1. Introduction The cornerstone problem of modern oil production is water intrusion in the productive layers resulted from water flood displacement (water introduction from water injecting to oil producing wells aimed at oil displacement and subsequent oil recovery). Water is typically introduced not earlier than the end of active and most cost effective stage of development (10-20 years). The water introduction is aimed at the increase of layer pressure. In Russia after pumping millions of tons of water and extracting about 40% of oil deposits the process gradually turns from oil extraction into water extraction. This process is accompanied by the formation of skin layer consisting of viscous heavy oil which more easily adheres to the surface of pores and cracks as compared to light oil. Because of oil hydrophobic properties, the water driven from water injection to oil recovery wells moves along the washouts thus displacing oil on a very limited scale. As a result of this about 60% of Russian known oil reserves stay underground labeled difficult or impossible to extract. These difficulties are further aggravated by the ever increasing cost of geological survey of new oil fields, almost all deposits at small depth (up to 5 km) being already known. Still during the recent years there has evolved a way to solve the above described problems by means of thermochemical technology of Binary Mixtures (BM) [1-8]. 2. Technology Development Milestones Binary mixtures are water solutions of petersalts (ammoniac and organic ones) with the reaction initiator of petersalt decomposition (metal hydrides or sodium nitrite) [1, 2]. The two components are injected into the oil well via two separate channels and the reagents react upon contact opposite or inside the productive layer emitting heat and gas. The binary mixtures found their application in the oil extraction domain starting from 1982. It should be noted that for the reason of considerable explosion hazard the Russian Technical Supervision Service used to restrict the injection amount to 1 ton of saltpeter per oil well. Up to the year of 2010 the BM reaction was maintained in an uncontrollable mode with its efficiency approximately amounting to 0.4 [3-5]. The year 2010 saw the development of the system of optimization and control over the heat emission inside the well, the BM reaction efficiency having increased from 0.4 to 0.8. The BM technology architects obtained the permission of the Russian Technical Supervision Service (№ 25-ИД-19542-2010) allowing them to inject the unlimited quantities of petersalt into oil wells. The system of reaction control has greatly contributed to spot and study the exothermic reaction of saltpeter decomposition in a heated layer with the emission of heat (Q1) and oxygen oxidizing a small part of layer oil accompanied by heat emission (Q2) . As Q2≈ 2Q1 the progress of heat front along the layer containing petersalt water solution in its cracks and pores is as a rule a self-maintaining process. The whole process is explosion-proof as once in the productive layer petersalt emits heat produced during the reaction which is further absorbed by the rock, the petersalt and rock mass ratio amounting to 1:20. By increasing the BM reagent mass injected into the oil well and the productive layer by tens of times the authors mastered the heating process as well as stage-by-stage removal of the skin layer accumulated near the wells

as a result of their long performance. In 2011 the partial removal of skin layer blocking the Usinsk oil field No. 1242 and No. 3003 by means of BM [6] led to the increase in oil extraction by 4.95 and 8.44 t/day respectively. The amount of additional oil extracted from the mentioned oil wells in 2012 amounted to 3.4 thousand of tons, that is - approximately 1.7 thousand per oil well. In 2012 in the course of treatment of the Usinsk oil fields No. 6010, No. 600, No. 1283, No. 7169 and No. 8198 managed by E. Alexandrov and V. Zavolzhsky the technology was further improved. The reaction catalyst of petersalt decomposition (sodium nitrite) was abandoned for thermal catalyst. The water vapor heat preliminary injected into the layer at the temperature of 250 °C promoted saltpeter decomposition and oxidation of small part of oil by the emitted oxygen. During the year following the treatment the extraction rate from the five described oil wells amounted to 13232 tons of additional oil. It is likely in this case that the treatment process promoted more thorough cleaning of the skin layer than the one described in oil wells No. 1242 and No. 3003. The increase of the average annual growth of oil extraction per one oil well from 1700 tons (2011) to 2646 tons (2012) is a safe indicator. In July 2013 oil wells No. 8 and No. 10 of the Eastland oil field (Texas, USA) were treated by the BM reaction products. The mentioned oil field was abandoned in 1994 labeled unprofitable. Starting from July, 1 to July, 7 just before treatment, the layer fluid was pumped from the well. The fluid consisted of water (99.999 %) and oil film ( 0.001 %). On July, 8 after injecting saltpeter solutions (about 35 tons) and sodium nitrite (about 12 tons) into the oil well both oil wells produced oil with the industrial ratio of 30% of oil and 70% of water. Although the production performance proved profitable solely from oil well No. 8 the customer company Viscos Energy put an advertisement mentioning the successful oil recovery at an abandoned field with the application of the Russian technology. The difference in the oil recovery rate at oil well No. 8 and oil well No. 10 is explained by the difference in their location. Oil well No. 8 is located in the center of the field while oil well No. 10 is situated on its border. 3. Main Results and Prospects of the BM Technology 1. The modern BM technology developed by the authors since 1997 at present differs from all the rest of similar technologies in the heat emission optimization in the course of reagent injection. For this reason the technology ensures a much more thorough elimination of the skin layer around the producing oil wells. Accumulated during tens of years the skin layer restricts the profitable extraction to less than a half of the deposited oil. 2. Defined by the market competition if compared to other technologies in respect to their cost the modern BM technology holds the second place and as related to the rate of oil extraction increase trails only the hydro fracturing technology (USA and Canada). Starting from the first patent (RU 2126084 97111229/031997.06.30) and up to the latest ones of 2010-2012 (Patent WO 2010/043239, April 22, 2010 и Patent WO 2012/025150, March 1, 2012) the efficiency increase of the technology application during the last 16 years is clearly seen from the increase in treatment cost of one oil well: · ≈ $5 000 (1997, Customer - the owner of the Vostochno-Poltavskoye oil field,

Ukraine); · ≈ $40 000 ( 2010 - 2011, Customer - LLC LUKOIL-KOMI); · ≈ $60 000 (2013, Customer - Viscos Energy Holding ltd. USA) 3. We tend to interpret the facts described in points 1-2 as a turning point from over the century accumulation of non-recoverable oil deposits to their profitable extraction. It should be noted that at present the amount of hydrocarbons still deposited underground is far greater than the deposits at the oil fields under current treatment. For this reason discovering the efficient technology for non-recoverable oil extraction equals discovering a new large-scale oil field. 4. The oil recovery revival of the previously unprofitable Russian oil fields by means of the BM technology can be regarded a new direction of field thermochemistry development which can promote a radical improvement of Russian economy as a great energy extracting power.