All-fluid overpressure maps of 8 stratigraphic groups; offshore and northeastern onshore Netherlands

The all-fluid overpressure maps show the distribution of fluid overpressures in the North Sea, Chalk, Rijnland, Schieland and Scruff, Upper and Lower Germanic Trias, Zechstein, Upper Rotliegend and Limburg groups. These fluid overpressures were calculated from selected fluid pressures listed in the enclosed excel database. These pressure measurements are from a variety of sources, such as wireline formation tests, drillstem tests, and kicks. Fluid pressures include pressures of water, gas, oil or condensate.

Excel database of selected fluid pressures

The excel database includes those pressure data that were selected for calculating the fluid overpressures used for constructing the fluid overpressure maps. The pressure data were selected from the integrated database of quality-controlled pressure, water chemistry and temperature data for the Netherlands that was developed during two successive joint-industry projects executed by TNO and CSIRO from 2002-2007 (Simmelink et al., 2003, 2008). A quality-control and quality-coding system was applied to the pressure data. The pressure reliability codes reflect the level of confidence and uncertainty related to a pressure value derived from a particular test. The code characterizes test design, the availability of information related to the test, and the actual conditions and attributes of the test when performed. The reliability codes do not quantify the accuracy of the test, nor do they consider broader reservoir properties. The excel database of selected fluid pressures includes the following information: well name, location, depth of measurement, pressure, stratigraphic unit (at group, formation or member level), fluid type (water, gas, oil or condensate), data type (wireline formation test, drillstem test, production test, kick), and reliability code.

Calculation of fluid overpressures

The mapped fluid overpressures were calculated relative to a constant hydrostatic gradient of 0.01 MPa/m that represents sea-water density (1020 kg/m3) (Figure 1). For pressures measured during wireline formation tests the following procedure was used. First fluid pressure gradients were determined per well for selected data points to determine the fluid type. If a set of pressure data defined a water gradient below a hydrocarbon gradient in the same stratigraphic unit, an overpressure was calculated for the water and the hydrocarbon gradients. For each gradient, the overpressure value relative to the assumed hydrostatic gradient, was calculated at the top-most data point of the series that makes up the gradient line (Figure 1).

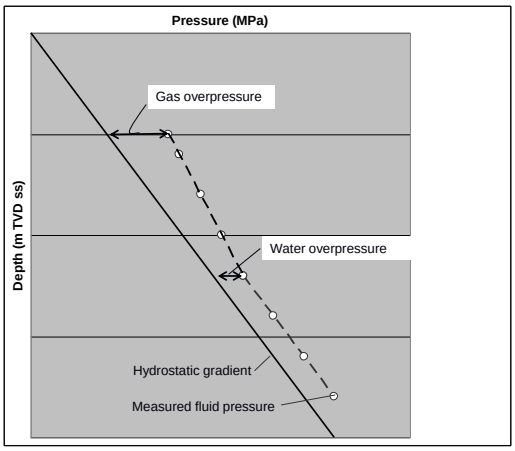

Figure 1 Schematic diagram showing the method used to calculate the water and gas overpressure values from wireline formation test data

For pressures measured during drillstem or production tests the fluid type of a data point at gauge depth was determined first. An assumed fluid gradient was used to calculate the pressure at mid-perforation depth from the pressure recorded at the gauge depth. These assumed gradients are: a gas gradient of 0.002 MPa/m, an oil gradient of 0.006 MPa/m and a water gradient of 0.01 MPa/m.

Fluid overpressure maps

The maps display the calculated overpressures at the wells for all-fluid types. This means that an overpressure at a certain location may be a gas, oil, condensate or a formation water pressure. On these maps, overpressure records that have been derived from 'most reliable' and 'reliable' pressure data are plotted with a large, color-coded symbol indicative of the amount of overpressure. The overpressure calculated from moderate to low reliable pressure data are depicted on the maps with a smaller symbol. More information on pressure and fluid systems in on- and offshore Netherlands is available in e.g. Verweij (2003) and Verweij et al. (2011, 2012).

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