Minimally Qualified Candidate (MQC) Profile

Compressed Air & Gas Institute (CAGI)

Compressed Air System Assessor Specialist Examination

Assumptions of the MQC

- Understands common compressed air system components, controls, measurements, and end uses encountered in industrial facilities.
- Can work safely within site safety requirements and can recognize when additional precautions, permits, PPE, or specialist involvement are required.
- Can apply standard compressed air calculations and interpret common engineering relationships involving pressure, flow, power, storage, dew point, and system response.
- Can identify major opportunities for improvement but is not necessarily expected to independently resolve highly specialized process risks, unusual code interpretations, or complex custom system redesign without consultation.

MQC Profile by Major Knowledge/Task Domain

1. Assessment Planning, Scope, Standards, and Safety

- The MQC can describe the purpose of a compressed air system assessment and can frame the work using a systems approach that considers the full chain from energy input to end use, rather than viewing individual components in isolation.
- The MQC can work with plant personnel and relevant specialists to define site-specific goals, operating constraints, production considerations, and the boundaries of the assessment.
- The MQC can identify typical operating periods or day types, determine when data collection is representative of normal operation, and recognize when additional baseline data or clarification is needed.
- The MQC can develop or follow a measurement plan that identifies what to measure, where to measure it, and how frequently measurements should be recorded in order to characterize normal operation and dynamic events.
- The MQC can recognize common assessment hazards (e.g., energized electrical panels, arc flash exposure, pressure hazards, and hazardous-area instrumentation constraints).

2. Compressed Air System Fundamentals and Terminology

- The MQC understands the major subsystems of a compressed air system, including generation, primary/wet storage, treatment, dry storage, distribution, controls, point-of-use conditioning, and end-use devices.
- The MQC can explain common compressed air terms and engineering concepts such as acfm, scfm, free air delivered, absolute versus gauge pressure, minimum system pressure, pressure profile, drawdown, deadband, effective storage, compression ratio, and capacitance.
- The MQC understands that system performance must be judged relative to production requirements and the minimum pressure needed to sustain processes rather than by compressor discharge pressure alone.
- The MQC can distinguish between moisture-related concepts such as dew point, pressure dew point, relative humidity, and saturation, and can explain why these concepts matter in system reliability and product quality.
- The MQC understands that pressure, flow, temperature, and power are interrelated and can use that understanding to interpret system behavior at a practical level.

3. Compressor Technologies, Capacity Control, and Supply-Side Operation

- The MQC understands the operating principles and typical application characteristics of common compressor technologies used in industrial compressed air systems.
- The MQC can describe common capacity-control approaches such as load/unload, modulation, variable displacement, variable speed control, and blowoff, including their effects on efficiency, stability, and control response.

- The MQC can interpret the roles of baseload and trim compressors, recognize control gaps, and understand how poor sequencing or incorrect setpoints can produce unstable pressure, unnecessary unloaded running, or inefficient operation.
- The MQC can identify common supply-side performance issues (e.g., short cycling, excessive blowoff, failed control components, poor ventilation, excessive intake or exhaust duct losses, elevated cooling water temperature, abnormal discharge temperatures).
- The MQC can interpret compressor performance information provided on CAGI data sheets or equivalent published information and can use that information in routine assessment calculations and comparisons.

4. Storage, Air Treatment, and Compressed Air Quality

- The MQC understands the purpose and practical effects of wet storage, dry storage, offline storage, and point-of-use storage, including how storage placement influences pressure stability, drawdown response, and effective system capacitance.
- The MQC can observe whether storage is likely to be too little, poorly located, or used in a way that does not support the process need.
- The MQC understands the basic operating principles, performance limitations, and common failure modes of refrigerated dryers, heatless regenerative dryers, blower purge dryers, filters, separators, and condensate drains.
- The MQC can recognize the system consequences of poor moisture removal, purge losses, clogged filters, failed drains, desiccant damage, or improperly sized treatment equipment.
- The MQC understands the relevance of compressed air quality requirements, including water, oil, and particulate contamination classes, and can relate treatment recommendations to process needs and relevant standards such as ISO 8573 concepts.

5. Instrumentation, Measurement Planning, and Data Quality

- The MQC can select and apply common instruments used in compressed air assessments, including pressure sensors, flowmeters, dew point instruments, power analyzers/transducers, and related data-loggers.
- The MQC understands the difference between directly measured values and inferred values, and can recognize when direct measurement should be preferred over assumptions or manufacturer estimates.
- The MQC can determine measurement locations that will best support diagnosis of restrictions, pressure loss, demand events, and compressor control response.
- The MQC can choose data intervals and sample rates that are appropriate for both long-term trends and short-duration dynamic events, and understands the risks of aliasing or missing transient behavior.
- The MQC can explain common measurement-quality concepts such as instrument accuracy, scaling, coverage interval, confidence, standard deviation, and quantification uncertainty at a practical assessment level.

6. Demand-Side Analysis, End Uses, and Pressure/Flow Requirements

- The MQC can characterize compressed air demand at the process or equipment level and can distinguish average demand, peak demand, intermittent events, and artificial demand.
- The MQC understands common end-use components such as filters, regulators, lubricators, diaphragm regulators, flow controllers, and local storage devices, and can recognize when these components may be undersized, dirty, misapplied, or causing unacceptable droop or restriction.
- The MQC can identify inappropriate or unnecessarily expensive uses of compressed air and can recognize when blowers, electric drives, fans, vacuum technologies, or other alternatives may be more suitable.
- The MQC can analyze common pneumatic applications (e.g., cylinders, baghouse pulse systems, machine tools, air motors, AOD pumps, conveying applications) well enough to estimate consumption, peak-flow needs, operating pressure requirements, and practical improvement options.
- The MQC can recognize when point-of-use storage, better demand-side piping, or revised local regulation may solve a pressure-performance problem more effectively than raising plant pressure.

7. Distribution, Pressure Loss, Storage Dynamics, and System Response

- The MQC understands how flow through piping and components creates pressure loss, and can explain why pressure drop often changes disproportionately as flow increases.
- The MQC can evaluate the likely effects of pipe size, branch layout, component restrictions, filters, dryers, and FRLs on end-use pressure and overall pressure profile.
- The MQC can calculate or estimate system volume, storage effectiveness, pressure decay, receiver support time, refill rate, and the pressure consequences of compressor failure, startup delay, or short-duration peak demand events.
- The MQC can interpret pressure and flow behavior to distinguish supply-side events, demand-side events, and component pressure-drop events, and can identify the most likely location of the problem within the system.
- The MQC understands that the recommended pressure profile should be evaluated from compressor discharge through treatment and distribution to the end-use device itself.

8. Energy Performance, Economics, and Opportunity Identification

- The MQC can relate compressor operating mode, system pressure, air demand, and treatment losses to overall energy use and operating cost.
- The MQC can estimate common performance and economic metrics such as annual energy consumption, annual operating cost, simple payback, leak load, specific power, and the approximate cost impacts of wasteful practices or poor control.
- The MQC understands that reducing unnecessary demand, artificial demand, blowoff, leakage, excessive pressure, and inappropriate compressed air use is often central to efficient system operation.
- The MQC can identify and compare practical improvement opportunities such as leak repair, control optimization, storage relocation or resizing, pressure reduction, piping improvements, treatment corrections, demand-side fixes, and equipment substitution.
- The MQC can distinguish between recommendations that improve reliability or stability and those that directly reduce energy consumption, while recognizing that many opportunities affect both.

9. Heat Recovery, Sustainability, and Communication of Results

- The MQC understands that a significant portion of compressor input energy leaves the system as heat and can identify common beneficial uses for recoverable heat from air-cooled and water-cooled compressors.
- The MQC can recognize when compressor room ventilation, remote intake arrangements, or exhaust ducting affect equipment performance, reliability, and heat recovery potential.
- The MQC can communicate assessment findings in a form that is technically sound and understandable to plant stakeholders, including clear statements of the issue, likely cause, recommended action, expected effect, and any important assumptions or limitations.
- The MQC can contribute to a site-specific action plan that balances energy performance, reliability, production needs, maintainability, and compressed air quality requirements.

Activities That May Exceed the Expected Scope of the MQC

- Interpreting unusual or conflicting code requirements without support from the appropriate authority having jurisdiction, qualified inspector, or specialist.
- Independently redesigning highly specialized process equipment, custom controls, or complex compressor installations with significant process, safety, or warranty implications.
- Making final determinations on hazardous-area instrument selection, major electrical protection changes, or pressure-vessel integrity without the appropriate qualified personnel.
- Guaranteeing energy savings or product-quality outcomes where site-specific testing, process validation, or engineering review is still required.