考虑水质状况的空化流计算理论 Computational Theory of Cavitating Flows with　Consideration of Influence of Water Quality

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关键词：　空化流 空化压力 水质状况 水轮机

摘　要：　传统的空化流计算理论均以气穴内与表面上压力为常数，并等于海拔高度为零时的20℃清水汽化压力作为空化流的计算边界条件，把空化和汽化概念混为一谈，而且没有考虑水质状况对空化压力特性的重要影响。本文通过水质状况对空化压力特性影响的分析，提出了考虑水质状况的空化流计算理论与方法。该理论对势流理论和多相流理论的空化计算均适用。最后通过水轮机流场的计算实例验证了水质条件对空化流场流动特性的显著影响。 In conventional computational theory of cavitating flows, it is assumed that the pressure within the cavity or on the cavity surface remains constant and is equal to the vapor pressure of the clean water at 20℃ and at zero altitude. The cavitation is confused with the vaporization, and the effect of water quality on cavitation pressure characteristic is not taken into account. The effect of water quality on cavitation pressure characteristic was analyzed and the computational theory and method of cavitating flows that considered the influence of water quality was proposed. The theory is suitable for both the potential theory and two phase method for cavitating flow simulation. Finally the validation results for cavitating flows in a hydraulic turbine indicated the significant influences of water quality on the cavitating flow performance.

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