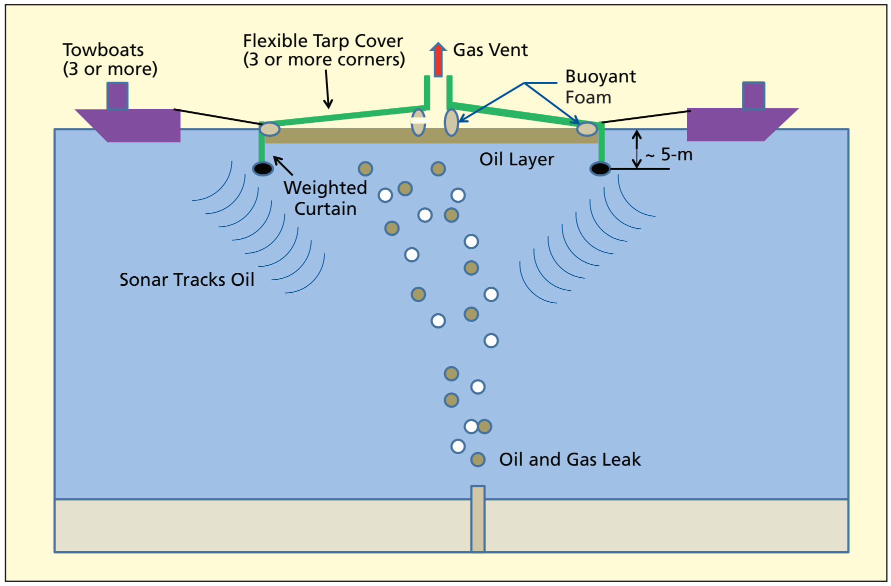
ballast on the ocean floor. This is similar to fixed, metal pyramid oil capture devices in the Santa Barbara Channel off the coast of California. The ballast lines for the improved design, however, would have winches that can move the pyramid to always be located above the oil and gas plume.

A third design is a combination of the first two. It uses a submerged pyramid to trap oil, but has no anchor and uses boats to locate the trap. It has ballast weights located along the bottom of the tarp and/or at the corners of the trap.

The improved floating oil-spill containment device has a large floating boom and weighted skirt surrounding the oil and gas entrapment area. The device is triangular (or more than three sides) and has a flexible tarp cover with a raised gas vent area. Boats pull on the apex of the triangles to maintain tension and to allow the device to move to optimum locations to trap oil and gas. The gas is retrieved from a higher buoyant part of the tarp, and oil is retrieved from the floating oil layer contained in the device.

These devices can be operated in relatively severe weather, since waves will break over the devices without causing oil leaking. Also, natural gas is entrapped and can be retrieved. All designs can use sonar to locate the moving oil plume, and then be relocated by using boats or winches to move the oil trapping devices. These devices can be constructed of treated, non-permeable DuPont Kevlar cloth (or similar material).



An **Improved Floating Oil-Spill Containment Device** features a flexible tarp cover with three or more corners that is pulled by three or more towboats.

This work was done by Jack A. Jones of Caltech for NASA's Jet Propulsion Laboratory. Further information is contained in a TSP (see page 1). NPO47679

Stemless Ball Valve

Potential applications include hazardous fluids and chemicals, and where fugitive emissions from valves are a concern.

Lyndon B. Johnson Space Center, Houston, Texas

This invention utilizes a new method of opening and closing a ball valve. Instead of rotating the ball with a perpendicular stem (as is the case with standard ball valves), the ball is rotated around a fixed axis by two guide pins. This innovation eliminates the leak point that is present in all standard ball valves due to the penetration of an actuation stem through the valve body.

The VOST (Venturi Off-Set-Technology) valve has been developed for commercial applications. The standard version of the valve consists of an off-set venturi flow path through the valve. This path is split at the narrowest portion of the venturi, allowing the section upstream from the venturi to be rotated. As this rotation takes place, the venturi becomes restricted as one face rotates with respect to the other, eventually closing off the flow path. A spring-loaded seal made of resilient material is embedded in the upstream face of the valve, making a leak-proof seal between the faces; thus a valve is formed. The spring-loaded lip seal is the only seal that can provide a class six, or "bubbletight," seal against the opposite face of the valve. Tearing action of the seal by high-velocity gas on this early design required relocation of the seal to the downstream face of the valve.

In the "stemless" embodiment of this valve, inner and outer magnetic cartridges are employed to transfer mechanical torque from the outside of the valve to the inside without the use of a stem. This eliminates the leak path caused by the valve stems in standard valves because the stems penetrate through the bodies of these valves.

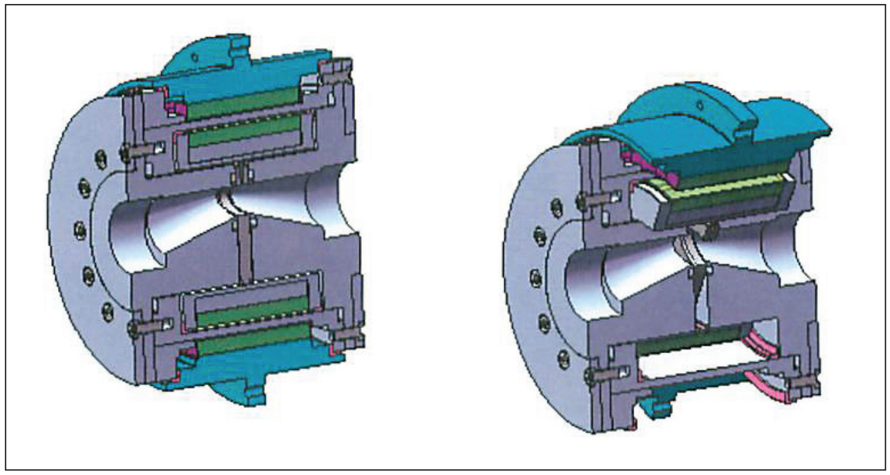
This design requires high precision during assembly for proper performance of the face seal. Slight variations in tolerances result in unacceptable seal performance. An effort was made to replace this design with a less demanding arrangement of component parts. A rotating gate was proposed to be installed between the two faces of the valve. This gate would rotate in and out of the flow path of the venturi, opening and closing the valve. Although this new gate design would require a seal on both sides of the gate, it would eliminate the requirement of rotating the entire downstream side of the valve. This would simplify the valve and allow for larger tolerances for proper performance. Magnetic cartridges would again be used to actuate the valve in a stemless design.

A MagBall concept replaces the rotating gate with a rotating ball. The ball does not rotate lock-step with the magnetic cartridge as the rotating gate did. Instead, the torque has a more complex rotation that allows the ball to go from fully open to fully closed.

Valves based on this concept are similar to standard ball valves, but they do not require an actuation stem as do other standard ball valves. Instead, this valve rotates the ball around a fixed axis by means of two guide pins. The two pins are guided by concentric grooves that interlock with the inner magnetic cartridge of the valve. This design is suited for magnetic actuation, and provides a leak-proof valve that can be used for hazardous gases and fluids.

The distinct advantages that this new design provides over previous VOST designs are the following:

- The passageway through the valve no longer has to be off-set as required by the rotating gate design. Instead, it can be machined through the center of the valve, using conventional boring techniques, and avoiding costly wire EDM (electrical discharge machining).
- The cross-sectional area of the passage through the ball is nearly twice the area provided by the hole in the rotating gate. Resistance to the fluid flow has been reduced by 40%. This is equivalent to gaining the advantage of the next pipe size larger without increasing the exterior size of the valve.
- The off-set venturi is no longer required for the best performance of the valve. This means that the previous minimum length requirements of the venturi are no longer necessary. The valve can be shortened to meet ASME flange-to-flange dimensions in the 4-in. (≈10-cm) and larger sizes without increasing the resistance to flow.
- Rotational requirements have been reduced from 180° to 90°. The valve can be actuated by standard quarter-turn actuators (without step-up gearing). This is the same type of actuation used with all ball, plug, and butterfly valves.



The rotating venturi ramp of the original VOST design is replaced in the **Stemless Ball Valve** by a rotating, non-venturi gate.

This work was done by Robert K. Burgess of Big Horn Valve, and David Yakos and Bryan Walthall of Salient Technologies for Johnson Space Center. For further information, contact the JSC Innovation Partnerships Office at (281) 483-3809.

In accordance with Public Law 96-517, the contractor has elected to retain title to this invention. Inquiries concerning rights for its commercial use should be addressed to:

Robert K. Burgess, CEO
Big Horn Valve, Inc.
1664 Terra Ave., #5
Sheridan, WY 82801
Phone No.: (307) 672-0968
E-mail: kevin@bighornvalve.com

Refer to MSC-24602-1, volume and number of this NASA Tech Briefs *issue, and the page number.*