FUELING THE FRONT LINES:
ARMY PIPELINE UNITS - PART I

By Mr. Thomas J. Petty

The United States Army's pipeline companies were developed to meet the Army's increasing reliance on the mechanized forces, which ran on gasoline, diesel, and aviation fuels. The truck, the tank, and the airplane all needed fuel to operate. Modern warfare saw the ever-increasing need to put these fuels into the theater of war in larger and larger quantities, over a more complex area. From the 5-gallon jerry can to a tank farm holding hundreds of thousands of gallons, uncontaminated fuels had to be delivered reliably and promptly in the quantities necessary to sustain the units they supplied. The pipeline companies were often up front with the invasion landing parties, to find and salvage any facility that could be used for fuel storage and distribution. Gasoline and fuel oil accounted for more than half of all the tonnage shipped overseas during World War II.[1]

World War I had seen limited need for pipeline systems. Distribution by tanker trucks and railcars and the jerry can was sufficient. After the war, the civilian petroleum industry expanded rapidly, and by the beginning of World War II a lightweight, easy-to-assemble pipeline and storage system had been designed. The system used lengths of rigid steel pipe with grooves at each end, joined by what were commonly called "Victaulic" couplings, named after the Victaulic Company of America, one of the coupling's manufacturers. Inside these couplings were rubber gaskets that sealed the joints. When hydraulic pressure was applied, it sealed the gaskets almost as securely as welding.

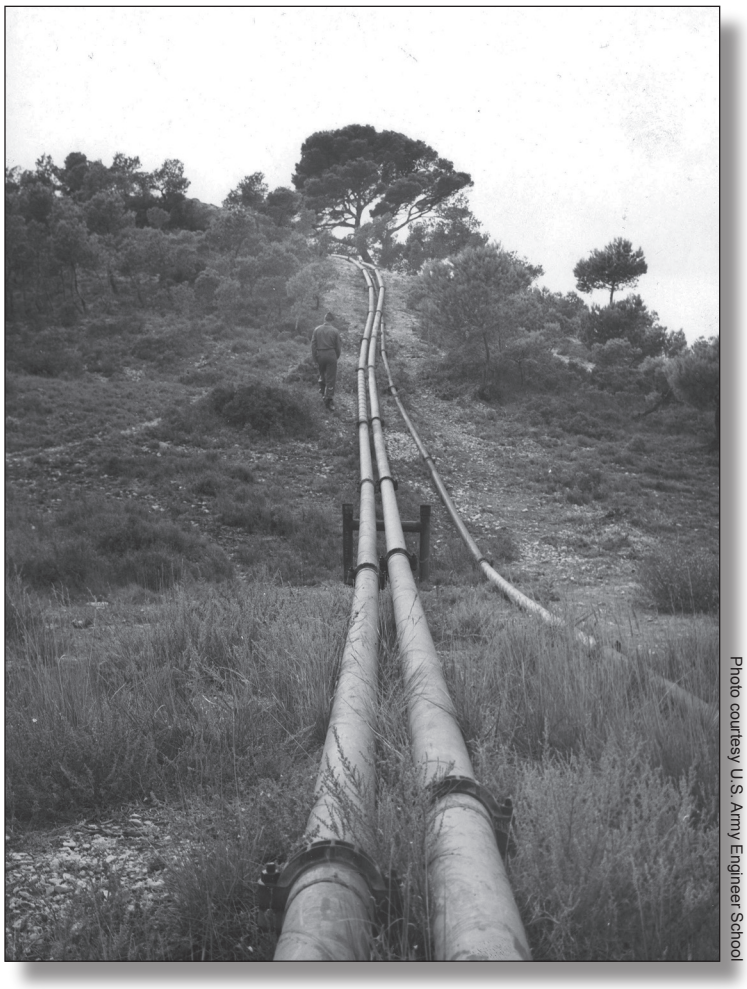


Photo courtesy U.S. Army Engineer School

The Rhône River pipeline stretched 487 miles between Marseilles and Sarrebourg, France. The line consisted of two 6-inch pipes and one 4-inch pipe. September 1945

In 1939, the Shell Oil Company offered the Quartermaster Corps (as the branch responsible for the purchase and distribution of petroleum products) an imaginative study that "contained all of the major elements of the military pipeline systems that were to be used during World War II, including lines from ship to shore, bulk storage tanks beyond the water line, and a pipeline with pumping units leading right up to the front line."[2]

The Quartermaster Corps, which was interested in using a pipeline as a way to unload fuel from ships and take it a short distance to the nearest storage facility, got approval to build a 5-mile test section of pipeline in Hydro, North Carolina, in February 1941. Results of the test—which constructed pipeline from a valley, across a river, and up a hill to a distribution point—were good. Further tests and trials soon came to the attention of the Army engineers, who wanted to string pipe from the ports to the front lines, even if the front lines were hundreds of miles away.

It was not only the Army engineers who saw the potential of this system. By the fall of 1941, the Chinese government wanted to obtain the system through the Lend-Lease Program for use along the Burma Road. A pipeline was of great interest to the Chinese since "trucks delivering gasoline over the Burma Road consumed half of their load in making the trip."[3] This pressure from the Chinese helped spur greater movement in the development of a usable and workable system. The Army engineers were asked to study this project. Brigadier

Photo courtesy U.S. Army Engineer School

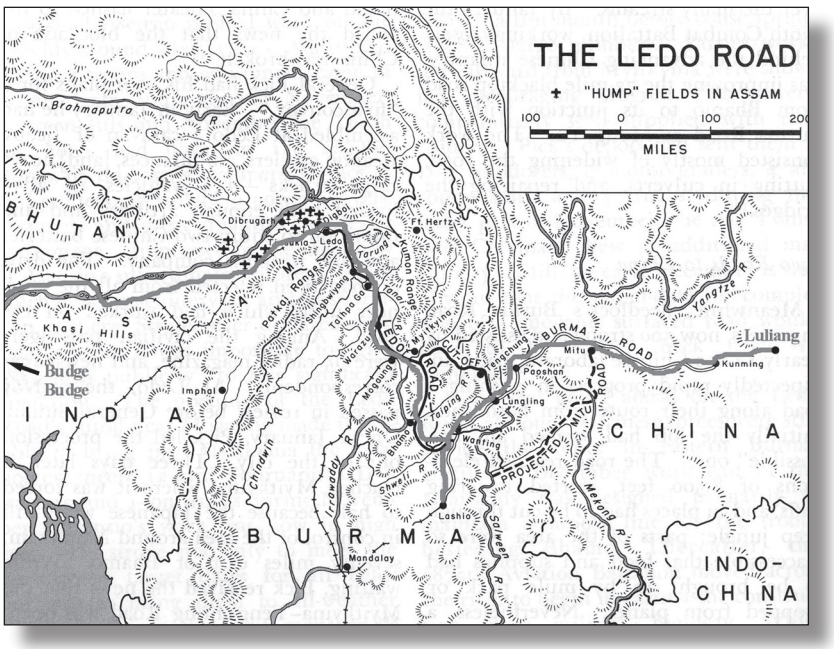
These 6-inch pipelines transported fuel from ports to the front line.

General John Magruder, Chief of the Military Mission to China, determined that the project would—

- Cost $5,000,000.
- Require 16,000 tons of steel.
- Include 240 possibilities of control failure and 200,000 possible points of leakage.
- Require 40 pump stations.
- Be constructed over very rugged terrain.

Brigadier General Magruder believed that the system had sufficient merit to warrant further study, but was not yet sufficiently proven to be installed.

Sid S. Smith, the Shell Oil Company representative who had designed the pipeline system, proposed laying a 30-mile line of 4-inch pipe, complete with pumps and automatic controls, as a further test of the system. This was a turning point for the military application of pipeline. A test site in the mountains of the Shenandoah National Park in Virginia was selected. Soldiers were not readily available for the project,



United States Army engineers and the Chinese army laid 2,000 miles of pipeline from Budge-Budge, India, to Luliang, China, in 15 months.

A Soldier from the 2656th Petroleum Distribution Company experiments with alternative transportation methods in Tunisia in 1943.

so workers were hired from the local civilian population. The project started on 30 June 1942 and concluded in mid-October. During this time, a lot of information was collected and problems resolved. On 8 July 1942, an unskilled crew laid 16.5 miles of pipe complete with pump stations in 18 days. Problems with the couplings were found and resolved. The reciprocating pumps seemed to wear out quickly, so centrifugal pumps were recommended as a solution.

At the same time, the Army engineers and the Quartermaster Corps resolved questions of control. It was decided that engineers would lay the pipeline from the ships to a point as far inland as needed and build the storage facilities and pump stations. The Quartermaster Corps would be responsible for the distribution points along the pipeline. Because the Virginia experiment was such a success, the Chinese were able to lay their pipeline along the Burma Road (and its successor, the Ledo Road). The Army engineers and the Chinese army eventually laid 2,000 miles of pipeline from Budge-Budge to Luliang in 15 months. (See map on page 33.)

With the success of the Virginia experiment in mind, the Office of the Chief of Engineers ordered a short training program to begin. On 15 October 1942, two pipeline detachments were organized and began training at Fort Belvoir, Virginia. A month later, the program was moved to the Desert Training Center in the Mojave Desert so that the equipment would not need to be winterized. The program was also expanded to four pipeline detachments at this time. These first units, which were manned by Soldiers with previous oil field experience, performed extremely well overseas. By later forming the nucleus of new units, these Soldiers helped expand the program in-theater.

The first petroleum distribution company was the 696th. Manned entirely by experienced oil field personnel,

A Soldier welds sections of 8-inch pipe that will bring fuel to Allied aircraft, armor, and motor transport in France. September 1944

Photo courtesy U.S. Army Engineer School

Photo courtesy U.S. Army Engineer School

American engineers work on a stone bridge to add support for sections of a petroleum pipeline. France 1944

both officers and enlisted, it bypassed the pipeline training school. In November 1942, it was already stationed in North Africa. By the end of the war, this company released personnel from its ranks to form the nucleus of three more pipeline companies. The first of these companies was the 697th Petroleum Distribution Company.

The first two detachments finished their training and left the Desert Training Center in January 1943. By March, there was dissatisfaction with the detachment system, which tied pipeline units to regiments. An independent pipeline company could do the same job with 20 percent fewer personnel. It was decided in May 1943 that an independent pipeline company should consist of 7 officers and 221 enlisted Soldiers, with headquarters and operating platoons. The training program was greatly accelerated and, in May 1943, an additional four companies started training, which put a strain on the training facility and staff. The facility was expanded, some parts of the training were cut short, and others were extended. In spite of the training shortcomings, pipeline units in Europe were laying 35 miles of pipeline per week, much faster than the 16 miles in 18 days that was first achieved. No theater had enough pipeline troops for optimum operations, and other engineer units were forced to take on pipeline duties. By the end of the war, there were 59 pipeline companies totaling 12,323 Soldiers.[4]

Some companies were formed in-theater by taking a few experienced officers and noncommissioned officers (NCOs) from other pipeline units and augmenting them with inexperienced enlisted men. One such company was the 2656th Petroleum Distribution Company (later designated the 697th), which was formed in North Africa in 1943.[5]

Around June 1943, one officer and nineteen enlisted Soldiers from the 2602d Engineer Pipeline Company (formerly the 696th), headquartered in Bizerte, Tunisia, formed the nucleus of the 2656th Engineer Pipeline Company. This company was then filled with Soldiers and officers from other units in North Africa. After working on projects in North Africa for two months, the 2656th landed at Palermo, Sicily, in August 1943. It was then renamed the 697th Petroleum Distribution Company. After completing a few simple tasks, the company packed up and relocated to Taranto, Italy, on 13 October 1943. The unit's Soldiers set up their base camp at Foggia, where the unit remained during its stay in Italy. From this base camp, the 697th sent out detachments to construct and operate various pipelines and storage tanks in Italy.

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The first assignment for the 697th was to construct a ship-unloading facility at Manfredonia and lay a 24-mile pipeline from there to Foggia. After just 28 days, the first fuel arrived at Foggia. Three 10,000-barrel tanks, one 5,000-barrel tank, the unloading facility, and 24 miles of pipeline had been completed. On 13 November, the first fuel was discharged from the gasoline tanker *Aroostock* and by 25 November, 160,000 gallons of 100-octane aviation fuel a week was flowing into Foggia, which was destined to be the hub of southern Italian fuel distribution. The 701st and the 696th Petroleum Distribution Companies (which were destined to work side by side with the 697th throughout the war) had now joined in the pipeline construction in southern Italy. In nine months, the 697th alone would construct a very large and elaborate network of pipelines and storage facilities. Besides the several airfields around Foggia, the 697th also supplied fuel to 14 other airfields. In addition, the company constructed 43 10,000-barrel tanks and 31 smaller tanks during this time. The 697th, 696th, 701st, 702d, and 704th Petroleum Distribution Companies together constructed 651 miles of pipeline to the airfields and storage facilities in that area of Italy.

On 15 July, the 697th moved out of Foggia to a staging area in preparation for Operation Dragoon, the invasion of France by Allied forces from Italy. D-Day was 15 August and by 16 August the 697th was established at Saint-Raphael, France, receiving materials to begin construction of the unloading facilities on 19 August. The project, which was completed by 30 August, included—

- Tanker discharge lines.
- Three 10,000-barrel storage tanks.
- A 1,000-barrel storage tank.
- Three miles of pipeline to the terminal.
- Three separate racks to fill tanker cars, drums, and cans.

Also, tanker-truck and drum-filling racks were constructed at the airport at Fejus, France, and connected to the port by six miles of pipeline.[6]

Photo courtesy U.S. Army Engineer School

A Soldier closes a valve near the start of the Rhône River pipeline near Marseilles, France. September 1945

It was decided before the invasion that the three refineries and the excellent port at Martigues would be the starting point for a pipeline up the Rhône Valley. On 25 August, an advanced element of two officers and 89 enlisted Soldiers from the 697th went to Martigues, bypassing Marseille and Toulon, which were still under German control. The French had just liberated the town and the Soldiers of the 697th were the first Americans the townspeople had seen. Flares and artillery fire lit the sky the first night since the Germans were still to the west, north, and east. Small units of German soldiers were reported in the area, so the detachment posted extra security on all sides. At this time, the United States Seventh Army engineers established a pipeline operations office at the La Mede refinery, which served as the main office for operations for the next 11 months.

Immediately, the 697th started to refurbish and connect all the refineries into one large storage facility. Difficulties were encountered in the harbor because the Germans had blown bridges and collapsed them into the harbor, which was mined extensively. The first Allied tanker to arrive, on 9 September, was saved from a mine only because the tugboat that was guiding it hit the mine first. The 697th would have lost a detachment of men, and the Lavera refinery could have been seriously damaged, if the mine had blown up the larger ship. While all this was being done, the 697th had a survey crew out locating the track for the pipeline to move north, up the Rhône Valley. On the same day the tug blew up, the first sections of pipe were laid.

From Martigues to Avignon, Valence, Lyon, Dijon, then northeast through Epinal to Sarrebourg, the 696th, 697th, 701st, 784th , 1385th, and 2814th leapfrogged along the Rhône Valley. Each company completed a section and connected with the next company's completed section. The companies were responsible for laying the pipeline and constructing the dispensing terminals along their routes. An example of this was the first section laid. In 16 days, the 697th laid 35 miles of pipeline from Martigues north to the Durance River, crossing the river southeast of Avignon. That section joined up with a section already completed by the 696th, just north of that crossing. Meanwhile, the base camp would remain in place until the pipeline bypassed it, making it impractical to communicate with the units. Then the base camp would move up the line another 50 miles and the process would repeat itself. This proved to be a fast, efficient method to get the projects completed.

It wasn't always a cakewalk for the companies. Sudden heavy rains caused flooding and rapid currents on the rivers, which caused loss of life and material. The terrain was not always flat and easy to cross. The fueling points took time to construct, and captured storage areas often were in dire need of major repairs due to neglect and sabotage. For example, how do you convert an old molasses plant into a fuel storage facility? The winter of 1944-45 was extremely cold with heavy snowfalls, which slowed progress. Crossings that would normally have been dug by pick and shovel had to be blasted out of the frozen terrain. Mines and other hazards were always present. When the companies reached Sarrebourg, France, in January 1945, they could take a break. They had caught up to the rapidly advancing Allied lines, and the Germans had not yet been cleared out of the area west of the Rhine River.

The pipeline companies were accomplishing their mission. By the spring of 1945, "The daily gasoline consumption of the (United States) Seventh Army … exceeded 600,000 gallons, and that of the French First Army only slightly less. Nevertheless, shipments of gasoline matched these expenditures and maintained adequate reserves in both armies at all times." [7]

In September 1944, the 696th started laying a 6-inch pipeline from the Mediterranean, parallel to the 4-inch line laid earlier by the 697th. It was March 1945 before it reached Sarrebourg. By the end of January, the 4-inch line was already delivering fuel all the way from the sea to Sarrebourg. After the Allied spring offensive drove the Germans east across the Rhine, the 697th began to run a pipeline from Sarrebourg to Sarreguemines, France, where the pipeline turned east and crossed into Germany. The pipeline went up to the Rhine River just north of Frankenthal, near Mannheim. The 696th had prepared a crossing by putting a Bailey bridge across the river on existing pylons. The first 4-inch pipeline reached the Rhine on 20 April 1945. By the end of April, fuel was being pumped from the Mediterranean to Germany at a rate of 10,000 barrels, or 550,000 gallons, daily. Since the pipeline system up the Rhône Valley in France and across the Rhine River into Germany had become so expansive, the 697th spent the rest of the war maintaining and operating the pipeline.

The statistics compiled in Europe by this company are extraordinary. From 9 September 1944 to 20 April 1945, the 697th alone constructed 347 miles of pipeline, surveyed another 519 miles of pipeline, strung 412 additional miles of pipe, rehabilitated or erected facilities for 419,600 barrels of storage (the equivalent of 42 10,000-barrel storage tanks), rehabilitated or erected 12 dispensing points, and crossed three major rivers.[8] The Soldiers who had served from the beginning were awarded stars for five campaigns:

- Algeria-French Morocco
- Tunisia-Sicily
- Naples-Foggia
- Rhineland
- Southern France Invasion arrowhead

The unit also was commended for its work at Foggia, Italy.

After the end of the war in Europe, the 697th was decommissioned due to lack of manpower. Its last assignment was to back-flush the pipeline with water, then tear down the pipeline from the Rhine River all the way back to the Mediterranean Sea. No records have been found describing

how far the company got on disassembling the pipeline system before being sent home. The 697th received orders on 8 October 1945 to leave the European Theater of Operations for the States. It left Southhampton, England, on 24 November and arrived in New York on 30 November. The unit was deactivated on 1 December 1945.

Endnotes

[1]United States Army in World War II, *The Corps of Engineers: Troops and Equipment*, 1958, Chapter XVIII, p. 417.

[2] Ibid., p. 418.

[3]Colonel James E. McNary and Colonel Edson W. Berlin, *History of the Development of Military Pipelines*, 28 December 1945.

[4]Reorganization for Global War, Table 10, *Number and Strength of Engineer Table of Organization Units*, 30 June 1945.

[5]The 2656th was a typical pipeline company, and its history is used since there is a large amount of information available on it. This is not meant to take away from the contributions of all the other companies. It is easiest to tell the whole story by focusing on one unit that went the distance, from 1943 to 1969.

[6]William D. Trethewey, *A History of the 697th Petroleum Distribution Company*, 1989, p. 18.

[7]Ibid., p 30.

[8]Ibid., p 31.

Mr. Petty, a farm boy from Iowa when he enlisted in the Army in 1966, spent his three-year Army career in pipeline companies. After leaving the Army, he graduated magna cum laude from Iowa Lakes Community College, which offered a farm equipment mechanic's course. He has been a mechanic for 34 years and is still very interested in the pipeline experience.

Acknowledgement

Thanks are extended to William Trethewey for saving this history. It stands as a testament to the hard work done by the engineers in World War II and those of the "Greatest Generation." It is on record at the archives at the United States Army Engineer School at Fort Leonard Wood, Missouri.

This is Part I of a two-part article. Part II will cover the pipeline story from the postwar years in Europe, to Operation Sledgehammer in the United States, to operations in Thailand, Vietnam, and the Persian Gulf.