What changes are we seeing in equipment specifications?

What’s being discussed in client meetings?

What’s happening in the market to support these requests?
EQUIPMENT TYPE

• Arc Resistant Switchgear and MCC

• Equipment Configurations
  • Arc Resistant NEMA 3R non-walk-in
  • Mixing equipment types on a single line-up
    • Close-coupling MCC with switchgear
    • Mixing different manufacturer’s arc resistant designs in a single line-up

• Arc Resistant Utility Metering Enclosures
EQUIPMENT SIZE

• The perception of a trend toward smaller equipment – not always true
  • The requested size of the equipment is often based on the cost of real estate at the installation
  • The actual size is dictated by the type of equipment. As an example; AR rated equipment generally cannot be reduced in size without retest
EQUIPMENT SIZE

• Complete front access (no rear doors)

• Smaller gear generally means more difficult installation and repair

• The GIS footprint is becoming more interesting to users, but the costs associated with SF$_6$ and the EPA are sending mixed signals
SWITCHGEAR RATINGS

• **Short-Circuit Current** – Not as much emphasis in higher current

• **Dielectric** – A trend toward higher than standard for MV gear. No real change in LV gear

• **Continuous Current** – A trend toward higher continuous current and a trend against using force-cooling
SWITCHGEAR RATINGS

• Interest in 15kV ratings for Motor Control

• Interest in higher amperage HRG

• Increased interest in VFDs with more exotic configurations
SWITCHGEAR RATINGS

• IEEE Design Testing
  – Circuit Breaker Testing is moving more to IEC methods, but the IEEE ratings are retained
  – Switchgear Testing and Ratings are solidly IEEE
ADDITIONAL TESTING

• Design Tests
  • Combinations of Design Tests using Different Standards
  • Design Tests Made from Customer Specifications

• Production Tests
  • Partial Discharge Testing
  • Design Testing on Production Equipment
INSTALLATION AND COMMISSIONING

• Trend toward hiring third party companies to do the installation and commissioning
  • The third party is viewed as impartial
TRAINING

• When onsite maintenance teams exist, the trend is to have the supplier train the maintenance and operations personnel

• General trend toward hiring outside service companies to eliminate the cost of onsite teams
FEATURES

• Longer Life
• No Maintenance
• Monitoring
• Communication
• Remote Operation
• Arc Fault Protection
• Seismic Ratings
• Customized G&T Devices
FEATURES

• Verification of Vacuum (vacuum breakers)
• Integrated Ground Switch
• Metal-Clad switchgear with switches
FEATURES – Longer Life

• What Constitutes “Longer Life” in switchgear used in the power and petro-chem markets?
  • The unwritten rule is 40 year life expectancy
  • Life of the interrupter?
  • Number of mechanical operations of the mechanism?
  • Number of electrical operations?
  • Time between maintenance?
  • Or is It just the time the equipment stands without rusting out?
FEATURES – Longer Life

• What Constitutes “Longer Life” for equipment used in the data processing industry?
  • Typical life is 5 years
  • Switchgear is considered “disposable”
  • Does longer life increase the value in this market?
FEATURES - No Maintenance

• What Constitutes “No Maintenance”?  
  • Sealed in an air-tight enclosure?  
  • No lubricated parts?  
  • No periodic adjustments?
FEATURES – Monitoring

• NO DATA!!!
  • System Status and Action Instructions only

• Smart Grid – Communications/Connectivity
  • Compliance with various protocols
  • Compliant with local firewall
FEATURES – Monitoring

• Monitored Conditions
  • Circuit Breaker Operation
  • Partial Discharge
  • Atmospheric Conditions
  • Bus and Circuit Breaker Temperatures
FEATURES – Monitoring

• Circuit Breakers (general)
  • Are the coils functional? Test without operating the circuit breaker

• Vacuum Circuit Breakers
  • Test vacuum while in service
  • Visible contact break
FEATURES – Communication

- Communication is a tricky area for most companies
  - Are communication lines susceptible to hacking?
- Most relays come with communication
  - IEC 61850 is being spec’d for relays
- Most monitoring and detection systems offer communication
FEATURES – Remote Operation

• Remote Racking Circuit Breakers and Auxiliary Rollout Trucks
  • External
  • On-board

• Remote Control
  • Racking
  • Circuit Breaker Operation
  • Communication with monitoring systems
FEATURES – Arc Fault Protection

• Arc Resistant Switchgear
  • Mechanical

• Specialized Relays and Protective Devices
  • High-speed devices to trip or commutate the fault current
FEATURES – Arc Fault Protection

• Standard NEMA 1 Switchgear with Specialized Relays and Protective Devices

• Extension to Existing Equipment
  • Increasing inquiries for making the installed base of non-AR equipment into AR rated gear by adding relay and sensing packages
FEATURES – Arc Fault Protection

• Questions about IEEE Arc Resistant Rating Type 2C are more frequent.
  • This indicates two things:
    • Concern for reducing equipment down time
    • Operators are working in energized equipment
FEATURES – Seismic Ratings

• Increased interest in seismic rated equipment
  • Changes in seismic activity
  • Changes in the ratings of locations
  • Revisions to building codes

• There is still no standardized rating.
  • The various test procedures do not produce results that are comparable.
FEATURES – Customized G&T

• Users of G&Ts have always requested the device be customize to meet their operating procedures

• Remote/Closed-door racking
  • Most commonly requested with AR switchgear
FEATURES – Verification of Vacuum

- Vacuum Circuit Breakers have two characteristics that are considered negative:
  - You cannot see inside them to verify contact part (visible break)
  - Monitoring vacuum while energized is not available
FEATURES – Switches in Metal-Clad

• Metal-Clad switchgear by definition requires that the primary switching devices be drawout. That means a switch on a breaker truck or similar racking means.

• Stationary switches do not comply, however;
  • Load break switches
  • Disconnect switches
  • Grounding switches

are all specified in Metal-Clad designs
FEATURES – Integrated Ground Switch

- Automatic/Manual
- Static Ground
- Fault Making
EQUIPMENT ROOM

• Batteries. Slow transition from Lead to Lithium Batteries.
• Fire-rated walls on the building
• Major changes to buildings due to the government rule changes with regard to insulation, lighting, etc.
What Did I Miss?

Questions