane waterwall construction, screen tubes, generating bank section and two stage pendant type superheaters. They are top supported, two-drum, bent tube, single gas