

## INTISARI

Turbin angin beroperasi pada kecepatan angin yang fluktuatif. Untuk menjaga kecepatan rotor pada wilayah operasi di atas kecepatan *rated* diperlukan kendali *pitch*. Jonkmann<sup>[1]</sup> telah mendemonstrasikan penggunaan algoritma kendali *pitch baseline* turbin angin berupa kendali proporsional integral terjadwal gain yang telah diaplikasikan pada model NREL 5 MW. Hasil simulasi menunjukkan unjuk kerja yang baik dalam menjaga kecepatan generator.

Makalah ini menjelaskan skema kendali untuk memitigasi efek gangguan menggunakan kendali sudut *pitch* kolektif untuk operasi turbin angin pada kecepatan di atas kecepatan *rated* dengan kendali berbasis *disturbance accommodating control* (DAC). Metode penempatan pole digunakan dalam menentukan gain *full state feedback* dengan gain *disturbance feedback* dihitung secara independen. Gain *estimator* dihitung menggunakan metode penempatan pole pada model *plant* gabungan berdasarkan error estimasi. Penelitian ini menggunakan model tiga *state* berdasarkan model representasi dua massa turbin angin

Hasil perbandingan unjuk kerja kendali hasil perancangan dengan kendali *baseline* pada kecepatan angin undak 17 m/s – 18 m/s menunjukkan tanggapan yang lebih baik dengan *overshoot* kecepatan generator sebesar 20% dan *settling time* 10 s dibandingkan 15 s pada kendali *baseline*. Sedangkan pada kondisi angin turbulen dengan kecepatan rerata 18 m/s kendali *baseline* memiliki unjuk kerja yang lebih baik dengan kecepatan generator rerata 1177 rpm berbanding 1167 rpm pada kendali DAC dengan kecepatan *rated* generator 1173 rpm.

**Kata kunci :** Turbin Angin, FAST, NREL 5 MW, kendali *pitch*, *disturbance accommodating control*.

## ***Abstract***

*Wind turbine normally operates at fluctuating wind speed. In order to maintain constant generator speed above rated speed operation, pitch control is employed. Jonkmann<sup>[1]</sup> has had demonstrated the use of baseline pitch control algorithm on NREL 5 MW wind turbine using gain scheduled proportional integral control approach. Simulations has had resulted a good performace in maintaining generator speed.*

*This report explains control scheme to mitigate the effect of wind disturbance using collective pitch control on wind turbine operating above rated wind speed using disturbance accommodating control (DAC) method. Pole placement has had been used to calculate gain matrices with disturbance matrices has had been calculated separately. Estimator gain has had been calculated based on estimation error. Linear model with three states based on two masses model representation has had been used in control design.*

*Performance comparisons has had shown that pitch control based on DAC method has had shown better result in maintaining generator speed with 20 % overshoot and 10 s settling time, while baseline controller has had 20 % overshoot with 15 s settling time at step wind from 17 m/s to 18 m/s. On the other hand, baseline controller has had shown better regulation performance on turbulence wind speed with mean generator speed 1177 rpm, while DAC controller has had 1167 rpm with rated generator speed 1173 rpm.*

**Keywords :** *Wind turbine, FAST, NREL 5 MW, pitch control, disturbance accommodating control.*