



Dynamic prediction and earthquake safety system for pipelines in seismo-active regions

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During global industrial development of oil - gas fields in Azerbaijan and in Caspian Sea region (production and transportation) designing of the main oil and gas pipeline across the Caspian and across the territory of Azerbaijan, Georgia and Turkey, namely, Baku-Tbilisi-Ceyhan and Baku-Tbilisi-Erzurum, it is particularly important to assess seismic hazards in these regions. This is one of the important tasks during anti-seismic construction and for environmental protection. It is possible to prevent and minimize possible losses by means of normative maps of seismic zonation designated for the Caspian basin and for oil and gas pipeline routes. At present these map significantly underestimates the region's hazard and current construction works are being performed without the proper assessment of this region seismicity. It is possible to solve problems on assessment of seismicity on new conceptual base by methods of dynamic earthquake prediction. Such a long-time dynamic earthquake prediction for the Caucasian-Caspian-Eastern Turkey region was based on systemic seismogeodynamic approach to investigation of earthquake focal zones and on block model of seismokinematics of this region. The resulting map of dynamic regionalisation of the degree of seismic hazards up to year 2005 predicted not only place and strength of potential zones of the strongest earthquakes, but also the periods of increased probability of their occurrence within the source volume of the future mainshock. An early warning system of automatic telemetry have to be set up along with local and regional monitoring networks to predict short and medium term seismic hazard zonation the international earthquake monitoring and forecasting network.. Economically, continuous operation of large pipelines is extremely important because of the huge energy content of the oil flow. If an earthquake occurs during the operation, a rapid decision

must be made whether the full flow can be maintained. In addition to the economic aspect, the ecological risk connected with a pipeline leak at extremely strong earthquakes dictates that the appropriate decisions are taken rapidly. This is specifically valid for offshore pipelines because they cannot be inspected easily and any leak results in considerable adverse ecological effects. In the Caucasus – Caspian Sea and surrounding area special seismic conditions exist. These are described in the present paper the section Dynamic prediction of seismic hazards by determination by seismicity focal zones place. The earthquake detection system presented here consists of accelerometers, which measure the immediate effects of the earthquake, and pipeline deformation sensors, which detect secondary impacts to the pipeline. The system gives a first indication of the actions to be taken within 5 seconds after an earthquake.