Title: A Gas Measurement Test Facility by E. L. Upp

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We have heard a great deal of discussion in recent years as to the need for a Gas Measurement Test Facility. What is meant by a Gas Measurement Test Facility? Ideally, it would be a facility that could be used by any interested party to conduct controlled gas flow tests that would produce answers for that party and be accepted by others as accurate and meaningful. This is probably an over simplification of the problems, but at least it starts us thinking in the same areas of what is meant by a Test Facility.

Mr. Pat Miller states that "In regard to measuring and regulating test facilities, perhaps we who are most effected have been too close to the forest to see the trees". "The aggregate of the measuring and regulating facilities of the natural gas industry embody all of the conditions of flow required for testing each piece of new or improved measuring and regulating equipment or there is no need for its development".

"With proper encouragement, I believe that a good percentage of the companies handling large volumes of gas would be willing to provide extra flanged piping space at new gas measuring and/or regulating stations as well as at existing stations to facilitate the testing of gas meter and regulator equipment submitted for test by manufacturers and other industry groups".

These two definitions of a flow facility cover two of the possible solutions to the problem of "Do we need such an installation?" However, first there are two answers to this question - "Yes, we do need a facility", and "No, we don't need one".

At the present we do not need a facility if all gas flow measurement problems are being answered to the industry's satisfaction. Some are of this opinion; however, others think there are areas of need for information such as:

1. Test on new meters
2. Acceptance of new metering devices to meet contract requirements
3. Improve old devices and methods
4. Automation and data handling improvements
5. Develop techniques for unusual gas compositions that have not been handled before in terms of operating pressures and temperatures - such as ethane and ethylene.
6. Develop techniques to sell on a basis other than a cubic foot.
7. Prove that present practices are within the "commercially practical limits" of accuracy and cost.

The question comes up of what is presently available? Again quoting Mr. Pat Miller "Our natural gas production, processing, transmission, storage, and distribution systems are replete with any amount of gas flow, any type of flow, any pressure, variety of fluid quality - from two phase to methane - all types

of meters for comparison, all current instrumentation, space for installation, routine or special attention by existing company personnel, and an array of experienced technically and administratively competent people in resident who are motivated by both academic and economic interests". In addition, several manufacturers and Universities have flow facilities of their own.

The general draw back to all of these seems to be acceptance by the gas industry in general of the results that are individually determined. The last work that has become an industry standard was the work done at Refugio by the AGA-ASME committees on the large diameter tubes. The acceptance of this work was due to the overall cooperation of the many interested parties so that most questionable feature of the test procedures and facilities were answered prior to the tests.

Since the Refugio Tests, there has been considerable work done by individual gas companies, research groups, and manufacturers that has little acceptance outside of the company or group that ran or sponsored the tests. Many of these tests are repetitions of tests that others have run and not too surprisingly the results and conclusions do not always agree. These results have prompted the suggestion that one facility be established to answer all of these questions. The suggestion is simple, but the accomplishment is more difficult.

It would be difficult, if not impossible to find one facility that has sufficient variables to answer "all questions". Consequently, the first compromise would have to be made based on which flow questions were most vital. The second problem would be one of financing. (In the construction of the Refugio test facility over $200,000 worth of equipment and labor were donated for its construction). If the facility were operated on a continuing basis, payment of personnel would have to be worked out. If it were operated on an intermittent basis, volunteer personnel would have to be obtained from the participating companies. Recently, it has been more and more difficult, finding companies with extra material and personnel to give to this type project. Whether or not a project such as this could become self-sustaining remains to be seen, however, the flow facility that Mr. Arnberg has at Boulder, Colorado has had some problems of financing.

Another problem that has been gingerly dealt with is the problem of possible government standardization of measurement. There is no positive basis for assuming that the governmental agencies will require a measurement standardization, but several years ago no one would have thought that would be the case in terms of pipeline safety. A year ago at the AGA measurement round table a representative of the Bureau of Standards stated (with reference to the metric system) that if industry did not do the job of studying the problem, that there was a good chance that sooner or later a government decision might be made anyway. There is a possibility of this happening to measurement because of recent actions of the Federal Power Commission in terms of measurement procedures, such as, the Permian decision and the study of BTU corrections. The leadership for studies of this sort should come from the gas industry and more particularly the people most informed on the total problem, the Industry Measurement people. There are numerous associations and groups such as: the AGA, ASME, SGA, WGPA, API, CNGA, ISA, National Bureau of Standards, various schools and societies that have an interest in this field that should furnish leadership for these projects. However, we as a group tend to project an impression that we are completely happy with our present practices and see no need for study or change.

Basically, what we are saying is who should set the standards of Gas Measurement and what is to be the basis of these standards? There is no question that to

date the AGA - more particularly the Measurement Committee - has done this job. Are we still providing the leadership to set the standards tomorrow? Within the gas industry is the best talent for this job. We should recognize the liability that if the job is neglected, we are in danger of having it done outside of our group.

Most industry people react to this suggestion by saying "What is wrong with our present equipment and methods that experimentation will correct?". As has been stated many times in the past there is very little data that shows the present equipment and methods to be in error outside the limits of the present tolerances. There are cases where the equipment has been misapplied because of some of the flowing conditions, or over zealous designers "saving" a few dollars on installation costs by restricting piping to below minimum design specifications. Experimentation will never completely eliminate these problems, however, the additional education that presentation of such data affords would be worth the effort alone.

Mr. Pat Miller has suggested that the role of the Measurement Committee in a "Gas Industry Measuring and Regulating Equipment Test Facility Pool" should be implemented through a permanent Task Group to be identified accordingly. The membership of this Task Group would consist of representatives of Gas Companies and Measuring and Regulating Equipment Manufacturers. Instructions to the Task Group would include the following:

I. Address to the AGA membership a carefully worded letter of explanation of the program giving background, necessity and goals.

(a). Point out advantages to Manufacturers which may be derived by cueing appropriate representatives of gas companies in on equipment developments and arranging with them for the use of field operating facilities for test purposes.

(b). Provide a suggested form for use by a manufacturer in applying to a gas company for assistance in field-testing.

(c). Provide a suggested form for use by the gas company in complying with a manufacturer's request for assistance in field-testing.

(d). Include an outline listing and explaining the essential steps in field performance capacity and accuracy testing and indicate the recommended minimum acceptable operating performance results.

(e). Provide a suggested test report form. (Each form should carry a footnote to the effect that copy of reports are to be furnished to the AGA Measurement Committee Test Facility Task Group, 605 Third Avenue, New York, N.Y. 10016).

II. Expedite the program, handle matters as they arise and make usual progress reports and receive instructions at the Spring and Fall meetings.

We should recognize that we have available to us, test facilities and procedures that were not available even three or four years ago. To mention a few of these we have: much more sensitive primary standards such as the new weigh systems, the mechanical displacement provers, both liquid and gas, additional measuring systems, such as turbine meters, magnetic flow meters, laser meters, sonic meters, and the like which might serve as secondary standards. Any one of these has possibilities that were not available to us before. As an example what this

means to us, the original coefficient of discharge work was done to a tolerance of +. 5% because of the metering capabilities of the basic standard. This tolerance could at least be cut in half if the data were rerun. This does not mean that the coefficients would necessarily change - chances are they would not - but we could reduce the stated accuracy in half and improve the stated over all system accuracy. Many people outside of the industry are concerned by the wide tolerances we have on our measurement. When the ASME under Mr. Bob Davis' subcommittee completes the restudy of the coefficient data this tolerance may be reduced on the basis of present data.

A new concept is available to us for which we can thank the liquid measurement people. This is the practice of testing the actual throughput of station against a standard. In large volume gas measurement individual parts of a station are tested to see if they individually meet the tolerances set in the standards. Essentially, we do not know what the overall accuracy of a given station is except by statistically adding the individual tolerances. However, we know from our lost or unaccounted for reports that we aren't as far off as these calculated percentages would indicate.

Another point that needs to be made is "What is the true need for accurate measurement as against the overworked term commercial tolerances?". It is true that tolerances give room for inaccuracies, but at the same time accuracies have their limit if the cost of obtaining them is beyond a "reasonable figure". So a balance of these must be obtained. One of the great influences of our times is the technological advances being brought about by the work being done in the NASA and related governmental programs. It may fairly be stated that accuracy comes before cost in a great number of their decisions. From a number of these programs we hear stated flow measurement accuracies to hundredths of a percent. Incidentally, this seems somewhat hard to believe since they relate the measurement to the Bureau of Standards were several tenths is still talked about in terms of true accuracy for the basic coefficient alone. Perhaps the hundredths of a percent refers to repeatability not accuracy. In addition, the basic requirements of NASA and commercial measurement are not necessarily the same. In a number of instances the NASA measurements are of short duration. Commercial gas measurement goes on 24 hours a day 365 days a year so that long term ruggedness is a major requirement. Also, any tolerances that range from plus to minus tend with long periods of time and multiple installations to balance closer to zero than the extremes that are quoted.

In review, we are living in a time where a press for change is constant. So far little real change has come into measurement in the Gas Industry. However, there are increasing pressures being applied to about this change - by management that says "Automate", by manufacturer's that say "I have a meter that can do a better job", and by governmental agencies that say "Is the measurement an accurate reflection of the goods being sold the consumer". Who can say unequivocally whether or not anyone of the three has a legitimate case? Certainly an accurate set of tests conducted by the measurement people of the gas industry has the best chance of answering these questions fairly for all concerned.