AquaShield™ | TECH REPORT

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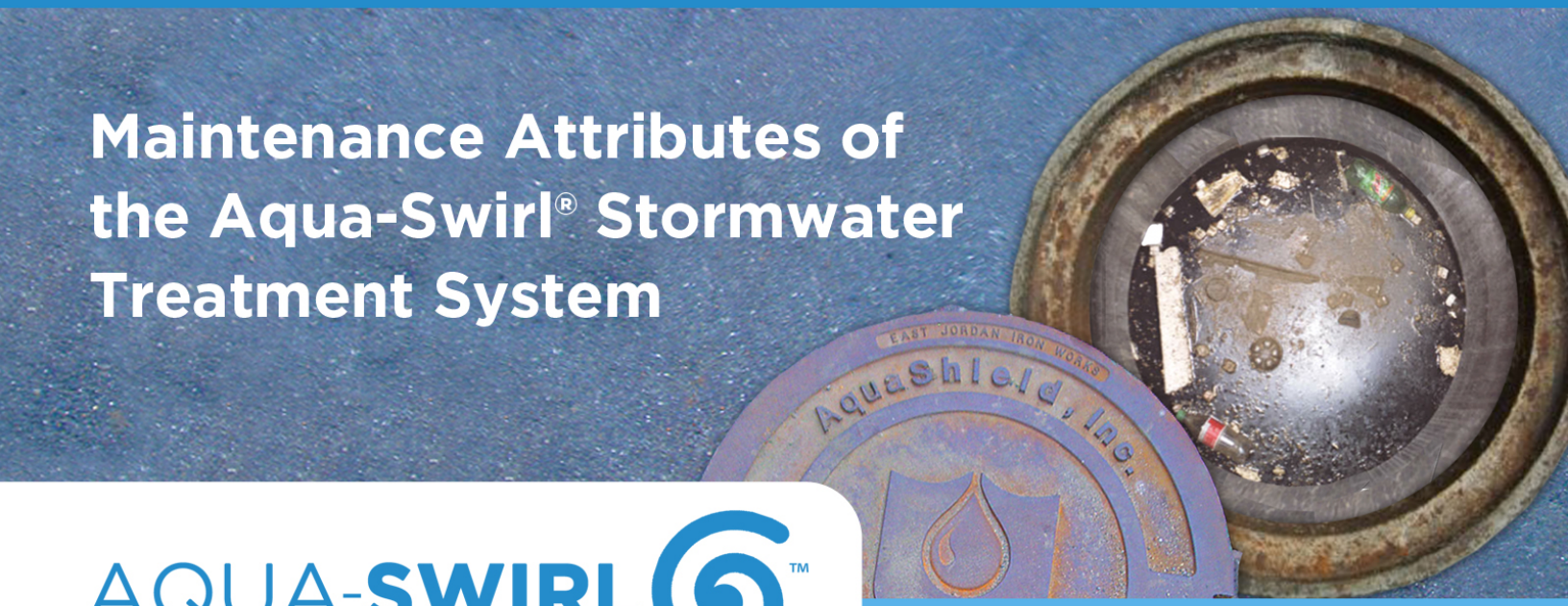
Maintenance Attributes of the Aqua-Swirl® Stormwater Treatment System



AQUA-SWIRL™

Understanding maintenance attributes of stormwater best management practices (BMPs) is an important factor for the implementation of a sustainable and effective maintenance program.

All too often the stormwater community has taken an "out-of-sight, out-of-mind" attitude toward BMP maintenance, instead focusing on the more high profile aspects of site design. This report explores the relationship between two critical maintenance attributes of hydrodynamic separator (HDS) technology and how those attributes can serve to either promote or hinder the management of maintenance programs. HDS design elements inherently include internal chamber configurations and their associated maintenance triggers. These two attributes are described for captured sediment and compared to those attributes of the Aqua-Swirl® Stormwater Treatment System.

AQUA-SWIRL® BENEFITS

- Single chamber facilitates inspections and maintenance from the surface
- Allows complete cleaning versus multi-chamber HDS systems having limited or blind access chambers
- Simple design reduces maintenance time and operational costs compared to complex multi-chamber HDS designs
- NJCAT field test verification demonstrates long term functionality and performance
- Promotes sustainable and effective BMP maintenance programs

TEST SUMMARY & PRODUCT INFORMATION ▶

TYPES OF HYDRODYNAMIC SEPARATORS

HDS systems can be generally classified as vortex-type, vault-type, or hybrid vortex-vault devices. Vortex systems, such as the Aqua-Swirl®, rely on a combination of gravitational and centrifugal forces to remove sediment from stormwater runoff. Vault systems are based primarily on gravitational forces for sediment capture while hybrid designs can use varying elements of both types. HDS systems can incorporate internal components such as inclined plates, screens or other mechanisms. Sumps may also be used to provide both treatment and sediment storage. While HDS designs range from simple to complex, negative maintenance attributes increase proportionally to design complexity.

AQUA-SWIRL® FIELD TEST VERIFICATION

Both long term functionality and performance of the Aqua-Swirl® has been independently verified by the New Jersey Corporation for Advanced Technology (NJCAT) for a 27-month TARP Tier II field test of an Aqua-Swirl® Model AS-5. Testing demonstrated 86% annual sediment removal efficiency against a clay-loam textured influent sediment at a surface area loading rate up to 41.2 gpm/ft^2. One routine annual maintenance event was performed during the testing period with no adverse operating conditions observed. Over 400 pounds of sediment was removed from stormwater runoff that otherwise would have been discharged to a nearby surface water body.

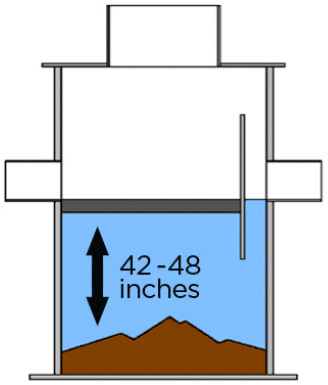
CHAMBER CONFIGURATION

HDS maintenance complexity increases with the number of treatment and/or storage chambers. The Aqua-Swirl® incorporates maintenance as a cornerstone of its design by uniquely using a single swirl chamber for both treatment and storage of sediment, debris and free-floating oil. This simple design and favorable attribute allows for easy and direct access to the captured pollutants which minimizes time and costs associated with inspections and maintenance events. A vacuum truck is used to clean the swirl chamber from the surface without the need to perform confined space entry.

Complex HDS designs typically rely on multiple treatment and/or storage chambers. The use of baffle walls or other internal components that segregate functions within the HDS often result in chambers having limited and/or blind access from the surface. Additional manholes may be needed for such complex designs in an effort to improve accessibility.

It should be kept in mind that a device's footprint may increase as the number of manholes increase. Furthermore, materials retained in limited and blind access chambers often lead to inaccurate inspections and incomplete maintenance events. Insufficient cleaning can diminish HDS performance while simultaneously increasing both maintenance frequency and operating costs.

MAINTENANCE TRIGGER



Site-specific sediment loading conditions will ultimately dictate maintenance cycles with sediment depth (thickness) being a common maintenance trigger. When sediment depth approaches or exceeds the recommended maximum level, HDS performance can be reduced and the potential for re-suspension (scouring) of previously captured sediment increases. Aqua-Swirl® maintenance is triggered when depth to sediment is measured to be 42 to 48 inches below the swirl chamber's standing water level. Maximum sediment storage capacity of the Aqua-Swirl® is reached with a sediment thickness of 36 inches (top of sediment measured to be 30 inches below water surface). A comparably sized HDS that requires maintenance with less or low sediment accumulation is generally regarded as an unfavorable maintenance attribute.

Scour potential of an HDS is a function of maintenance. When the sediment storage capacity of any HDS system is exceeded, the potential for scouring of previously captured materials significantly increases. Maintenance programs should fully consider sediment storage capacities and maintenance triggers of HDS systems prior to installation.

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