



CASE STUDY

SHEFFIELD FLOOD DEFENCE, UK

The client

J.N Bentley, UK and The Environment Agency (EA), UK

The situation

Sheffield has a long history of river flooding, with significant events recorded in 1973, 1991, 2000, and 2007. The River Sheaf, which flows through the city center, is surrounded by residential buildings and vital infrastructure, making flood prevention essential for safeguarding the community. The 1991 flood event, in particular, extended to the central train station, disrupting the East Coast mainline and causing severe transportation issues for several days.

As part of a broader Flood Protection Scheme to protect the local community, critical transport routes, and infrastructure—especially in the Sheaf and Porter Brook valleys—new screening equipment was required for the River Sheaf. The old screen system was in poor condition, with damaged and missing bars, necessitating frequent clearing during storm events. The system relied heavily on manual labor and a mechanical arm controlled by an operator, which was resource-intensive and inefficient, especially during high-debris, high-velocity events.

Due to the high debris load in the River Sheaf, dual raking machines were required to operate on a single curved monorail due to limited space at the site. Synchronization and safe operation were essential, as was ensuring debris removal during flood events when the screens could easily become clogged, leading to flooding of nearby residential and commercial areas.

Additionally, external visibility of the site was limited, meaning that high-debris events, especially those occurring at night, could go unnoticed for hours. This raised the need for a remote monitoring solution to always keep the site fully operational, even during power outages, which could otherwise cause equipment downtime and create a backlog of debris.

The solution

To address these issues dual Brackett Bosker® Automatic Raking Machines were installed on a single curved monorail in 2021. This design took into consideration the limited space at the site, incorporating anti-collision technology to ensure synchronized operation of the two machines. The machines were capable of clearing debris from both parallel and perpendicular trash screens during extreme flood events, ensuring consistent performance.



Bringing water to life®



Before



Clearing debris



After

“Sheaf Screen has been a challenging project with numerous complexities to overcome and to the credit of Ovivo, along with their partners Bosker and IES works Ltd, have supported the design and delivery of this bespoke scheme creating a product that we can all be proud of...”

— Robert Culledge
Contracts Manager, JN Bentley

A key innovation was the use of an energy chain system, which eliminated the need for a separate cable storage area. This optimized space usage on-site and ensured that the raking machines could operate smoothly, even during the high-debris events that often accompany storms.

To address the issue of limited visibility and real-time responsiveness, opsCTRL™ Digital Plant Monitoring Technology was implemented. This technology enabled the client to remotely monitor the system via mobile app or desktop, providing real-time data on equipment status, debris load, and system health. This significantly improved the client’s ability to maintain the site, schedule downtime, and respond proactively to potential blockages or equipment malfunctions.

To mitigate the impact of power outages, a manual Brake Release mechanism was installed on each raking machine, allowing for safe disengagement and recovery in the event of a power failure. This system ensured that even if one raking machine failed, the secondary machine could continue operating without delay, thus maintaining the flood defense system’s functionality and reducing equipment downtime.

How we made a difference

The solution enhanced the flood defenses for Sheffield City Centre by significantly improving the efficiency and resilience of the debris screening system. The installation of dual Brackett Bosker® Automatic Raking Machines on a single curved monorail system optimized the limited space on-site while ensuring synchronized and continuous operation. The anti-collision technology provided an additional layer of safety, ensuring that both machines could operate simultaneously without risk of damage or system failure.

The introduction of opsCTRL™ Digital Plant Monitoring Technology allowed for real-time remote monitoring, enabling the client to always stay informed of the system’s status. This proactive approach reduced the risk of undetected blockages, especially during off-peak hours, and allowed the client to efficiently manage maintenance schedules without compromising the flood protection system’s performance.

The incorporation of the manual Brake Release mechanism further reduced downtime during power outages, ensuring that the secondary raking machine could continue debris removal even when the primary machine was out of service. This solution not only reduced the risk of flooding but also improved on-site safety by minimizing the need for manual intervention in difficult-to-reach areas above water.

This innovative solution helped the Environment Agency and other Risk Management Authorities fulfill their obligations to manage flood risk in Sheffield City Centre. The advanced raking machines improved the efficiency of debris removal, minimized environmental impact, and enhanced the health, safety, and security provisions at the site.

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