王安辉1,2, 张英魁2, 高景龙2, 韦文勇2
阮宝涛2, 朱明文3, 王海忠2, 刘丙辉2

(1. 中国地质大学(北京) 2. 吉林油田分公司勘探开发研究院 3. 吉林油田分公司采油公司)

Hall: 应用吉林油田现有的实际岩石压缩系数资料对前人的经验公式进行验证的结果, 总相对误差为 0.54. 25% - 681.15%, 由柑发现这些经验公式对吉林油田并不适用。采用人工神经网络 BP 算法, 以压力、孔隙度为输入层参数, 以岩石压缩系数为输出层参数, 分别预测了吉林油田区两个地区油藏的岩石压缩系数, 应用实际资料验证, 相对误差仅为 12.8%, 表明用此方法预测岩石压缩系数的可靠性。图 1 表 5 表 6

Hall: 分别预测了吉林油田区两个地区油藏的岩石压缩系数

\[ C_t = \frac{0.014104}{(1 + 55.872)F_1} \times 10^3 \]  \( (2) \)

<p>| | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Hall</td>
<td>11.17</td>
<td>6.3</td>
<td>0.000688993</td>
<td>1705.78</td>
<td>0.000791759</td>
<td>1402.98</td>
</tr>
<tr>
<td>0.01190</td>
<td>0.0921</td>
<td>0.114</td>
<td>0.000666496</td>
<td>1281.85</td>
<td>0.000817519</td>
<td>1026.58</td>
</tr>
<tr>
<td>0.00732</td>
<td>0.0109</td>
<td>15.27</td>
<td>0.000674287</td>
<td>985.59</td>
<td>0.000844739</td>
<td>766.54</td>
</tr>
<tr>
<td>0.00586</td>
<td>0.0109</td>
<td>15.27</td>
<td>0.000679651</td>
<td>762.21</td>
<td>0.000863755</td>
<td>578.43</td>
</tr>
<tr>
<td>0.00482</td>
<td>0.0107</td>
<td>18.23</td>
<td>0.000685158</td>
<td>668.49</td>
<td>0.000883516</td>
<td>445.55</td>
</tr>
<tr>
<td>0.00376</td>
<td>0.0106</td>
<td>21.2</td>
<td>0.000687988</td>
<td>446.54</td>
<td>0.000893568</td>
<td>320.73</td>
</tr>
<tr>
<td>0.00624</td>
<td>0.0108</td>
<td>24.16</td>
<td>0.000690816</td>
<td>325.58</td>
<td>0.00090405</td>
<td>225.20</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
</tbody>
</table>

中国地质大学

王安辉 1105 中国地质大学电子出版物有限公司. All rights reserved. http://www.cnki.net
<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>8</td>
<td>7</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>9</td>
<td>13</td>
<td>10</td>
<td>9</td>
</tr>
<tr>
<td>3</td>
<td>28</td>
<td>63</td>
<td>103</td>
<td>72</td>
<td>64</td>
</tr>
<tr>
<td>4</td>
<td>21</td>
<td>45</td>
<td>75</td>
<td>56</td>
<td>49</td>
</tr>
<tr>
<td>5</td>
<td>7</td>
<td>18</td>
<td>28</td>
<td>16</td>
<td>15</td>
</tr>
<tr>
<td>6</td>
<td>300</td>
<td>1000</td>
<td>2000</td>
<td>2000</td>
<td>1×10^6</td>
</tr>
<tr>
<td>7</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>8</td>
<td>11.63</td>
<td>9.02</td>
<td>11.11</td>
<td>13.56</td>
<td>7.48</td>
</tr>
<tr>
<td>9</td>
<td>10.71</td>
<td>17.54</td>
<td>21.51</td>
<td>13.66</td>
<td>23.86</td>
</tr>
<tr>
<td>10</td>
<td>11.40</td>
<td>11.45</td>
<td>13.98</td>
<td>14.03</td>
<td>11.32</td>
</tr>
</tbody>
</table>

| 3 | 2 | 4 | 1 | 7 | 9 |

| 4 | 11.39% (C) | 3 | 19.97MPa, | 0.15 |

| 5 | 8 | 19.12MPa, | 2.2076×10^-3 | 0.15 |

| 6 | 18 | 19.87MPa, | 2.2076×10^-3 | 0.15 |

| 7 | 20 | 19.21MPa, | 2.2076×10^-3 | 0.15 |

| 8 | 21 | 19.21MPa, | 2.2076×10^-3 | 0.15 |

| 9 | 22 | 19.21MPa, | 2.2076×10^-3 | 0.15 |

| 10 | 23 | 19.21MPa, | 2.2076×10^-3 | 0.15 |

| 11 | 24 | 19.21MPa, | 2.2076×10^-3 | 0.15 |

| 12 | 25 | 19.21MPa, | 2.2076×10^-3 | 0.15 |

| 13 | 26 | 19.21MPa, | 2.2076×10^-3 | 0.15 |

| 14 | 27 | 19.21MPa, | 2.2076×10^-3 | 0.15 |

| 15 | 28 | 19.21MPa, | 2.2076×10^-3 | 0.15 |
Predicting rock compressibility by artificial neural network

WANG An-hui\(^1\), ZHANG Ying-kui\(^2\), GAO Jing-long\(^2\), SHAO Wen-yong\(^2\), RUAN Bao-tao\(^2\), ZHU Ming-wen\(^3\), WANG Hai-zhong\(^2\), LIU Bing-hui\(^1\) (1. China University of Geosciences, Beijing 100083. P. R. China; 2. Exploration and Development Research Institute of Jilin Oilfield, PetroChina, Jilin 138001. P. R. China; 3. Producing Test Corporation of Jilin Oilfield, PetroChina, Jilin 138001. P. R. China)

Abstract Due to the requirements of the mass balance calculation, elasticity energy calculation, well testing interpretation, and overcoming the difficulty in measuring the rock compressibility in the oil-gas reservoir engineering in Jilin Oilfield, east China, earlier experience formula is tested and verified by using the present data of practice rock compressibility in Jilin Oilfield, east China, resulting in 504, 20\% of the total relative error. The study has found that these experience formulas are hardly to be used and applied in the Jilin Oilfield. So, taking pressure and porosity as input layer parameters and rock compressibility as output layer parameters, the rock compressibility is calculated by using the error back-propagation of artificial neural network which is named as a BP method. The study has predicted the rock compressibility in the Block I and II of Jilin Oilfield respectively, and tested and verified the reliability of this method by using practice data, resulting in 12. 8\% of the relative error only.

Key words: rock compressibility, relative formulas, artificial neural network, BP method