Shaped Support Grid (SSG)
Johnson Screens’ Shaped Support Grid (SSG) is designed to be installed into the bottom head of hydroprocessing or gas dehydration vessels, allowing for better liquid and gas flow, bed utilization, distribution and an overall more efficient process.

The SSG design performs better than traditional flat surface grid assemblies that are located near the tangent line of the head to shell weld. With traditional flat surface grids designs, the entire volume of the head is a dead area, with no reaction or drying adsorption occurring. The Johnson Screens SSG lies directly on the bottom head surface, allowing for the entire volume to be filled with media. Increased bed volume allows for the conversion of existing vessels to achieve higher process capacity and new vessels to be built shorter in shell length.

The enclosed stainless steel bottom surface of each Johnson Screens SSG panel ensures that any bed material that might migrate under one of the panels will not leak into the flow of the process. For systems with coking potential, a Vee-Wire® screen surface can be applied to the bottom to eliminate dead areas, retaining catalyst on the bottom surfaces.

The typical flat grid’s design requires support beams to carry the weight of the bed and the process pressure differential. On the Johnson Screens SSG, the vessel head supports the grid directly and creates a strong and rigid structure without adding special ledge rings or heavy beams to the vessel.

Each panel to the Johnson Screens SSG grid is totally enclosed element with a bolted and gasketed connection to the central hub. The enclosed design allows the SSG to expand and contract under the bed without compromising an outer perimeter seal, which may happen in a cyclic gas dehydration application.
During the down flow operation, the tapered design of SSG collects flow from the entire cross section of the vessel and moves it toward the center hub outlet, producing a uniform flow across the entire vessel and better bed utilization up to 30% over traditional bed support systems. Away from the vessel centerline, the volumes of catalyst or sieve are much greater. The SSG panel matches the configuration shape of the vessel head, collecting flow from all areas uniformly without having to cover the entire cross section of the vessel.
Outlet Basket Liquid Down Flow

A central outlet causes flow to move sideways as it reaches lower elevations of the bed. Flow rates can vary within only a single level of the bed, causing poorly utilized catalyst and potential early breakthrough of the sieve. Filling the head with inert balls for better flow movement does not improve the uniformity of velocities.

Distribution of Gas Up Flow for an Outlet Basket

In an up flow case, an outlet basket covering the nozzle creates very poor distributed flow, and filling the head with inert balls will not help. The implications for bed regeneration can be quite severe, causing potential early breakthrough and effective loss of up to a 3.3 ft. (1 m) of bed height.
Bed utilization by the SSG is extremely efficient. Every level of the bed has uniform flow within horizontal planes and from top to bottom. The entire bed is utilized, maximizing the return on the investment in media and allowing for the unit to perform as the bed volume is engineered. Any additional bed volume placed in the bottom head becomes usable space, enhancing unit capacity.
The SSG provides up flow gas distribution and performs better than a traditional flat support grid with beams or an outlet basket. The SSG vessel head is filled with active media rather than inert balls. Deep into the head, flow distribution is excellent, allowing full use of the entire bed and effective regeneration over the entire volume.

Even though the SSG does not extend all the way to the vessel wall, flow is actively moving into the entire bed cross section. The bed sections show uniform flow in proximity to the SSG and improved results as the flow moves upward.
The key to installing the Johnson Screens SSG is attaching the center outlet sleeve to the vessel outlet nozzle.

The center sleeve is welded directly to the top forged area of the nozzle, or welded inside the nozzle diameter with some depth of insertion. An alternative not requiring welding to the nozzle is to use a trapped flange at the first exterior joint to the vessel. A jig is provided for proper extension of the center hub into the vessel.

Hangers are provided to position the nose section of each grid panel and will assist in the final sealing operation.

After all pieces are placed inside the vessel and seated, a gasket is used on each stub flange (gasket is not shown).

A bottom plenum plate is then placed over the stub connections and fully bolted to the stub flanges. The plenum plate is sectioned to be able to pass through a manway, then can be assembled and bolted to the center hub flange.

A gasket is placed on the top plenum flange and is ready for a final cover.

The plenum center cover is then seated over the gasket and bolted into place. The cover has a flow control surface to match the performance of the grid sections.

As a final step, the panels are checked for full bearing directly on the head and shimmed, if necessary.

The connection for the tie bolts is slotted to allow for thermal expansion and connect all the grids into one assembly so no panel can lift relative to the others.