

# Mitigation of Cyclic Production Behavior in a Geothermal Well at the Uenotai Geothermal Field, Japan

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## *Key Words:*

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## **ABSTRACT**

Well T-52 was drilled to a depth of 2,013m and has been providing geothermal steam to the 25 MW Uenotai geothermal power plant in Akita Prefecture, Japan, since the plant was commissioned in 1993. Since its inception and throughout its production history, the behavior of well T-52 showed the typical characteristics of a well intersecting multiple production zones with different production potential. Detailed analysis of the wellhead flow characteristics and downhole temperature, pressure, and spinner surveys indicated the presence of at least two dominant production zones. The water-dominated, lower production zone of well T-52 is located between the depths of 1,675m and 1,780m, while the upper, steam-dominated zone is located at approximately 1,450m. These two zones produced in an alternating pattern, resulting in a strong surge that peaked approximately every 70 minutes. Because of this surging behavior, wellhead pressures periodically fell below the production header pressure, so that the well was periodically unable to supply the power plant. A mitigation plan to restore the well to full productivity was developed following the analysis of the flow behavior. This plan involved plugging off the lower production zone, which was producing most of the liquid fraction, allowing only the steam-dominated upper zone to produce. A plan involving a combination of gravel, sand and cement plugs, which could be removed later if the expected response was not achieved, was developed to resolve the problem. A 2-3/8-inch coiled tubing unit was mobilized to the well site to undertake the remediation, and the plugging operation was completed within one week. After one month, of recovery time, during which temperature and pressure logs were run to monitor wellbore heat-up, the well was reconnected to the power plant. The cyclic behavior of T-52 was successfully eliminated, and the generating capacity of the well increased by at least 35%.

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