 الآية الكريمة

قوله تعالى:

{فتعالى الله الملك الحق ولا تعجل بالقرآن من قبْل أن يُقضِى إلَيْك وَحْيُه وَقُل رَب زِدْنِي عِلْمًا} [طه٣٤:١١]
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Dedication

To......

My Mother

To......

Soul My Father

To......

My Brothers

and

My Sister

To......

Anyone Who Helped Me And

Encouraged me to Achieve This Research

Researcher MORAHED
Abstract

The present research aims to study the effects of tip leakage flow phenomena on the performance of the axial flow rotor. To understand the effect of this phenomena, three different tip clearance sizes, 0, 4, and 6mm at different rotation speeds studies. The understand includes investigation of detailed tip clearance flow structures and representation of different flow parameters at different regions inside the rotor. The steady, viscous, compressible flow three dimensional governing equations representing the flow field coupled with standard $K-\varepsilon$ turbulence model are solved using computational fluid dynamic code. The analysis of the results shows, the rotor blade with zero gap has higher efficiency and higher total pressure. Increasing tip clearance, leads to decrease of both efficiency and total pressure. Also the result show the increase of tip clearance from 4mm, to 6mm strong vortex formed for tip 6mm than that for tip4mm. Also the rotation speed has great influence on the tip leakage flow and vortex. A comparison between the predicted results and available literature results indicates that the different phenomena inside the tip region and their effects are properly predicted.
يفتح هذا البحث تأثير تدفق ترسب الخلوص في الجزء الدوار محوريا السرين على اداء الجزء الدوار. لتحقيق الفهم العام لأثر التدفق على الاداء. ثلاث ابعاد من الخلوص وسرعات دوران مختلفة اخذت. باستخدام ديناميكيا المكاف آئحة الحسابية لحل معادلات السرائين المضطرب.تحليل النتائج تبين اثر زيادة الخلوص على كفاءة والضغط الكلي للجزء الدوار حيث اعلي كفاء وضغط في حالة النموزج بدون خلوص وتنخفض كفاءة زيادة الخلوص واترزيادة الخلوص من 4 الى 6 ملم في كمية ترسب الوسطي العامل. وكذلك توضح النتائج ان هنال دوامات كبيرة تتشكل في جزء الضغط المنخفض من ريشة الجزء الدوار وتزداد هذه الدوامة بزيادة الخلوص من 4 الى 6 وكذلك تتأثر بزيادة السرعة الدورانية. المقارنة بين النتائج المتوقعة والنتائج الدراسات السابقة المتاحة تشير إلى أن الظواهر المختلفة داخل المنطقة ظرف وأثارها وتقع بشكل صحيح.
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NOMENCLATURE

English symbols

\( u, v, w \)  \textit{velocity components}

\( P_0 \)  \textit{total pressure}

\( X \)  axial coordinate (m)

\( Y \)  Tangential coordinate (m)

Greek symbol

\( \mu \)  dynamic viscosity \( \left( \frac{\text{kg}}{\text{m.s}} \right) \)

\( \rho \)  density \( \left( \frac{\text{kg}}{\text{m}^3} \right) \)

\( \mu_t \)  Turbulence dynamic viscosity \( \left( \frac{\text{kg}}{\text{m.s}} \right) \)

\( \varepsilon \)  Turbulence dissipation Rate \( = \rho C_3 \frac{k^2}{\mu_t} \left( \frac{m^2}{s^3} \right) \)

\( K \)  Turbulence kinetic energy

\( \eta \)  Efficiency

Abbreviations

CFD  \textit{computational fluid dynamics}

L.E  \textit{leading edge}

PS  \textit{pressure side}

SS  \textit{suction side}

T.C  \textit{tip clearance}

T.E  \textit{trailing edge}

TP  \textit{total pressure}

Definitions

\( \nabla = \frac{\partial}{\partial x} i + \frac{\partial}{\partial y} j + \frac{\partial}{\partial z} k \)