

be got and fed back to the water-filling system. The biggest drawback of this system is that the precision is very low when the moisture fluctuation of used sand is large.

G. Neutron method

The principle of the neutron method is as follows. When the fast neutrons from the neutron source (Americium-Beryllium or Radium-Beryllium) collide with the hydrogen nuclei of water, their speed will slow down. The more the water is, the more the quantity of the slow neutrons is. There is a linear relationship between the quantity of slow neutrons and the moisture content of green sand. Therefore, the moisture content can be obtained by the quantity of slow neutrons [20].

The neutron method can be used for measuring a large volume of green sand. The quantity of slow neutrons is not affected by the clay and sand thickness, but is affected by the compactness. In addition, the security measures must be taken because of the radioactivity.

H. Nuclear magnetic resonance method

When the frequency of the alternating magnetic field applied to green sand is equal to the Larmor frequency of the hydrogen nuclei, all of the hydrogen nuclei will form a synthetic magnetic moment, and thus an alternating current proportional to the moisture will be generated in the coil [21]. This is the nuclear magnetic resonance method, and the moisture content can be calculated by the current.

The advantage of this method lies in avoiding the influence of the density and temperature, but it is expensive and complicated. At present, it is still at the experimental stage.

IV. SUMMARY

The moisture content is one of the most important parameters that affect the green sand performance and thus the casting quality. The measurement for the moisture content of green sand is a comprehensive and multi-disciplinary technology. The direct method for measuring the moisture content is accurate but slow, which is unsuitable to online measurement and control, and used for calibrating other measurement methods. The indirect method is mainly used for online measuring the moisture. The resistance method, capacitance method and inductance method have applied in casting production to some degree. However, because these methods are developed to measure the moisture content based on the dielectric coefficient, they are susceptible to many factors. With the development of computer technology, the microwave method is paid more and more attention and is gradually used in casting production. As a noncontact method, the infrared spectrometry is not affected by the temperature, density and measurement range, but it can only measure the surface moisture content. Although the performance parameter method based on the compactability and moldability measurement has been used, the precision need to be improved. Because of potential radioactive danger the neutron method is rarely used. The nuclear magnetic resonance method is still at the experimental stage.

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