

Design and evaluation of new overview screens for the LABIHS simulator

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Keywords: reactor research, PSA, fuzzy.

The development and evaluation of Human-System Interfaces (HSIs) for control rooms is a research area at the Human-System Interface Laboratory (LABIHS). The main objective of this laboratory is to develop and evaluate projects of HSIs for industrial plants using different methodology construction. The evaluation of the interfaces is carried out in the LABIHS simulator at the Nuclear Engineering Institute (IEN). Previous evaluation of the overview screen of the nuclear power plant (NPP) simulator of the LABIHS showed the necessity of additional information to reduce the operator workload. To overcome this issue, a set of three 52-inch LCD TV was acquired to replace the projector in the task of showing the overview screen to the simulator operators. A new set of screens was developed to gather information in the three LCD screens. The approach used on the development of the new screens was based on human factors guidelines and recommendations [1],[2]. The objective of this work is present the design of these new overview screens and to evaluate their contribution to reduce the operators mental workload in this new scenario. Fig. 1 presents the original overview screen of the simulator. In the design phase of this interface screen, no consideration was taken into account to satisfy the guidelines of HSI.

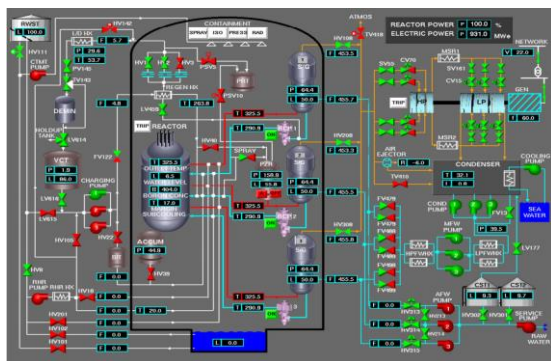


Figure 1. Proposed thermo-hydraulic overview screen

Fig. 2 presents the new developed left overview screen and Fig. 5 the screens used by the operator where information met to compose this screen.

TRIP ALARMS													
REACTIVITY		RBM		PCS		MISC CONTROL			MUETS		CONDENSER		FBIS
WARNING 1X ACT TRIP	CHT PRESSURE 1X 5.1 ACT TRIP	CHT WATER LEVEL 1X ACT TRIP	PCS LS-LOW 1X 10.0 ACT TRIP	PCS LS-LOW 1X 10.0 ACT TRIP	WARNING BOMBARDIER BELLFLOW 1X 10.0 ACT TRIP	WARNING POWER RANGE BELLFLOW 1X 10.0 ACT TRIP	WARNING BOMBARDIER BELLFLOW 1X 10.0 ACT TRIP	WARNING BOMBARDIER BELLFLOW 1X 10.0 ACT TRIP	MUETS PRESSURE LOW 1X 1.0 ACT TRIP	MUETS PRESSURE LOW 1X 1.0 ACT TRIP	CONDENSER WATER LEVEL 1X 1.0 ACT TRIP	CONDENSER WATER LEVEL 1X 1.0 ACT TRIP	FBIS WATER LEVEL 1X 1.0 ACT TRIP
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WARNING 1X ACT TRIP	CHT PRESSURE 1X 5.1 ACT TRIP	CHT WATER LEVEL 1X ACT TRIP	PCS LS-LOW 1X 10.0 ACT TRIP	PCS LS-LOW 1X 10.0 ACT TRIP	WARNING BOMBARDIER BELLFLOW 1X 10.0 ACT TRIP	WARNING POWER RANGE BELLFLOW 1X 10.0 ACT TRIP	WARNING BOMBARDIER BELLFLOW 1X 10.0 ACT TRIP	WARNING BOMBARDIER BELLFLOW 1X 10.0 ACT TRIP	MUETS PRESSURE LOW 1X 1.0 ACT TRIP	MUETS PRESSURE LOW 1X 1.0 ACT TRIP	CONDENSER WATER LEVEL 1X 1.0 ACT TRIP	CONDENSER WATER LEVEL 1X 1.0 ACT TRIP	FBIS WATER LEVEL 1X 1.0 ACT TRIP
OVERTEMP CHT ACT TRIP	CHT PRESSURE 1X 5.1 ACT TRIP	PCS WATER LEVEL 1X ACT TRIP	PCS LS-LOW 1X 10.0 ACT TRIP	PCS LS-LOW 1X 10.0 ACT TRIP	WARNING BOMBARDIER BELLFLOW 1X 10.0 ACT TRIP	WARNING POWER RANGE BELLFLOW 1X 10.0 ACT TRIP	WARNING BOMBARDIER BELLFLOW 1X 10.0 ACT TRIP	WARNING BOMBARDIER BELLFLOW 1X 10.0 ACT TRIP	MUETS PRESSURE LOW 1X 1.0 ACT TRIP	MUETS PRESSURE LOW 1X 1.0 ACT TRIP	CONDENSER WATER LEVEL 1X 1.0 ACT TRIP	CONDENSER WATER LEVEL 1X 1.0 ACT TRIP	FBIS WATER LEVEL 1X 1.0 ACT TRIP
OVERTEMP CHT ACT TRIP	CHT PRESSURE 1X 5.1 ACT TRIP	PCS WATER LEVEL 1X ACT TRIP	PCS LS-LOW 1X 10.0 ACT TRIP	PCS LS-LOW 1X 10.0 ACT TRIP	WARNING BOMBARDIER BELLFLOW 1X 10.0 ACT TRIP	WARNING POWER RANGE BELLFLOW 1							

Figure 2. Proposed Alarm overview Screen.

The new right overview screen integrates information to the operators about the position of the rods of the control and shutdown banks in the reactor core, the thermo-hydraulic operation point of the plant in a pressure versus temperature curve (P-T curve), and plant mode operation. Fig. 3 presents the new developed Pressure-Temperature Curve overview screen

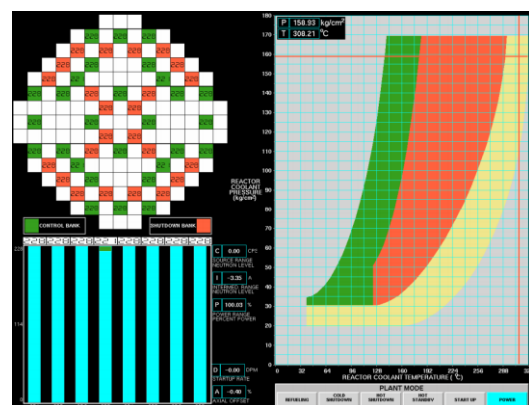


Figure 3. Proposed PT-Curve overview screen

References

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