MECHANICAL ENGINEERING NEWS

COADE

For the Power, Petrochemical and Related Industries

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BULLETIN POLICY

The **COADE** Mechanical Engineering News Bulletin is published on a quarterly basis from the **COADE** offices in Houston, Texas. The Bulletin is intended to provide information about software applications and development for Mechanical Engineers serving the power, petrochemical and related industries. Additionally the Bulletin will function as the official notification vehicle for software errors discovered in those mechanical programs offered by **COADE**.

PC HARDWARE FOR THE ENGINEERING USER (PART 5)

The last issue of **"Mechanical Engineering News"** reported disappointing news about OS/2. Recent literature indicates the situation has not improved, and from a "user expense" point of view has deteriorated. What are these expenses which the user must swallow? First is the cost of the operating system itself. This will no longer be a $100 expense, rather a $300 to $800 outlay. Second, it is reported that OS/2 will consume the majority of a 20 Mbyte hard disk. Therefore users running substantial applications packages will need to have at least a 40 Mbyte drive if they want to operate with breathing room. Third, OS/2 takes an unwarranted amount of memory, 1.5 to 2 Mbytes just to boot the system. (Use of the Presentation Manager will require an additional 2.5 Mbytes of memory.) Additional memory must be available to execute application packages. The

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applications and errors are uncovered by taking this approach when looking at the results.

Many areas of piping related quality assurance are under scrutiny today as the optimization of piping and steel structures, combined with higher pressures and temperatures creates a more critical environment in which to work. Primary interest is in the following areas:

1 - Input coding mistakes

2 - Computer operating system errors.

3 - Program errors and reporting.

This article was written to outline some of the reliability concerns associated with the correct analysis of piping systems, and to create a forum for interaction between the developers and users of piping programs so that we can effectively and practically eliminate and understand problems due to faulty analysis.

ARTICLE ON: SUSTAINED AND EXPANSION STRESSES.

This particular article in the last issue of **"Mechanical Engineering News"** generated considerable interest. In an attempt to clarify the items discussed, the following bullets were developed to summarize the major issues in the article:

* There are stress contributions associated with nonlinear supports, (i.e. +Y's, guides and limit stops with gaps, and friction). These stress contributions are zero when a piping system is perfectly linear.

* Ultimately these nonlinear stress contributions must be broken down into primary/sustained or secondary/expansion stress components to be dealt with by the piping codes.

* The added bending stress component due to weight, when a +Y support lifts off (the most common nonlinear stress component), should be added to the secondary/expansion stress component of the code stress because the stress is cyclic, thus contributing to fatigue failure.

* The added bending stress component due to weight, when a +Y support lifts off, should in some cases ALSO be added to the primary/sustained stress component of the code stress because the displacement necessary to cause self-relieving is considered excessive.

* It is always conservative to add these nonlinear stress components to the sustained stresses, as well as to the expansion stresses, because in some situations they have the characteristics of both.

* **CAESAR II** adds the nonlinear stress component to the expansion stress The **CAESAR II** sustained stress calculation should be reviewed whenever:

  1 - The liftoff at a +Y support is large in terms of displacement

2 - The hot allowable stress is very small, i.e. the piping system is very hot.

* Many other piping programs add the nonlinear stress component to the sustained stress, (and incorrectly leave it out of the expansion stress). The expansion stress calculations of these programs can be in error whenever a nonlinear support is activated, regardless of the temperature, or degree of activation.

* The **CAESAR II** approach is preferred because:

Expansion stresses are generally more important to compute accurately:

a. They most often govern the design

b.) Expansion stress failures tend to be catastrophic

2 - The possible sustained stress non-conservatism" applies in a much smaller number of situations.

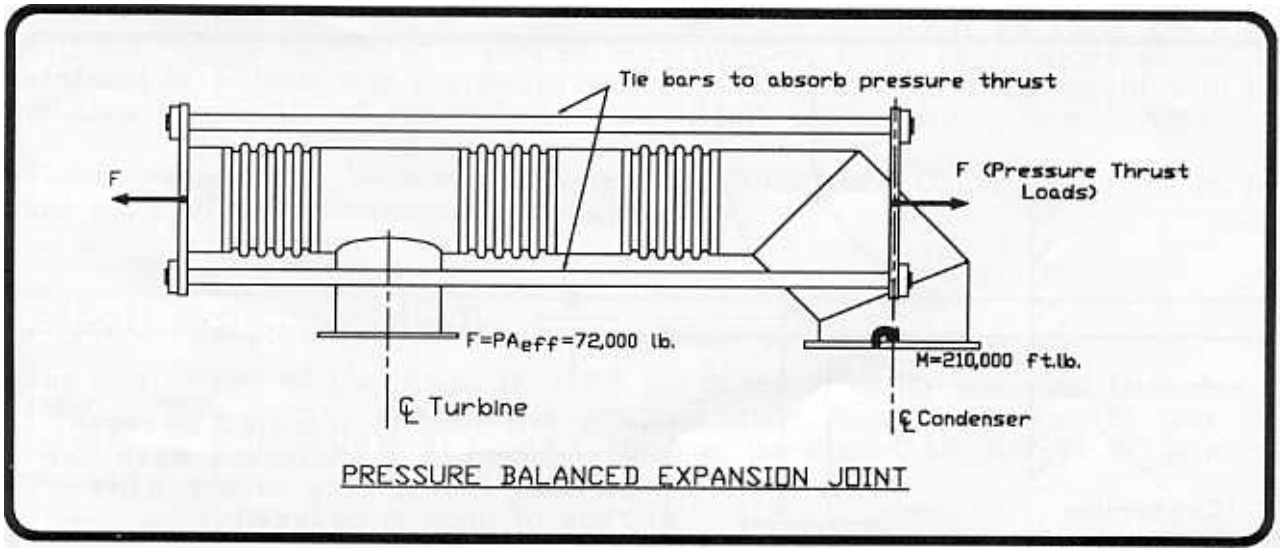
3 - The possible sustained stress non-conservatism can be checked easily in **CAESAR II** with an additional run.

4 - The expansion stress error in other programs is almost impossible to check, unless the user is willing to make hand calculations of moment ranges and subsequently stresses.

* An option is being added to **CAESAR II** to allow the conservative calculation of the sustained stresses in the same run with the accurate calculation of the expansion stresses.

RELATIVE RIGID STIFFNESSES - AN EXAMPLE

The figure below illustrates a simple two anchor, tied expansion joint model. The pressure balanced joint should absorb both the vertical and horizontal expansion of the large diameter piping from the turbine to the condenser.



PRESSURE BALANCED EXPANSION JOINT