

FAIRFIELD SERVICE COMPANY

Providing excellence in Service, Product, and Value in our efforts to support the Water, Wastewater, and Material Conveyance industries since 1978.

DEEP RAKER

TRASH RAKE



MODEL

- Cleans on the Ascent
- Uses a Traveling Dead Plate for Debris Capture
- Travels to 350' Deep
- Uses Vector Motor Control Technology
- Locks The Rake Opened/Closed with a Mechanical Interlock



In the early 1980's, Fairfield Service Company developed and constructed the screening equipment for the Mainstream Tunnel System, the CSO pumping project that the Metropolitan Sanitary District of Greater Chicago (now Metropolitan Water Reclamation District of Grater Chicago) constructed. The operation was massive compared to conventional headworks screening: the bar racks were 12' wide x 50' high; the rake traveled to 350' below the operating floor; the rake weighed 18,000 lbs.; and the hoist drums were driven by two unique (at the time) VFDs that could go to zero speed and hold a torque.

Fast-forward to 2010

Fairfield Service Company has developed a deep-shaft screening system that reflects STATE OF THE ART. The Fairfield **Deep Raker** System is used upstream of a CSO tunnel system's pumps to screen large debris that enters the combined sewer system.

- Unlike some deep-shaft screening systems, the Fairfield Deep Raker removes the debris from the bar rack while the rake is ascending. The rake grabs while raking, instead of pushing it down towards the invert of the screening chamber where much debris is not very efficiently removed, as is the case with rakes which clean on the descent
- The rake on the Fairfield Deep Raker is comprised of three elements:

The **frame** with wheels to maintain the rake in vertical guides for its travel below the operator floor to the invert of the screening chamber and a pivot shaft for the grapple arm (which captures the debris). Each of the



wheel assemblies has plows to keep the guides clear of debris and allow the wheels to run cleanly along the guides.

The **grapple arm** with rake teeth that clean between the screen bars (to nearly the full depth of the bars). The three ropes (two closing and one opening rope) attach to the pivot shaft to engage and open the grapple arm.

The traveling dead plate which works in conjunction with the grapple teeth in its closed (raking) position to maintain capture of the debris above the bar rack, until the grapple is opened to discharge the debris into the trash container. The traveling dead plate, which rides on the frame during its full travel (except when the rake is below the top of the bar rack), is maintained in position relative to the frame and grapple teeth by two locating pins



and a secondary latch hook. When the descending rake reaches the top of the bar rack, a second set of three locating pins, pointing down, enter fixed register holes on supports mounted to the bar rack supports. The traveling dead plate is thus supported in position at the top of the rack, and the rest of the

rake continues its descent to the invert of the screening chamber (to start the raking portion of the cycle). The dead plate is positioned such that it mimics a conventional dead plate as used on most other types of head works screens. Thus, when the ascending rake brings debris above the top of the bar rack, the debris rests against he dead plate,(captured by the combined action of the rake teeth and the dead plate). The locating pins and secondary latch hoop then recapture the traveling dead plate for the rake to ascend to the operator floor for discharge. To ensure that the traveling dead plate will not be dropped if the locating pins fail to engage, the three ropes pass through the top of the traveling dead



plate...a further protection for the reliability of the system.

- ► The **hoist system** is mounted on a traveling bridge crane and is comprised of two independently driven drums with a special mechanical interlock system that both locks the two drives together with the rake (either open or closed), and allows the sharing of loads between the two drives. Each of the grooved drums are driven by an inverter-duty brake motor through a conventional speed reducer, along with the aforementioned mechanical interlock (which operates at motor speed). The output shaft of the reducer supports one end of the drum and the other end is supported on a conventional roller bearing pillow block. Encoders (on the outboard drum shaft) relay the exact position of the rake to the hoist control system.
- The bridge crane can be equipped to move in either two or four directions, depending on the Owner's specific application, usually dictated by whether there are one or two shafts to be serviced by the single rake. The bridge crane is used to carry the rake from over the shaft to over a trash container or truck, again depending on the Owner's needs. Control of the operation can be from a local stationary station, an elevated cabin, or pendant mounted controls (or a combination in between).



- ► Hoist controls apply 21 st Century vector technology to provide outstanding and reliable position control. State-of-the-art encoders on the drums will monitor and control both the position of the rake throughout its cycle as well as provide precise intelligence on the differential motion of the drums (which open and close the rake). Fairfield Service Company's E&I engineer will work with the Consultant and Owner to provide whatever level of automation of the system is desired; as well as incorporate all of the protections which will make the system both safe and reliable. Because each of these systems is custom built, our system design will be compatible with the Owner's standard controls architecture.
- Depending on the specific customer needs, a clamshell can be provided to clean a debris pit upstream of the bar rack. The debris in the pit will be heavier material which flushes through the system and settles into the pit. The clamshell is suspended from the hoist drum by two ropes and operates in a separate set of embedded guides. It opens closes electroand hydraulically.



Stainless steel guides for the system are provided in standard sections to be embedded in pockets in the side walls of the shaft(s). The guides and bar rack are bolted to one another to ensure the correct positioning for proper operation of the rake. A fixture is provided from the factory to fix the guides in proper relationship to one another. With a pair of standard section guides attached to the fixture, nuts on the anchor bolts are adjusted and the section of guides is grouted in place before the fixture is removed. Ties (tack welded to the guides to maintain the guide slot width), are then easily removed after the grouting. This system helps the installation contractor maintain the precision needed for smooth operation of the rake and clamshell during its ascent and descent.

FAIRFIELD SERVICE COMPANY IS MBE CERTIFIED.

Plant

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