BKW, INC.
PIPELINERS TULSA
-WHAT WE DO -

What does BKW do?

For 45 years, BKW has specialized in furnishing unique items and widgets that cannot be found on the shelf. We custom design, fabricate, and test equipment for the pipeline industry and more. BKW has undertaken numerous projects worldwide and the items we have tested and furnished have advanced the pipeline industry in several directions.

This booklet contains a wide assortment of BKW projects over the years.

BKW specializes in custom designed equipment to fit your needs.

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Table of Contents

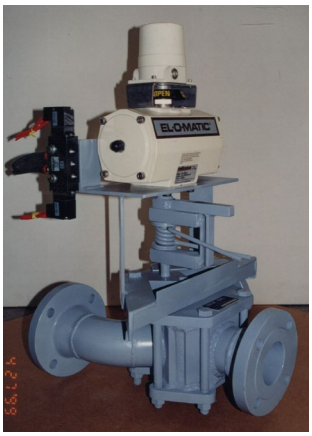
Section 1- Pigs and Pigging Equipment

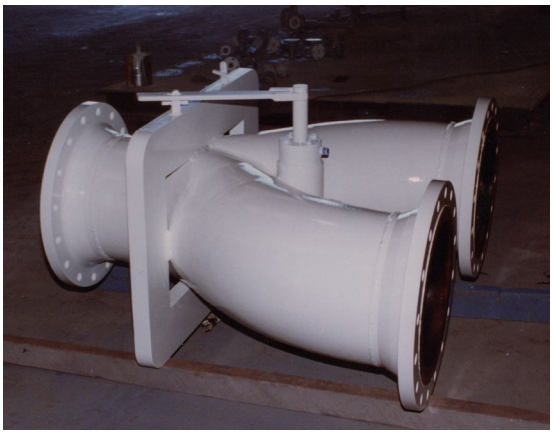
The following is a list of BKW items involving Pigs and Pigging Equipment:

1- Piggable Y's
2- Piggable Switches
3- First Pig Switch in 1984
4- 3-way Pig Switch
5- Experimental Switches
6- Tadpole Pig
7- Floating Pig
8- Pig Trap Extension
9- Pig Test for multiple diameter pigs
10- Pig and Receiver Trap testing
11- Multiple Pig Launcher
12- Pig Trap Trays
13- Pig Traps
14- Ball hooks
15- Ball Launchers/Receivers
16- Ball Launch Pins
17- Rocker type Ball Launcher

1- **Piggable Y's:** BKW developed the Piggable Y for running pigs from two pipelines into one pipeline eliminating receiver traps. The two pipelines can be of different diameters.

2- **Piggable Switches:** BKW developed two types of Pig Switches to run pigs from one pipeline into two pipelines, eliminating Pig Launchers. The first type is the Non-Sealing Switch which uses an arm to guide the pig into the desired pipeline. The two pipelines do not have to be the same diameter. The second type is the Sealing Switch that blocks flow to the pipeline that does not require pigging. This type requires special pigs and cannot be switched unless there is zero pressure drop between the legs.

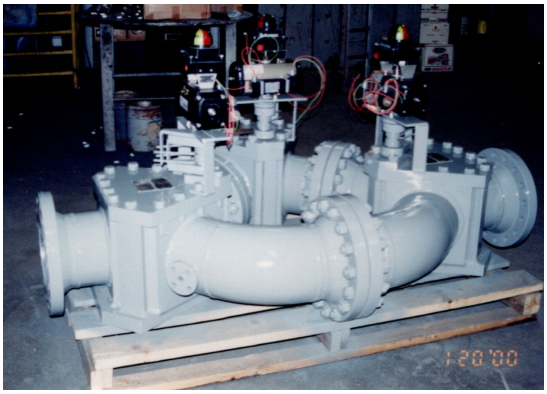




3- **First Pig Switch:** BKW designed, furnished, and tested the original Pig Switch in 1984. The job included a Skid-Mounted Pig Launcher.

4- Three-way Pig Switch:

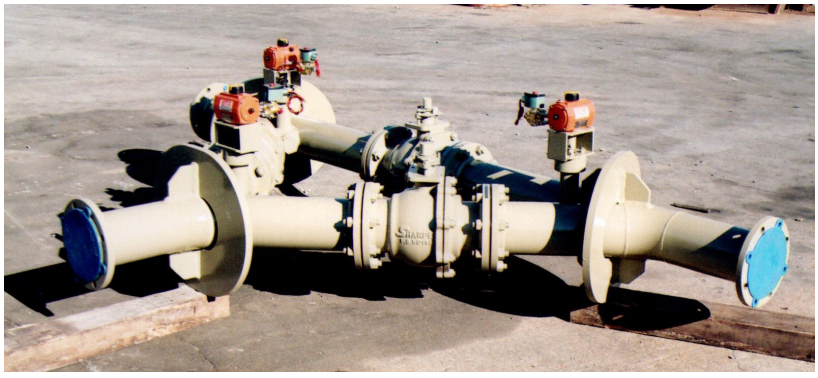
BKW designed and fabricated the pipeline pigging 3-way Switch to allow pigs to travel in six directions as required in gathering systems.



3-way Sealing Switch

3-way Switch in the field

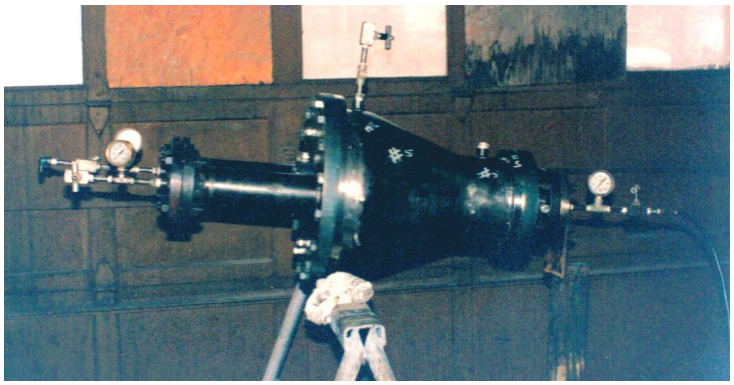
8” 3-way Switch



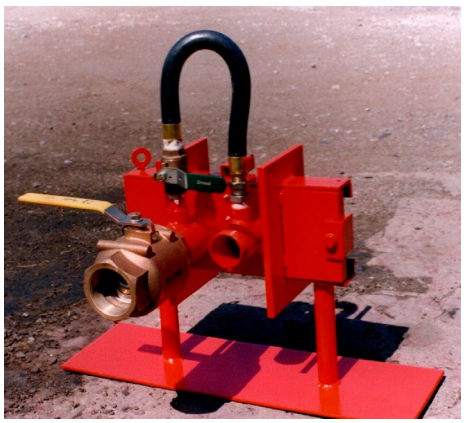
3-way Sealing Switch with remote operators.

5- Experimental Switches:

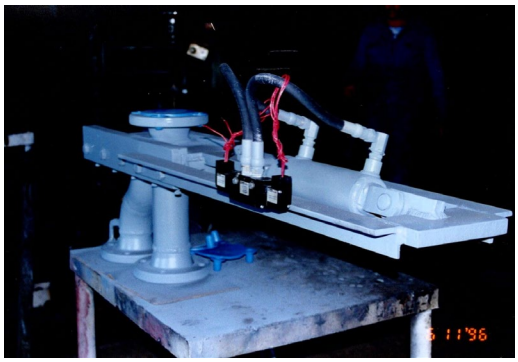
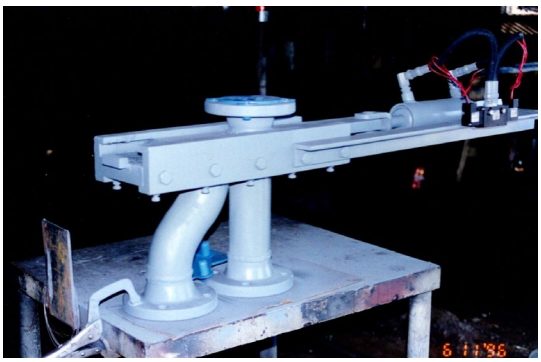
Designed, fabricated, and tested a rotating Sealing Switch that is not limited to type of pig or pressure drop across legs.




Designed and tested a sliding Sealing Pig Switch that was used for testing chemical pigs in a test loop. Switch uses the pipeline movement for switch displacement.

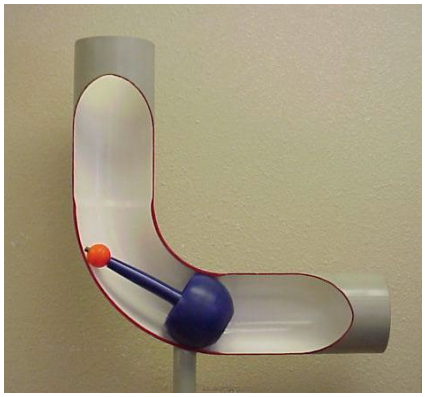
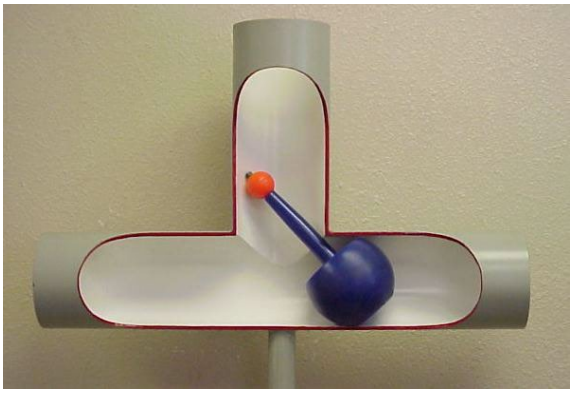



Designed and tested larger Sealing Pig Switch that is not dependent on type of pigs or pressure drop across legs.

6- **Tadpole Pig:** Designed and tested the Tadpole Pig for running through short radius weld ells and tees. Designed for attachments such as cups, brushes, and scrapers. Used for testing and dewatering gathering systems.



7- **Floating Pig:** Designed, furnished, and tested a large floating squeegee pig that can be retrieved after running through an offshore outfall.

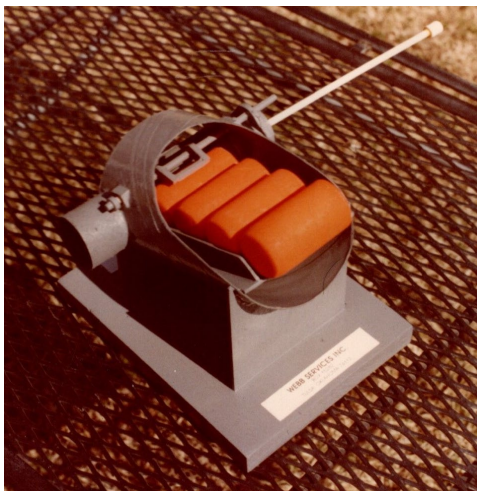

8- **Pig Trap Extension:** Designed and furnished an extension for a set of Pig Traps to run smart pigs. Used a closure door on one end to attach to existing trap door, a blind flange on the other end and a cradle for spinning the extension to attach to trap. Used existing kicker line and drains to run pig.

9- **Pig Test for Multiple Diameter Pigs:** BKW furnished equipment to test various pipeline pigs to run through multiple diameter pipelines. One test was for a pipeline riser at a North Sea platform that had to be in the vertical, and another was for a pipeline with a check valve. There was also one for a pipeline requiring a line pull pig that had to go through a pipeline with internal upset threads.

10- **Pig and Receiver Trap Testing:** Tested a pig receiver and pig to determine the source of force that had fired a pig out of a receiver trap barrel killing an operator.



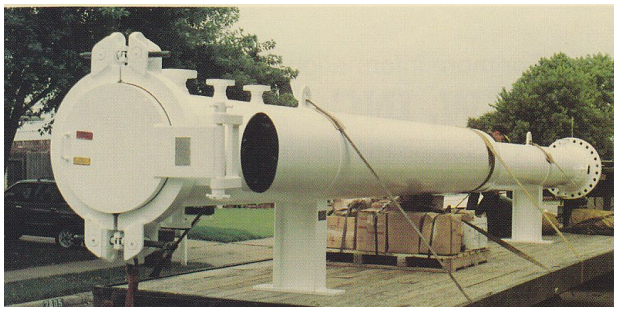

11- **Multiple Pig Launcher:** BKW designed a multiple pig launcher for a products pipeline. Waiting for approval.



12- **Pig Trap Trays:** BKW designs and furnishes custom Pig Trap Trays for Launchers and Receivers. Launchers include a ram to move the pig to the reducer and powered by pipeline gas or hydraulic or electric. Receivers use a winch to remove the pigs.



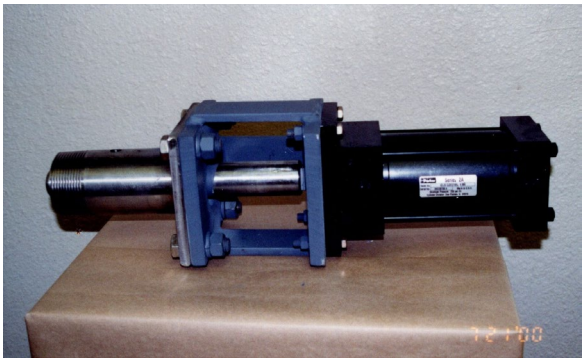
13- **Pig Traps:** BKW designs and furnishes custom Pig Launchers and Receivers for various shipped products. If required, includes skid mounted, mainline valve, blowdowns, operators, or various accessories.

14- **Ball Hooks:** BKW designs and furnishes Ball Hooks and custom stands for loading, unloading, and handling pipeline balls.


15- Ball Launchers and Receivers: BKW designed and furnished skid-mounted Ball Launchers and Receivers with mainline block valves and blowdowns.

16- Ball Launch Pins: Dual Ball Launch Pins designed and furnished by BKW uses gas from the pipeline to power the pins. Operation is local or remote.



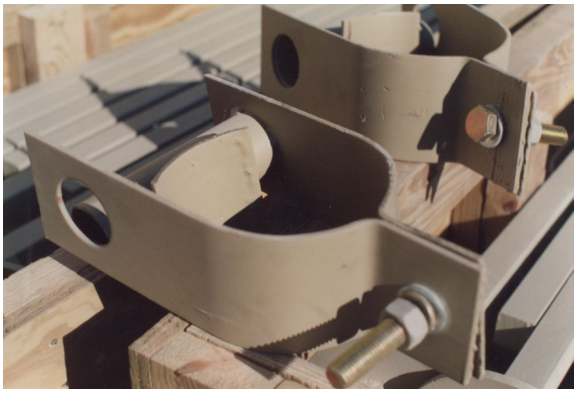
17- **Rocker Type Ball Launcher:** The Rocker Ball Launcher has been used since 1960 for launching balls into 2 phase pipelines. The use of pins is common today.

Section 2: Anchors

- BKW designed and furnished a boom mounted on a bombardier that installed test anchors and applied a pull test for soil surveys. The survey was to determine auger anchor types to match the soil for hold down. The equipment was also used to install auger anchors to hold down fish habitats in area lakes.

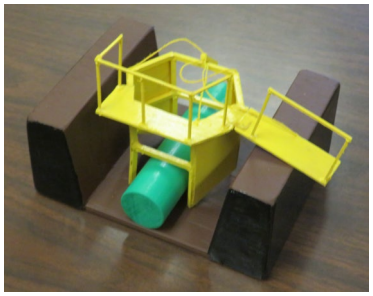

- Designed and tested a Slot Weight to replace weights and sacks for pipeline buoyancy control. The patented Slot Weight uses the backfill for weight. 36-inch diameter pipelines require 9,000-pound weights on 10-foot centers. Slot Weights only weigh 200 pounds, thus reducing hauling costs.


- Designed and furnished 9,000 anchors for stabilizing military quick deployment fuel pipeline. Anchors were required to stabilize the pipeline laying on desert sand because of heat expansion. Work included teaching the Army how to use the anchors.



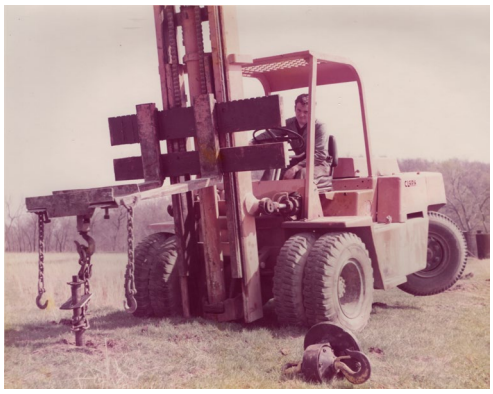
- Designed and furnished an Anchor Installation Tool for installing auger anchors on an offshore pipeline off the California coast. The patented tool applied a pull test on each anchor. The tool was lowered onto the submerged pipeline and operated by divers. A second offshore installation tool was furnished for a large diameter outfall in Washington.

- Patented a Portable Trench Box designed to protect workers during the installation of anchors on a pipeline. The box comes equipped with a gang plank that allows the workers protection while entering and exiting the trench box from the bank. The trench box is moved ahead using the BKW Anchor Installation Tool.

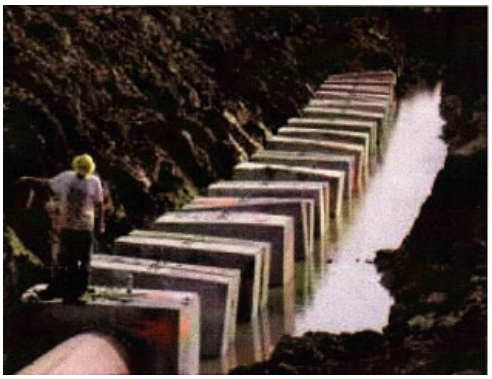


- Designed, furnished, and supervised installation of auger anchor pipe support that was required on exposed pipe span.

- Designed and tested an expansion anchor for buoyancy control. Anchor flukes are folded back and drilled into the soil and when at depth, the anchor is expanded and pull tested. The expanding anchor is designed for large loads.

- Design and furnish Auger Anchors for pipeline buoyancy control. Anchors are installed using the patented BKW Installation Tool mounted on a large backhoe. Anchor is pull tested following installation to verify required hold down. One anchor set will replace five 9,000-pound weights on a 36” diameter pipeline, thus reducing the cost of buoyancy control.




Pictures above show the difference in spacing between concrete weights and the BKW anchors.

Section 3: Underwater Pipe Supports

- BKW designed and fabricated pipe supports for a Hudson River pipeline crossing span. Span height was only 2 feet above the bottom and required raising pipe 2 feet. Included was a bolt on pipe weight tool that was required to install the weights on the span.

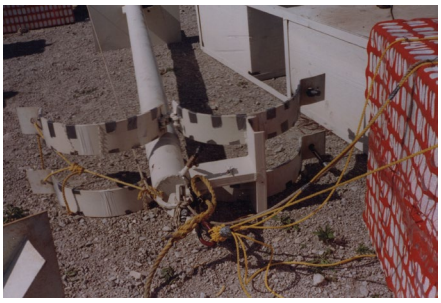


- Flooding on the Missouri River created many washouts on the flood plain. A pipeline crossed these washouts and when the flood waters receded, the pipe would be left hanging causing a span that would overstress the pipe. BKW designed and furnished dual pipe supports and a barge for installing the pipe supports. Divers attached the supports to the pipeline.



- BKW designed, fabricated, and use expanding pipe supports for pipeline spans on the Missouri River. Job included furnishing installation barge and pipe supports with flotation. All equipment was flown to location with helicopters. Divers attached pipe supports to pipe and a small water pump on the barge inflated pipe supports to establish pipe at elevation.





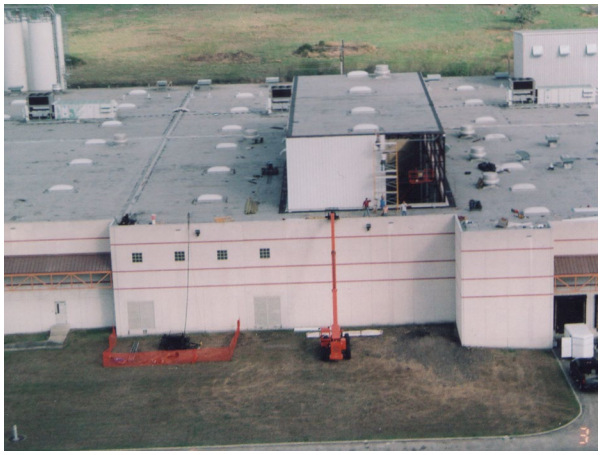

Section 4: Construction

- BKW designed a 12” jet fuel pipeline in Anchorage, Alaska. Pipeline began at a port tank terminal and ran on the offshore Cook Inlet mud flats to the Anchorage airport. Design included a pump station, pig traps, and meters.

- BKW was contracted to install gathering system using screw pipe. Modified a bombardier with two booms for connecting the pipe. First boom supported the pipe using a roller hook and the second boom ran the torque tongs. Only one piece of equipment was necessary to make up pipe.

- Backhoe bucket extension blade for backfilling and clean up. Blade attached using only one bolt for stabilization. Reduced backfill time by half.

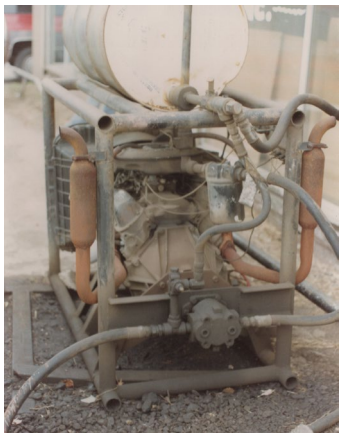
- BKW can design, furnish, and install telescoping Pipe Jacks for raising roofs. Jacks can be used temporarily or left as part of the building structure. Following preparation, roof will be lifted in less than 8 hours depending on area and required lift.



- BKW designed and furnished creek crossing bridges. One type was a ridge type and another was a suspension type. Both types did not need concrete and only a backhoe for installation.

Section 5: Miscellaneous Equipment

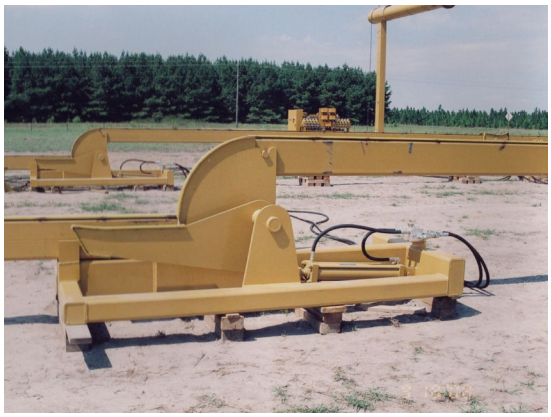
- BKW designed, fabricated and used two hydraulic power packs using Ford V8 engines putting out 20GPM at 2,000PSI. Units have been used in Texas, Louisiana, and Oklahoma to operate the BKW patented anchor system.



- BKW designed, fabricated and used a 250,00-pound chain jack to pull flow lines through j-tubes on offshore platforms in Cook Inlet. The pipelines were pulled from shore to the platform requiring a chain jack to pull the pipeline through the j-tube riser to the platform floor.

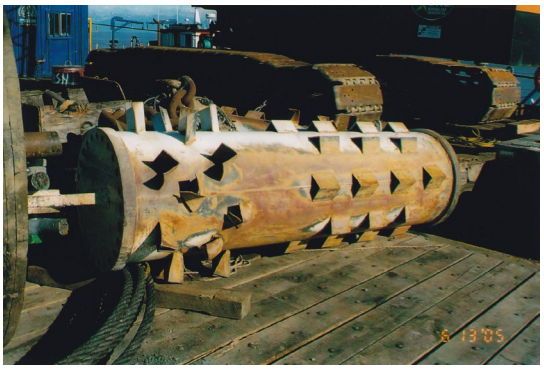
- BKW designed and fabricated dyke drain valves for a tank farm in West Tulsa. Drains were used to drain water from heavy rains.

- BKW was contracted to furnish equipment for an add-on to existing double joint equipment. New equipment was designed to provide a weld xray station and a field joint station. New equipment increased the double joint length, thus requiring a pipe elevator.

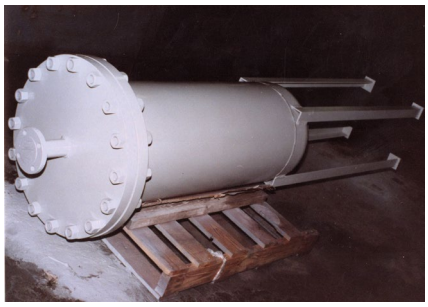


- BKW designed and fabricated equipment to internally clean an offshore pipeline. Equipment included cleaning pigs, sizing pigs, and equipment necessary to put the equipment into the pipeline.

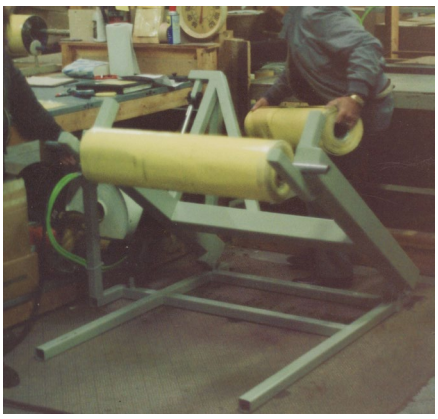
- BKW designed, fabricated, and used two Darth Vader 9,000-lb pull heads for a pipeline pull from shore to an offshore tie-in in Cook Inlet. Pull heads were required to create a 10-inch-deep ditch to stabilize the pipeline. Also included was an A-frame required to lift tie-in fitting.

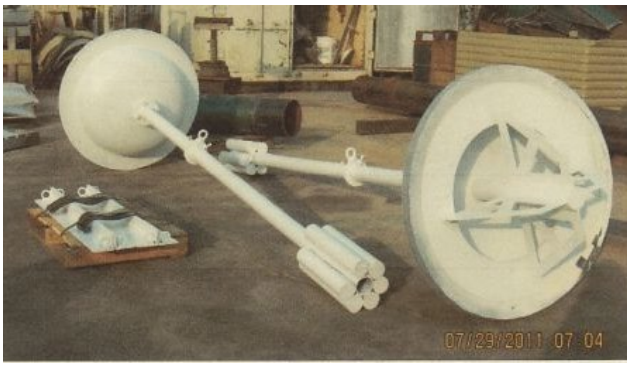
- BKW designed and furnished a mist separator from gas received from a water, oil, gas separation on a production lease. The mist settled in the gathering lines increasing pressure drop. BKW designed a large gas liquid separator with an internal mist screen.



- A pipeline supply company requested equipment that would enable them to efficiently handle rolls of field joint wrap and package the material for the field. BKW designed a roll lift machine and a machine to roll the field joint material.



- Alaskan divers requested two dam plugs for holes in a dam that allowed water inside the dam. The holes needed to be plugged to drain the inside of the dam. The dam was not only oval but had a 4-foot overhang requiring a counterweight.

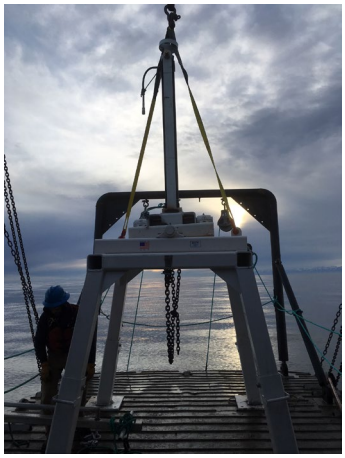
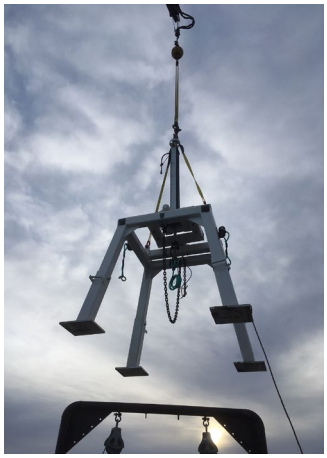


- BKW was contracted to provide a poly pipe slicer. A contractor had a 24-inch diameter poly pipe inside of a 24-inch steel pipe and was required to remove the poly pipe, however, the poly pipe was stuck and could not be pulled out. The pipe slicer was designed to longitudinally cut the poly pipe by pulling the pipe slicer through the pipe with a wire line that was run through the pipe and connected to the pipe slicer. When pulled through, the pipe slicer cut the poly pipe in place. The pipe slicer did not have to be pulled through the entire length of pipeline before the poly pipe pulled out.

- Salvaged pipe on the north slope has to be squeaky clean before removal from the slope. BKW engineered and fabricated a pipe cleaning machine that cleaned around 7 miles of various diameters of pipe. In addition, a pig pulling machine was included that would remove 6 inches of oily, sandy material from inside the pipe joints. BKW received several “attaboys” for the performance of this equipment.


- BKW designed and built a 24-inch ball trailer to haul six balls from receiver to launcher. Trailer was equipped with ball separators to allow for only one ball or up to six balls. The separators prevent the balls from moving while under way.

- Divers in Alaska needed A-frames in Cook Inlet. Their purpose was to pick pipe off of the ocean floor to make repairs to the coating at the weld joints. The pipe was concrete coated without concrete being applied to the weld joints and ocean currents eroded the protective coating down to metal. To make repairs, BKW designed and fabricated two hydraulic towers to lift the pipe.

Section 6: Testing and Design

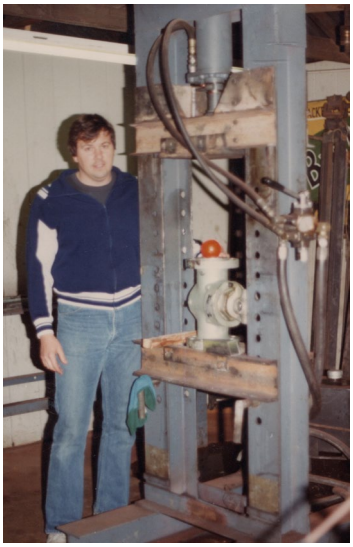
- BKW designed, fabricated, and tested an 8” ANSI 2500 Switch. The Switch was hydrostatic tested to 9,000 psi. Strain gauges were installed on the Switch at critical locations to verify the design calculations at the high pressures. The test results verified the design.

- BKW tested 12” Pig Cups to determine the pressure required to blowout the cup. Pigs were used to pull equipment through a pipeline. A total of eight styles of cups were tested.

- BKW designed, built, and tested 48” pipeline pig cups to determine blowout pressure. Results got your attention.

- BKW tested use of cable clamps for attaching pipe straps to auger anchors for pipeline buoyancy control.

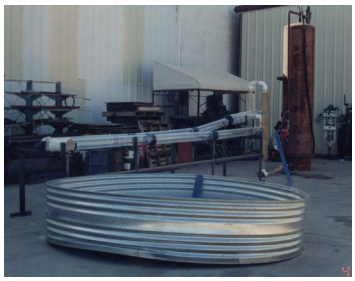
- Tested the force required for a poly pig ball to pass through a plug valve.



- BKW designed, fabricated, and tested a high-pressure expansion joint for heated pipelines using line pressure to equalize stress in the pipeline.

- BKW created, designed, and tested a single riser Slug Catcher that prevents blow by during pigging operations. The tests proved effective and a 20” pipeline Slug Catcher was designed and built as a result of the tests.

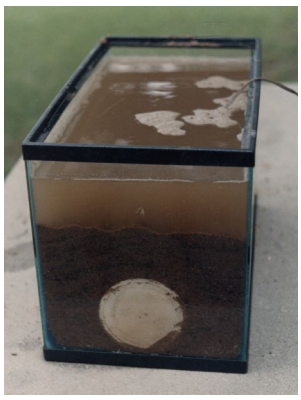





- BKW was required to raise a pipeline above ground because of slough on the side of a hill. The location was in a deer hunting area and owners required to test the effects of hunting rifles fire hitting the pipe. BKW got pipe nipples with .250”, .375”, and .500” wall thickness and tested the effects.


- BKW was contracted to lay a 10” pipeline across the Arkansas river and following installation, it floated with a 1.25 specific gravity and later at a 1.5 specific gravity. BKW ran tests on a pipeline buried in sugar sand and the effects of vibration on the pipe. Presented a civil engineering paper and found several people had the same problem. Determined a pipeline buried in sugar sand required a 2.0 specific gravity to resist effects of vibration.

- A pipeline contractor had 40 miles of 36” diameter pipeline rise in sugar sand with 20 miles requiring lowering to meet code. BKW designed and furnished a full-size test box and established the cause of the problem.

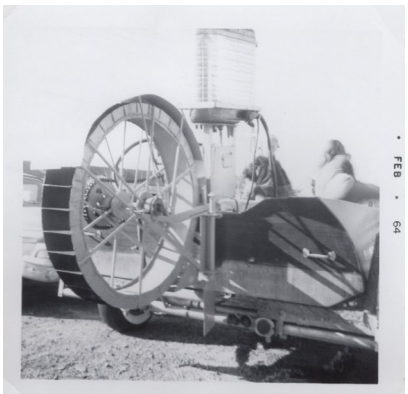

- BKW designed and furnished a jib for testing seals for pipe jacks to determine maximum pressure before leakage or blowout.

Section 7: Boats and Non-Pipeline Work

- In 1952, designed a small boat using aluminum ribs and wood stringers covered with cloth. Since it was the first design before testing, had to use an outrigger for stability. The second time it worked well.


- Designed, built and tested using skis for turning race boat on oval race courses. The skis were an improvement in turns but propeller location put boat into a yaw on straight runs. A jet drive would have eliminated the yaw.

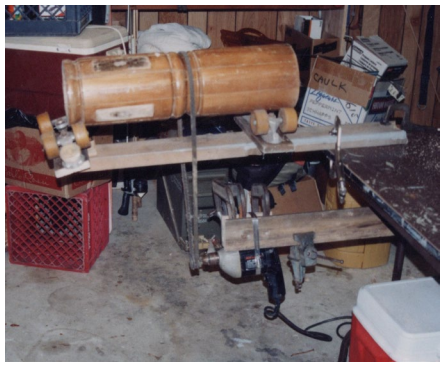
- Design, fabricated, and tested a water wheel for propelling high-speed boats. Required additional drawing board time. The gear box was from a 1940's farm tractor steering gear box and was worn out. Splashed a lot of water.



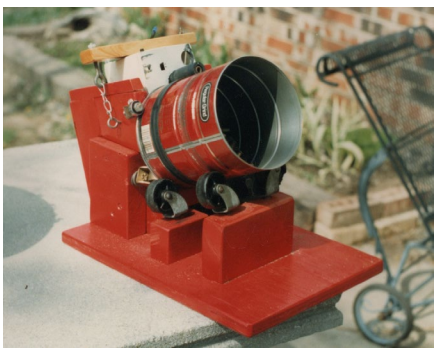
- Designed and fabricated a 16-foot-long ski boat in 1975. Note lightness of boat indicated by transom out of water creating minimum boat wake at high speed. Boat was designed for pulling slalom skiers, thus required a ski pole in the center of gravity.



- Required a large lathe to grind a kitchen table post. The post was reglued and not quite round so, since there was no big lathe handy, something had to be engineered. Roller skates and an electric drill were used to accomplish the work.



- Developed a “Rube Goldberg” system to clean brass. Original system appeared to be complicated so went back to the drawing board and simplified the design. The new design was smaller and simpler but did not do a good job.

- Wind tunnel tested race boat models at University of Tulsa in 1967 and developed the pickle fork hydroplane. Conventional round nose hydroplanes had a tendency to blow over backward causing intense excitement and injuries. The round nose did not assist the lift of the hydroplane out of the water because it stuck out too far forward. However, when the boat porpoised up, the round nose caught the air and rotated the nose of the boat over backward. The removal of the round nose reduced this tendency by nearly 100%.