

## PENERAPAN STANDAR IEC 61499 PADA PEMODELAN SISTEM TERDISTRIBUSI PROSES *FLUID CATALYTIC CRACKING* MODEL IV

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### INTISARI

*Fluid catalytic cracking* (FCC) merupakan salah satu unit proses terpenting pada kilang minyak. Keahlian operator menjadi salah satu penentu keberhasilan unit proses FCC. Simulator unit proses FCC dikembangkan untuk melatih kemampuan operator. Simulator FCC Model IV yang telah dikembangkan oleh R.C. Mc. Farlane, dkk, digunakan sebagai acuan dalam penelitian ini. Simulator FCC Model IV cukup lengkap dalam menyajikan dinamika proses yang terjadi pada proses FCC dan telah banyak digunakan sebagai simulator acuan. Simulator acuan bersifat tersentralisasi pada Matlab-Simulink, sehingga tidak dapat dilakukan konfigurasi ulang ketika simulasi dioperasikan. Pada simulator FCC acuan produk hasil perengkahan belum dapat ditinjau pada hasil simulasi.

Kebutuhan simulator dalam melatih kemampuan operator terpenuhi dengan menerapkan standar IEC 61499 pada pemodelan proses FCC. Penerapan standar IEC 61499 menggunakan 4DIAC-IDE memungkinkan perubahan masukan ketika simulasi dioperasikan. Pemodelan produk ditambahkan pada model proses FCC dapat ditinjau pada 6 komponen, yaitu *gas oil*, *diesel oil*, *gasoline*, *LPG*, *light gas*, dan *coke*. Simulator FCC terdistribusi dengan melakukan pendistribusian *resources* pada beberapa *runtime-environment* FORTE. Setelah itu dilakukan perbandingan rata-rata penggunaan memori pada simulator FCC terdistribusi.

Validasi model proses FCC standar IEC 61499 dilakukan dengan membandingkan hasil simulasi terhadap acuan pada kondisi operasi normal, perubahan karakteristik umpan, suhu atmosfer, dan suhu umpan. Validasi produk hasil simulasi dilakukan dengan membandingkan produk hasil simulasi terhadap data *plant* dan fraksi massa total hasil perengkahan, yang harus bernilai 1. Simulator FCC standar IEC 61499 yang terdistribusi pada 2, 4, dan 7 *resources* dapat mengurangi penggunaan memori simulasi tersentralisasi 1 *resources* sebesar 18%, 36%, dan 48,8%.

**Kata kunci:** Simulator FCC terdistribusi, Model Proses, Model Produk, IEC 61499.

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**THE IMPLEMENTATION OF IEC 61499 STANDARD IN MODELING  
DISTRIBUTED SYSTEMS OF FLUID CATALYTIC CRACKING  
PROCESS MODEL IV**

by

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**ABSTRACT**

Fluid catalytic cracking (FCC) is one of the most important processing units in oil refineries. Operator expertise is one of the determinants of the success of the FCC process unit. The FCC process unit simulator was developed to train operator skills. FCC Model IV Simulator which has been developed by R.C. Mc. Farlane et al. were used as the reference in this study. The FCC Model IV simulator is quite complete in presenting the process dynamics that occur in the FCC process and has been widely used as the reference simulator. The reference simulator is centralized in Matlab-Simulink, so it cannot be reconfigured when the simulation is being operated. On this reference FCC simulator the cracking products cannot be observed in the simulation results.

The need for simulators in training operator skills is met by applying the IEC 61499 standard on modeling the FCC process. The application of the IEC 61499 standard using 4DIAC-IDE enables input changes when the simulation is being operated. Product modeling added to the FCC process model can be observed in 6 components, namely gas oil, diesel oil, gasoline, LPG, light gas, and coke. The FCC simulator is distributed by distributing resources across several FORTE runtime environments, which then analysed by comparing the average memory usage of the distributed FCC simulator.

Validation of the ICC 61499 standard FCC process model is done by comparing the simulation results with reference to normal operating conditions, changes in feed characteristics, atmospheric temperature, and feed temperature. The validation of the simulation product is done by comparing the simulation product to the plant data and the total mass fraction of the cracking result, which must be 1. The IEC 61499 standard FCC Simulator that is distributed in 2, 4, and 7 resources can reduce the memory usage of centralized simulation 1 resource by 18 %, 36%, and 48.8%.

**Keywords:** Distributed FCC Simulator, Process Model, Product Model, IEC 61499.

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