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两类扇形雾喷头雾化过程比较研究

Comparative research of two kinds of flat fan nozzle atomization process

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中文摘要:

为了探究标准扇形雾喷头(ST)与防飘喷头(IDK)的雾化特性,利用雾滴粒径分析仪(PDIA)对以上2种类型喷头的雾化过程进行了试验研究与可视化图形分析。结果表明:ST喷头具有面积较大的液膜区,且具有波纹结构,破裂区内的破裂孔洞呈现不规则撕裂状;IDK喷头液膜区面积较ST喷头小,具有气泡状结构,但并未发现波纹区。随着ST与IDK喷头孔径的增大,液膜长度、破裂区长度分别由20 mm增长至40 mm、10 mm增长至20 mm。随着压力的增加,ST110-03型喷头的液膜长度由35 mm降低至22 mm,雾滴体积中径由128.2 μm 降低至92.4 μm ;IDK120-03型喷头的液膜-破裂区长度由40 mm降低至30 mm,雾滴体积中径由366.4 μm 降低至285.3 μm 。该研究可为进一步研究新型防飘喷头的雾化特性以及新型喷雾设备的生产提供参考。

英文摘要:

The objectives of this research were to study the atomization characteristics of normal flat fan nozzles and air induction flat fan nozzles which were made by the LECHLER Company by a particle droplet image analysis system (PDIA) with visualized features. Images of ST110-03 and IDK120-03 nozzles' spraying fan from orifice to 30 mm below nozzle were taken at 0.3 MPa to observe the structure of the spraying fan. Spraying visualizations were conduct from 10 to 70 mm with the interval of 10 mm below the nozzle in the spraying fan centerline of ST110-01、02、03、04 and IDK120-01、02、03、04 at 0.3 MPa to analyze the influence of orifice width on spraying sheet length. To research the influence of spraying pressure on liquid sheet length and droplet size, spraying visualizations were performed from 10 to 70mm with the interval 10mm below the nozzle in the spraying fan centerline of ST110-03 and IDK120-03 at 0.2、0.3、0.4、0.5、0.6 MPa. The results showed that there was a larger liquid sheet in the ST110-03 spraying fan. It was very easy to observe the wave formation and irregular atomization holes in the ST110-03 spraying fan. There was a smaller spraying sheet in the IDK120-03 spraying fan than in the ST110-03. There were many bubbles in the spraying sheet of the IDK120-03. The data showed that the spraying sheet length of the ST110-03 was increased from 20 to 40 mm and the atomization length of the IDK120-03 was increased from 10 to 20 mm, and also resulted in increasing intensity of bubbles with the orifice width increasing. The liquid sheet length of the ST110-03 was decreased from 35 to 22 mm and the droplets volume mean diameter was decreased from 128.2 to 92.4 μm . Also, the wave's amplitude was increased by increasing the spray pressure. The liquid sheet-atomization length of the IDK120-03 was decreased from 40 to 30 mm and the droplets volume mean diameter was decreased from 366.4 to 285.3 μm with increased spray pressure. The conclusion of the research was that there are huge differences between the spraying sheet and atomization region of IDK and ST nozzles. The air bubble existed in the liquid sheet of the IDK, and the liquid sheet length showed negative correlation with the droplets volume mean diameter.

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