A TECHNIQUE FOR MAKING TROUBLESHOOTING DECISIONS

The rules are very simple. Decisions have to be made when doing nothing will cause the condition to degenerate. As an example: if you can live with the present leak rate, you don't have to make any decisions about fixing the leak, but If you can't live with the problem because the pollution people are going to close you down, then you better start making a decision and the following sequence should help you come up with the correct one:

- Decide if this is a generic problem or just a unique event.
- Decide what the decision really has to accomplish.
- Be prepared to do what is right rather than what is convenient or acceptable.
- Know that nothing is going to happen until the decision is converted to action.
- You are going to need a feed back system to compare the results of your decision or action. In other words you have to test the results.

Let's look at each of these points in detail:

1. Generic problems require a specification, standard, rule, policy or principle. It is only then that manifestations of the same generic situation can be handled intelligently. There are four possibilities you will encounter:

- The problem is truly generic. The individual occurrence is only a symptom of a much larger problem.
    - Example: The seal is failing because of shaft deflection caused by starting the pump with the discharge valve shut in an attempt to save power. The shaft has to be stabilized or this problem will reoccur each time the equipment is started.
- It is a unique event for the individual, but actually is a generic problem.
    - Example: The ceramic face fractures in hot water, but seems to work well in other fluids, or the carbon face pits in higher temperature hydrocarbons but has no problem in other hot fluids. Problems of this type are only solved by educating the work force or having only qualified people do the troubleshooting.
- It is truly exceptional, a really unique event.

- Example: A Marlin system starts normally but on changeover tripps the whole system and reboots. This is caused by a mal adjusted Phase failure relay that trips on the low voltage. Problems of this type are only solved by educating the work force or having only qualified people do the troubleshooting.

- You are seeing the early manifestation of a new generic event.

  - Example: On changeover from VFD to DOL the check valve slams home excessively. This happens only on end suction pumps when the check valve is located on the suction side of the pump.

It would be foolish to treat any new event as just another example of an old problem. Blaming operator error and bad maintenance practices is frequently used to mask generic design problems. The truly generic problem is being treated as a "unique event".

The hardest thing to realize its that there are no "facts" for you to act on. There only events until someone makes them relevant. You must decide if the explanation explains the observed events and if it explains all of them. It is very difficult to separate the extraneous information from the relevant data.

It is imperative to ask "Is the data that I am collecting relevant to the problem at hand"

Attempt to simulate the problem in order to be able to attempt a solution.

2. Now that you have decided you have a generic problem, and a decision to correct the problem has been made, can you verbalize what the decision has to accomplish? Here are a few examples of what is possible:

- Changing the check valve from the suction to the discharge would assist the problem.
- Adjusting the contactor delay time would stop the potential backflow from the adjacent pumps
- O-rings are the only elastomer shape that can seal in both directions.
- Balanced designs balance the opening and closing forces acting on the seal faces to prevent leakage and the generation of destructive high heat.
- Two way balance is necessary in dual seal applications so that you can choose either a high or low barrier fluid pressure between the seals and not be concerned about the seal faces blowing open when and if the pressures reverse.
- A low L^3/D^4 pump shaft will resist excessive shaft deflection and movement. This is an important consideration if you want to increase seal and bearing life.

- A stuffing box heating jacket can be controlled to prevent many chemicals (caustic, sugar, etc.) from crystallizing, vaporizing, solidifying etc.
- Centerline design pumps can eliminate a lot of misalignment problems and wear ring damage when the pumping fluid temperature exceeds 200°F (100°C)
- The correct grade of carbon/graphite can run dry for long periods of time.

3. Now we come to the third and hardest part of the process, Are you prepared to do what is right rather than acceptable or convenient? Insight is not achievement. You will be judged on your results not your words. No matter how many people are involved, the results will always be identified with a single name and it probably will be yours.

Unfortunately a change in supplier, design, or specification makes some one look like he made a wrong initial decision. Too often companies keep doing the same old thing because the boss will "lose face" or it is too difficult to change the standards.

Change is always difficult and uncomfortable for some people. Remember the old western expression, "the pioneers catch all of the arrows". Remember also that they end up with all of the land.

- Modifying a pump to lower the L^3/D^4 can mean changing the original specifications, but the seal and bearings will work better.
- Installing an oversize stuffing box and hooking up a suction recirculation line is inconvenient, but it will dramatically increase the life of most mechanical seals.
- For many years maintenance people have complained that, "there is never time to do it right but there is always time to fix it!". That is the same reason heart attack victims start a sensible diet and exercise program after the heart attack. There was no time to exercise in the past, but there is plenty of time to do it now. How would you feel if your supplier gave you a discrepant part because there wasn't time to get a good one? Most rotating equipment problems manifest themselves in poor seal and bearing life. Are you just replacing these items or are you solving the generic problem that is causing them?

If you are not in a position to make the necessary decision, team up with somebody that is. There is nothing more powerful than the combination of an engineer willing to take a chance on a new idea and a maintenance man prepared to make the decision work.

One more thought on this subject is to remember that it is crazy to consider something that might work if nothing goes wrong. Miracles do happen, but you can't count on them.

4. Converting a decision to an action will never occur until it becomes some one's responsibility to carry it out in specific steps. It is only a wish until a person is chosen and a time limit is set. You must act or not act, you must never compromise:

- Who is supplying the print for the pump modification? Who will do the machining?
- Who will enter the new parts into the spare parts system and sign the purchase order for the new inventory?
- What is going to happen to the old spare parts that are now obsolete. Who will take charge of them?

5. Even the best of decisions eventually become obsolete. You must go and look for your self. Do not even think about having someone else do the follow-up.:

- You decided to purchase a standard ANSI, ISO or API pump. Did this solve or increase your seal and bearing problems?
- Should you continue to use solid seals or would split designs make more sense?
- Is purchasing an efficient pump increasing your maintenance problems? It often does. You would probably be better off with a less efficient design like a double volute type and solve the shaft deflection problems you are experiencing every time the pump operates off of its best efficiency point (B.E.P.)