

**LAPORAN HASIL
PENELITIAN DISERTASI DOKTOR
TAHUN ANGGARAN 2010**



Judul : **Optimasi Ujuk Kerja Turbin Arus Lintang Sebagai
Pembangkit Listrik Tenaga Air**
Peneliti : **Jusuf Haurissa**

Dibiayai Oleh Direktorat Jenderal Pendidikan Tinggi, Kementerian Pendidikan Nasional sesuai dengan Surat Perjanjian Penugasan Dalam Rangka Pelaksanaan Penugasan Penelitian Disertasi Doktor Tahun Anggaran 2010 Nomor : 492/SP2H/PP/DP2M/VI/2010, tanggal 11 Juni 2010.

**Universitas Brawijaya
Malang
2010**

**LEMBARAN PENGESAHAN
PENELITIAN HIBAH DOKTOR
TAHUN ANGGARAN 2010**

1. Judul Penelitian Hibah : Optimasi Unjuk Kerja Turbin Arus Lintang sebagai Pembangkit Listrik Mikrohidro.
2. Bidang Ilmu (penelitian) : Rekayasa
3. Judul Disertasi : Pengaruh Penambahan Saluran Pengarah Pancaran Air Pada Sudu Terhadap Kinerja dan Karakteristik Aliran Turbin Arus Lintang
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12. Biaya Penelitian : Rp. 33.950.000
13. Lokasi Penelitian :

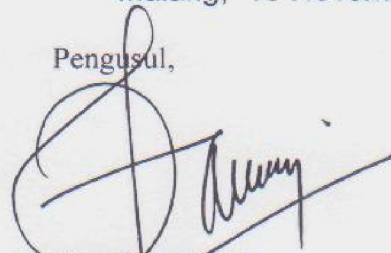
No.	Lokasi/Laboratorium	Alamat	Pemilik/Pengelola
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RINGKASAN

Tujuan Penelitian ini adalah menstabilkan Putaran Turbin dan meningkatkan efisiensi dari Turbin Arus Lintang.

Pengaruh penambahan pipa pancar (nozzel) pada sudu turbin tingkat kedua turbin arus lintang akan dikaji dalam penelitian ini. Dengan memasang pipa pancar (nozzel) pada sudu turbin tingkat kedua, kinerja turbin arus lintang menjadi lebih bertekanan pada sudu masuk tingkat kedua. Kemudian, terlihat bahwa karakteristik aliran yang akan masuk tingkat kedua sudah mengikuti garis alir aliran. Peristiwa inilah yang mengakibatkan sudu masuk tingkat kedua bertekanan. Sehingga, efisiensi maupun torsi yang tinggi, dipengaruhi oleh pipa pancar (nozzel) pada sudu masuk tingkat kedua.

Hasil menunjukkan bahwa penambahan nozzel pada sudu turbin tingkat kedua meningkatkan efisiensi turbin. Dan juga putaran poros turbin yang di hasilkan lebih stabil (konstan) bila di banding dengan tanpa menggunakan pipa pancar pada sudu turbin tingkat kedua. Putaran turbin yang dihasilkan melalui sudu turbin tingkat pertama sebesar 70 % dan sudu masuk tingkat kedua 30%.

Kata Kunci : *Turbin Arus Lintang, Head, debit air, Saluran Pengarah, Dynamic Similitude, Segitiga Kecepatan*

DAFTAR PUSTAKA

- A.V.Ramayya, Desta Lemma, Fikirte Mekeonen, Solomon Bayou and Tariku Amare, 2006, *Performance Simulation Of Locally Made Crossflow Turbine For Power Generation And Flour Mill Drives*, Department of Mechanical Engineering, Faculty of Technology, Jimma University.
- A. Thakker, J. Jarvisa, M. Buggyb, A. Saheda, 2008, *3DCAD conceptual design of the next-generation impulse turbine using the Pugh decision-matrix*, Department of Mechanical and Aeronautical Engineering, University of Limerick, Limerick, Ireland and Composite Research Center, University of Limerick, Ireland Received 5 August 2008 Accepted 9 October 2008 Available online 1 November 2008
- Achmad Hasan, 2002, *Pengontrol Beban Elektronik Pada Pembangkit Listrik Tenaga Mikrohidro*, P3 Teknologi Konversi dan Konservasi Energi Deputi Teknologi Informasi, Energi, Material dan Lingkungan Badan Pengkajian dan Penerapan Teknologi.
- Barglazan, M., 2005, *About Design Optimization of Cross-Flow Hydraulic Turbines*, The Politechnica University of Timisoara New York, Mc Graw Hill.
- Chaerul, 2008, *Prospek Pengembangan Pembangkit Listrik Tenaga Microhidro (PLTMH) di Provinsi Papua Barat*. Thesis, JBPTITBPP, Central Library Institute Technology Bandung.
- Dragu. C, Soens. J, Belmans. R. (2007). *Small-Scale Energy in The Next Century Market Hydro Plants – State of The Art and Applications*, Energy Institute Kasteelpark Arenberg, Leuven, Belgium.
- Hayati, Olgun, 1998, *Investigation of The Performance of A Cross Flow Turbine*. Mechanical Engineering Department, Karadeniz Technical University, Trabzon, Turkey. International Journal of Energy Research.
- Inversin, A.R. 1986, *Microhydro Power Source Book*, NRECA International Foundation, Washington DC.
- In Seong Hwang, Yun Han Lee, Seung Jo Kim, 2009, *Optimization of cycloidal water turbine and the performance improvement by individual blade control*, School of Mechanical and Aerospace Engineering, Seoul National University, San 56-1.
- Junichiro Fukotomi, Yoshiyuki Nakse, Masahi Ichimiya, Hirohito Ebisu, 1995, *Unsteady Fluid Force on a Blade in a Cross-flow Turbine*, JMSE International Journal, series B, vol. 38, No. 3
- Junichiro Fukutomi, Rei Nakamura, 2005, *Performance and Internal Flow of Cross-Flow Fan with Inlet Guide Vane*. JMSE International Journal series B, vol. 48, No. 4
- Karlis, A.D., Papadopoulos DP., 2000, *A Systematic Assessment of the Technical Feasibility and Economic Viability of Small Hydroelectric System Installations*. Renewable Energy 2000; 20(2):253-62.
- K.V. Alexander, E.P. Giddens, A.M. Fullera, 2009, *Radial-and-mixed flow turbines for low head microhydro systems* Department of Mechanical Engineering, University of Canterbury, PB 4800, Christchurch, New Zealand Department of Civil Engineering, University of Canterbury, Christchurch, New Zealand Received 14 September 2008 Accepted 10 December 2008 Available online 3 February 2009
- K.V. Alexander, E.P. Giddens, 2007, *Optimum penstocks for low head microhydro schemes*, Department of Mechanical Engineering, University of Canterbury, Christchurch, P.O. Box 4800, Christchurch, New Zealand and Formally of Department of Civil Engineering, University of Canterbury, 81 Grange Street, Opawa, Christchurch, New Zealand Received 8 March 2006; accepted 16 January 2007 Available online 19 March 2007

- Montanari, R., 2003, *Criteria for the Economic Planning of a Low Power Hydroelectric Plant*, Pergamon. Dipartimento di Ingegneria Industriale, Universita degli Studi di Parma, Viale delle Scienze, Parma, Italy.
- N. H. Costa PEREIRA and J. E. BORGES, 1995, *Study Of The Nozzle Flow In A Cross-Flow Turbine*, Mechanical Engineering Department, Instituto Superior Tecnico. Technical University of Lisbon, 1096 Lisboa Codex. Portugal q Received 2(July 1994; and in re-vised form 24 May 1995).
- Philip Leigh, George Aggadis, David Howard and Bob Rothschild Kampen, 2007, *Renewable Energy Resource Impact on Clean Electrical Power by developing the Nort-West England Hydro Resource Model*, Lancaster University, England.
- R.C.Morgans, C.J. Doolan and D.W. Stephens, 2005, *Derivative Free Global Optimisation of CFD Simulations*, Australasian Fluid Mechanics Conference, School of Mechanical Engineering Adelaide University, SouthAustralia, 5005 AUSTRALIA.
- Reza Aghaeitog and A. Mesgharpoor Tousi, 2007, *Design and CFD analysis of centrifugal compressor for a micro gas turbine* Department of Aerospace Engineering, Amir Kabir University of Technology, Tehran, Iran, and M.Soltani Niroo Research Institute of Iran, Tehran, Iran.
- Sai Rachoor et. al. 2006, *Renewable Energy Source: Micro Hydro Power*, New Jersey, USA.
- Stepanhorst, F.W.E. 1984. *The Ossberger Cross-Flow Turbine. Small Hydro Power Fluid Machinery*. Quebec, Canada.
- S. Warsito, Abdul Syakur, Agus Adhi Nugroho, 2005, *Studi Awal Perencanaan Sistem Mekanikal Dan Kelistrikan Pembangkit Listrik Tenaga Mini-Hidro*, Jurusan Teknik Elektro Fakultas Teknologi Industri Universitas Islam Sultan Agung Seminar Nasional Teknik Ketenagalistrikan.
- Yong Do Choi, Jae-Ik LIM, You-Tak KIM, Young-Ho Lee, 2008, *Performance and Internal Flow Characteristics of a Cross-Flow Hydro Turbine by the Shapes of Nozzle and Runner Blade*. Jurnal of Fluid Science and Technology. Korea Maritime University. Vol.3, No3, 2008.
- Autodesk Inventori Profesional 2008
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