Major CP project finishes early

Neither searing desert heat nor endangered species could stop the early completion of a major cathodic protection (CP) project in the western U.S.

One of the 10 compressor stations along the Kern River Gas Transmission project running from Wyoming to California. Photo courtesy of MATCOR, Inc.

The Kern River Gas Transmission Co. (Salt Lake City, Utah) earlier this year placed into service 717 miles (1,154 km) of new 36- and 42-in. (91- and 107-cm)-diameter pipe along its existing pipeline, which runs from southwestern Wyoming to Southern California. The $1.2 billion expansion more than doubled the amount of natural gas transported on the Kern River system to approximately 1.7 billion ft^3/day (36.8 million m^3/day), according to the company. MATCOR, Inc. (Doylestown, Pennsylvania) installed the new line's CP system as well as 10 compressor stations and high-voltage alternating current (HVAC) mitigation.

MATCOR Senior Corrosion Engineer Joe Pikas says that the complex project required considerable manpower and expertise. Originally scheduled for completion in December of this year, the project was finished in September. Pikas attributes the feat to widespread cooperation among a diverse team of field engineers; technicians; equipment, engineering, and logistic support; and project managers. "The biggest challenge was having good communications with all parties," he says, pointing out that it was necessary to have three scheduled conference calls each week of the project to monitor progress. "MATCOR had as many as four CP construction spreads going at one time from California to Wyoming in order to make schedule. It took the cooperation of all parties in order to have a successful job. This required close coordination of having the right materials being delivered to the job and not having too little or too much, which could affect the cost of the project."

Pikas adds that the CP installation also required a quick turnaround on as-builts. "This was necessary in order [that], should other activities occur within the station or pipeline, Kern's operations people could mark out the pipelines and CP facilities quickly and appropriately," he explains. "It should be noted that CP [red] markers were used throughout the yard to identify the location of the cables, and boxes were installed over each anode for the purpose of identification and watering if required."

"The project was simply extraordinary," says MATCOR Vice President of Engineering Glenn Shreffler. "It's very similar to the project we are working on in Turkey for Baku-Tbilisi-Ceyhan." A major pipeline running from Baku, Azerbaijan, to Tbilisi, Georgia, to Ceyhan, Turkey, is under construction to transport oil from the Caspian Sea region to the Mediterranean for export onto world markets.

Like Baku-Tbilisi-Ceyhan, the Kern River project required workers to contend with a wide range of soil types and tempera-

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The desert tortoise, which is protected under the U.S. *Endangered Species Act*. Photo courtesy of the U.S. Fish and Wildlife Service.

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tures. The routes of both pipelines cross dry, sandy deserts as well as moist, mountainous regions with clay/rocky soils. Personnel in both projects had to adapt to extremes ranging from triple-digit desert heat at the height of summer to cold and snowy conditions in the mountains. They also had to work with both HVAC and high-voltage direct current (HVDC) power lines in the same rights-of-way while maintaining CP.

In the case of the Kern River project, Pikas notes that the effort to mitigate alternating current (AC) in dry desert conditions resulted in the development of new types of potentially controlled rectifiers to block AC rectification from overvoltage in the pipeline coating. "These systems are presently installed as conventional auto potential systems with the capability, if needed, to block high AC rectification," he says. "These auto potential rectifiers are used to keep the system from discharging during monopolar conditions when an upset occurs on the HVDC system."

Unlike their counterparts on the Baku-Tbilisi-Ceyhan project, Kern River personnel had to undergo an unusual educational requirement as the pipeline's right-of-way passes through the habitat of the endangered desert tortoise. "This project had environmental issues relating to endangered desert turtles, requiring all field personnel to receive special turtle awareness training," says Shreffler.

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—M.V. Veazey

Continued from MP *Forum, page 13. The following NCN items relate to cathodic & anodic protection.*

Please be advised that the items are not peer-reviewed, and opinions and suggestions or recommendations are entirely those of the inquirers and respondents. NACE does not guarantee the accuracy of the technical solutions discussed. MP *welcomes additional responses to these items. They may be edited for clarity.*

Pulse rectifiers

Q I am looking for information on the operation and theory of pulse rectifiers for cathodic protection of pipelines.

A I would be very cautious about using pulse rectifiers on pipelines as these rectifiers can create significant electronic noise, which can interfere with communication systems. Cell phones and radios can be rendered useless when near an operating pulse rectifier.

Pulse rectifiers were developed to have direct current emulate alternating current. This was supposed to overcome the capacitive effect of the structure, which effectively limits the ability to throw current. The technique was developed to protect well casing, and it has shown evidence of being effective in that application. We tried it once in an effort to throw current further down a pipeline, but it was not effective in overcoming the problem—although it did display a little improvement.

CP for subsea concrete weight coated pipe

Q I would like to get some advice on current requirement for cathodic protection (CP) of a subsea pipeline, which is well-coated but has also been given a well-applied concrete weight coat over its entire length. Most references seem to indicate that if the line is buried in silt, the current required can be much less than if it were resting on the ocean floor. Would the concrete act the same or similar to the silt, and if so what evidence can be produced to support this? If I interpret some work by others correctly, there is a "washing effect" of the current on an exposed line because of undersea wave and current action. In a buried situation, this is substantially reduced. My hypothesis is that the concrete weight coat acts as a similar barrier to burial or silting over, preventing the "washing-away" effect. I have seen references in some oil company in-house design standards that have mentioned this possibility. I have not seen any reference in any of the major international standards as yet. Has anyone done any research or work in this area?

A A pipeline encased in silt is not exposed to the same depolarizing effects of electrolyte movement as a pipe exposed on the hard sea bottom. With less depolarization, it will require less current to protect defects in the pipe coating. If the defect is under a sound concrete weight coating (dielectric coating is damaged but cement is not), several things come into play. The high pH of the concrete may tend to passivate the exposed steel, but it also drops its potential. The concrete is a very poor dielectric compared to the pipe coating itself. But the intact concrete will prevent depolarization of the defect by electrolyte (seawater) movement. The continuous concrete coating will result in decreased current demand if all other things are equal.

I assume that you are using distributed galvanic anodes along the length of the pipeline—probably applied as bracelet anodes. The reduced current demand associated with the concrete-weight coated pipe (pipe also has dielectric coating) will allow you to reduce the total weight of anode material for any given time period of protection. However, the original weight also will allow operation for a longer period before requiring anode replacement. This becomes a question of economics: which solution is least expensive? Also, consider that your current distribution plan still may require just as many bracelet anodes, just of different weight.

A The overall CP design should also take into account temperature and water depth. See DNV RP B401. *MP*