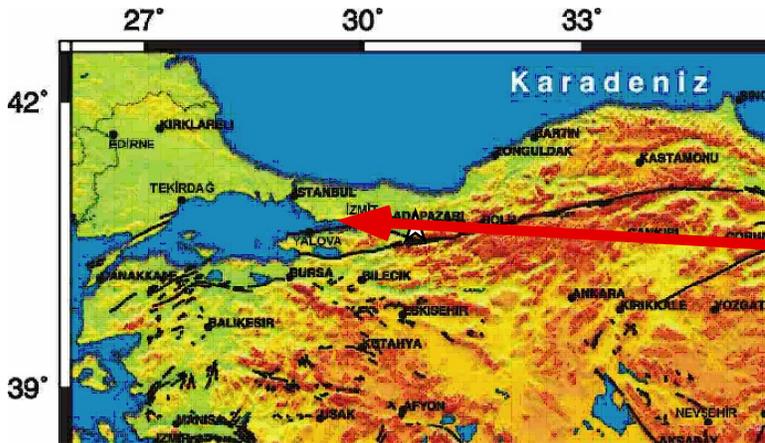




ASSESSMENT OF SEISMICALLY INDUCED FAULT AND FOLD DEFORMATION POTENTIAL at the AKSA Acrylic Facility, Yalova, Turkey

PROJECT DESCRIPTION

The destructive earthquakes east of Istanbul in 1999 generated great concern about the potential for future earthquakes in this populous, industrialized region of Turkey. AKSA's acrylic manufacturing facility sustained significant damage, even though the earthquake was over 50 km from the plant. Liquefaction, tsunami, ground failure, and probable fault rupture were all mapped at the site by *Earth Consultants International* geologists. An offshore mole failed from underwater landsliding; the landslide generated a tsunami that destroyed several petrochemical storage tanks, ground failure through the plant damaged foundations and walls, and strong shaking tossed the piping racks into complete chaos. Because of the high probability of a large earthquake much closer to the plant in the near future, management was interested in determining their vulnerability retrofit strengthening options.

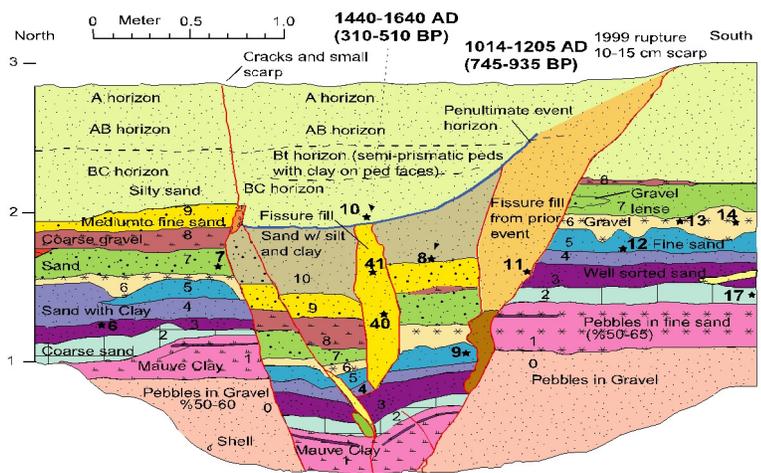


The epicenter of the 1999 M7.4 Kocaeli earthquake is shown with a star, and the location of the AKSA facility is shown by the red arrow.

The AKSA facility suffered partial failure of the mole, loss of a docking dolphin, failure of several storage tanks, and cracking and tilting of several production structures.

SOLUTION

Using exploratory trenches and borings, *Earth Consultants International* was able to determine the timing and magnitude of past displacements across those surface features that exhibited deformation in the 1999 earthquake (right). A previously unknown strand of the North Anatolia fault passes directly through the AKSA plant, expressed as a 5-meter-high scarp immediately west of the plant, that exhibits up to 10 cm of lateral displacement from the 1999 quake through the plant itself. Working with engineers from the Istanbul Technical University, a liquefaction analysis was also completed for the sediments under the plant. Using the findings from the fault trenches, ITU and AKSA engineers were able to model the structural vulnerabilities of the plant and its extensive piping infrastructure.



Excavations across small, surface fractures revealed a pattern of prior, larger paleoseismic offsets.

