

Title (en)  
Method for determining the thermal profile of drilling fluid

Title (de)  
Verfahren zur Bestimmung des thermischen Profils von Bohrflüssigkeit

Title (fr)  
Méthode de détermination du profile thermique d'un fluide de forage dans un puits

Publication  
**EP 1205631 A1 20020515 (FR)**

Application  
**EP 01402678 A 20011017**

Priority  
FR 0014305 A 20001108

Abstract (en)  
A general expression  $\theta_1$  is determined for the temperature profile of fluid in the drill string. A general expression  $\theta_2$  is determined for the corresponding annulus temperature profile. The equation of thermal transfer employed, takes into account the temperature profile of the medium surrounding the well. Three actual temperature measurements are taken: the inlet temperature T1, that at the base of the well T2 and that at the well outlet T3. Expressions  $\theta_1$  and  $\theta_2$  are used to check limiting conditions of the temperatures T1, T2 and T3. Preferred Features: Following measurement of T1, T2 and T3, a curve of temperature as a function of depth is drawn up. Measurements are re-iterated to obtain an actual temperature profile. The general expressions  $\theta_1$  and  $\theta_2$  contain unknown constants. During temperature measurement and verification, limiting conditions are substituted to determine the unknown constants. The equation of thermal transfer used initially, takes into account at least the thermal equation of the medium surrounding the well, fluid flow rate and the balance of thermal exchange undergone by the fluid. This includes the exchange between ascending and descending fluid. Initial expressions of heat transfer are for a homogeneous medium on a cylinder of infinite height centered on the well. The cylinder comprises the string carrying descending fluid, and the annulus surrounding it, carrying rising fluid. The general expressions  $\theta_1$  and  $\theta_2$  are broken down into several independent equations. At the temperature measurement stage, in addition, a condition is imposed on the curves and their derivatives, that they are continuous in the string and annulus.

Abstract (fr)  
Méthode pour déterminer en temps réel un profil thermique du fluide de forage dans un puits à partir de trois points de mesures disponibles sur le chantier, c'est-à-dire les températures d'injection, de sortie et en fond de puits. La forme du profil entre ces trois points est définie par une courbe type représentative des profils thermiques dans un puits en forage, estimée à partir de considérations physiques sur les transferts thermiques dans le puits. <IMAGE>

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**E21B 47/06**; **E21B 21/00**

IPC 8 full level  
**E21B 21/00** (2006.01); **E21B 47/06** (2012.01)

CPC (source: EP US)  
**E21B 47/07** (2020.05 - EP US)

Citation (search report)  
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• [A] CORRE ET AL.: "Numerical computation of temperature distribution in a wellbore while drilling, SPE paper no.13208", 59TH TECHN. CONF. AND EXHIB., 16 September 1984 (1984-09-16) - 19 September 1984 (1984-09-19), Houston, Texas, USA, XP002176189

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**EP 1205631 A1 20020515**; **EP 1205631 B1 20070711**; CA 2361653 A1 20020508; CA 2361653 C 20100126; FR 2816350 A1 20020510; FR 2816350 B1 20021220; NO 20015450 D0 20011107; NO 20015450 L 20020510; NO 322168 B1 20060821; US 2002096321 A1 20020725; US 6807854 B2 20041026

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