Description:

Air Fuel Ratio (AFR) control system from ComAp Systems is a comprehensive solution for generating sets driven by lean burn gas engines. The system consists of several specific control and interface modules:

- InteliSys<sup>NT</sup> AFR – Highly configurable, expandable gen-set controller with built-in PLC functions
- ECON-3, ECON-4 – digital speed governor with possible misfiring detection (in ECON-4 only)
- I-Step – interface to stepper motor actuator controlling variable gas/air mixer
- DENOX-20 – anti-knocking system with 20 channels, (marketed as DetCon20 by MOTORTECH)
- I/O modules – inputs and outputs for various analog and binary signals.

Optimal set of modules depends on engine size and number of cylinders. Control modules are fully integrated via CAN bus. The key parameters from all modules are accessible via the main display on InteliSys.

All key algorithms are field proven on many installations:

- AFR algorithm keeps air to fuel ratio on the optimal level, ensuring the right exhaust gas emissions with minimum of AFR readjusting
- Knocking and misfiring detections protect engine from severe damage when the gas quality exceeds the expected limits or when some engine defect makes combustion unreliable

Benefits:

- Fully integrated system – all parts and parameters are monitored and accessible from a single point.
- Simple and robust AFR algorithm does not require lambda sensor.
- Gen-set performance log stored in InteliSys<sup>NT</sup> AFR is an invaluable tool for troubleshooting.
- Solution for various types of gases – natural gas, landfill gas, biogas, with possible utilization of the CH4 content of the gas.
- Built-in PLC functions and high configurability of InteliSys<sup>NT</sup> AFR enables to build the system exactly satisfying the customer needs.
- Excellent remote monitoring features backed by sophisticated PC programs are especially suited to fleet owners – helping plan maintenance and trace production of heat and energy for each genset from the fleet.
Elements of the system

InteliSysNT AFR

Description:
InteliSysNT AFR provides comprehensive AFR control system for lean burn applications for single or multiple gas gen-sets.
The system offers a solution for either a single gen-set or up to 32 gen-sets in parallel. Powerful graphical display, with possibility of color display version with user friendly control allows even new users to find quickly the required information.

Benefits:
- Field proven AFR solution ensures the right exhaust gas emissions with minimum of AFR readjusting, minimizing the operator interference with the system
- Solution for various types of gases – natural gas, landfill gas, biogas, with possible utilization of the CH4 content of the gas
- No Lambda sensor required
- Excellent configurability enables the user to achieve the required behaviour for their application
- One solution for both gen-set applications and large CHP applications
- Wide range of communication possibilities means you can monitor and supervise the system remotely, from office or home
- Built-in PLC with user friendly PLC

Features:
- Automatic synchronizing and power control (via speed governor)
- Voltage and PF control
- Generator measurement: U, I, Hz, kW, kVAR, kVA, PF
- Mains/Bus measurement: U, I, Hz, kW, kVAR, PF
- Manual and Automatic operational mode
- Event-based history (up to 1000 records) with customer selectable list of stored values, RTC, static values
- Interface to remote display units (3xIS-Display)

Editor removes the necessity of external PLC usage
- Gen-set performance log for an regular overview (kW per month, etc) and easy problem checking

Communication:
- 2xRS232/RS485 interface with Modbus RTU protocol support
- Analogue / GSM / ISDN / CDMA modem communication support
- SMS messages / emails based on engine protection activation
- Ethernet / Internet interface via IG-IB module

PC software:
- GenConfig – free configuration tool for controller adjustment
- InteliMonitor – free PC SCADA software for supervision of single or multiple controllers, for multiple sites configurable site structure. Direct / Modem / Internet connection

Upgrade kits:
- IGS-NT-AFR-PCM: enables the functionality of the AFR control system
- IGS-NT-AFR-LSM+PMS: enables the functionality of the AFR control system and enables the PMS system for multiple operation (via CAN bus)
Elements of the system

**ECON-3**
- Speed governor for control of various types of actuators (Heinzmann, GAC, Woodward)
- Capable of controlling 2 actuators from one unit
- Integration with InteliSys® AFR controller via CAN line
- Parameters for adjustment accessible via main unit
- 3 PID loops for adjustment
  - Actuator response
  - Speed control
  - Load control

**ECON-4**
- Digital speed governor as an alternative to ECON-3 governor, capable to control 1 actuator
- Additional feature against ECON-3 is possible misfiring detection, signalized in the main controller

**I-Step**
- Stepper motor driver
- Capable of controlling up to 2 stepper motors from 1 unit
- Integration with InteliSys® AFR controller via CAN line
- Parameters for adjustment accessible via main unit
- Adjustable start speed and start steps, maximum speed
- Adjustable stepper maximum allowable current
- 3 operational modes:
  - Calibration to 1 end-point
  - Calibration to 2 end-points
  - Position feedback information

**DENOX-20**
- Anti knocking device
- Field proven solution of knocking detection
- Integration with InteliSys® AFR controller via CAN line
- Parameters for adjustment accessible via main unit
- Up to 20 monitoring channels
- One channel can be configured for 1 cylinder monitoring, or for monitoring of 2 neighbouring cylinders
Schematic diagram

- ECON-4 can be used as an alternative to ECON-3 on systems where just one actuator is fitted.
- Ignition module communication (displaying Ignition data) is not supported by default. In case of specific requirements the Ignition module support can be implemented (via RS485, CAN, etc.).

Agrogen, located in Merkendorf Germany, is one of the leading suppliers of cogen sets into the biogas industry.

Its gensets are controlled by ComAp’s InteliSys™ controller line using the AFR (air fuel ratio control) software allowing efficient control of the plant and its heat circuits as well as emissions under variable load. As the system is fully integrated using CAN bus based extensions modules, it allows full remote control and adjustment over GSM/GPRS modem and via Internet.

Complex CHP
United Kingdom, London

A Jenbacher 6 series engine, 1945 kW, fuelled by natural gas was converted from Jenbacher Dia. Ne solution to ComAp Systems AFR solution.

The system was supplied and commissioned by ComAp Systems UK. The complexity of the system and high number of sensing signals led to solution with InteliSys™ AFR for engine control and InteliSys™ for auxiliaries control.

The engine is demanded to run automatically at predefined times throughout the day exporting electrical power of 1945 kW into the grid and supplying the customer’s greenhouses with heating water of defined temperature. The ComAp Systems solution also provides essential signals to the customer’s PLC for exhaust gas treatment to obtain CO₂ for further utilization within the greenhouses.
Mini AFR solutions

InteliGen<sup>NT</sup> miniAFR is the InteliGen<sup>NT</sup> based variant of the AFR lean burn control system for generating sets up to 75kW. Ideal price/performance ratio solution for micro and mini CHP installations, utilizing the similar AFR algorithm from InteliSys<sup>NT</sup> AFR.

**Upgrade kits:**
- IGS-NT-miniAFR-PCM: enables the functionality of the lean burn AFR control system
- IGS-NT-miniAFR-LSM+PMS: enables the Power management functionality in the miniAFR software

For more information about our products and solutions visit

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