# SOPHISTICATED COMPUTER POWER AVAILABLE AT REMOTE LOCATIONS

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## ABSTRACT

It is well known that a computer can help engineers to be more productive. Currently, there are multitudes of hardware and software available on the market. Communications capabilities now exist to provide a link between the well site and the computer. The paper focuses on the current availability of software and communications to provide access to large core programs from the well site, the benefit to the engineer of this expanded computer power, and some specific examples of the software.

## INTRODUCTION

Engineers have long been using computers in their work. Historically, usage has been a function of the complexity of the problem, the availability of computer power, and the cost/benefit relationship to the engineer. Originally, big computers were used to solve every variety of mathematical computation. This problem solving process required programming and access to a big computer. It often involved long turn-around times and incurred high costs. The advent of the programmable mini-computer eliminated many of the difficulties associated with using big computers - such as cumbersome programming and JCL, and long turn-around times. Lately, the cost of solving engineering problems has also been reduced. Thus, it would now appear as if we were entering into a more harmonious state for the engineer and his minicomputer.

This period, however, may be short lived. The problems now facing the engineer are far more complex than those of a decade ago and the demands on his time are much greater. In order to effectively solve problems, the engineer needs access not only to problem solving computers, but also to large databases and sophisticated models. Since large databases and sophisticated models most often reside on large, centralized computers, the engineer is faced with having to access a central computer, locating the appropriate database, finding the proper model and putting it all together to solve a problem. This requires much more time and effort and significantly increases the cost of solving the problem.

Fortunately, we have the capability to address these drawbacks:

A. Access to a big computer.

B. Locating the proper database.

C. Finding and using a model that will do the job.

Various entrepreneurs have focused on points B. and C. These programmers and engineers who have developed systems designed to solve a family of related engineering problems. However, the engineer in the field is not always aware of the availability of these systems. Thus his problem is not solved quickly, completely, or economically. What is needed to make the search for these systems easier is a complete index of all available models, databases, and systems that exist to help the engineer to solve the problem. Also, access to the proper computer that handles the system and a method whereby the raw information from the engineer can get to the computer, be processed, and then get back to the engineer - e.g. a reliable communications network.

## THE CURRENT SITUATION

A number of companies and universities supply remote computing services for the engineer. Many have developed libraries of programs and associated databases for dealing with complex analytical problems. Some have developed communications networks to provide access to their libraries from remote locations. The quality of these programs and communications networks vary from quite sophisticated to barely adequate. The one with which the author is most familiar is the General Electric Information Services Company's MARK III (R) Service. This system of computers and communication equipment provides access on a local dial-up basis to more than 600 cities in the world. It also provides access to other remote locations via telex service or long-distance telephone connection. GEISCO has developed a large library of sophisticated programs which focus on helping the engineer to be more productive. Many of these programs have been developed by outside programmers - experts in their field - who receive a royalty for the use of their programs. These programs focus on keeping the engineer productive and up-to-date with the latest techniques. It has been estimated that the use of these types of programs can increase the efficiency of an engineer up to 20 percent. Obviously this increase helps the engineer; he has more time to work in non-problem solving areas, he can be more creative, and he could possibly even gain a few more hours to enjoy his family.

The enclosed listing contains some authors and programs that may be of interest to production engineers. During the classroom discussion, the author will be prepared to discuss specific applications of these programs and to review the different terminals and communication techniques that are available to provide access to this kind of computer power at remote locations.

A table of authors and a partial list of their programs is below:

| AUTHOR | PROGRAM NAME(S) | DESCRIPTION |
|---|---|---|
| Atlantic Software,Inc. | Project Control/70 (PC/70) | Project and resource management. Focusing on planning, simulation (what if), monitoring correcting, and evaluating manpower productivity and costs. |
| Baker Packers Completion Systems | Tubing Movement Program | Based on SPE paper no. 5143. Focuses on determination of forces and stresses in a string of tubing due to changes in pressures, temperatures and fluids. |
| Core Labs (ENPAL Library) | MCRES | Monte Carlo Revenue Estimator. |
| | DECIT | Decline curve projection. |
| | ECOCSHF | Economic cashflow projection. |
| | WCTR | Time rates waterflood oil recovery. |
| | PVTOIL: PVTGAS | PVT properties of low volatility oils. PVT properties of dry gas. |

...and others...

| AUTHOR | PROGRAM NAME(S) | DESCRIPTION |
|---|---|---|
| Delta X | SUPRO* | Designs complete rod pump system given design and load factors. |
| | SURDYN* | Predicts surface dynagraph from an assumed down-hole pump dynagraph according to API-RP-11E. |
| | PUMPDYN* | Calculates down-hole dynagraph and gearbox torque according to API-RP-11E. |
| | SYSTOR* | Computes the pump unit gear-box torque and/or permissible polished rod load in accor-dance with API-RP-11E. |
| | ...and many others... | |
| Garrett Computing Systems | PUMP | Determines SPM required to stay within various constraints for rod pump and string design. |
| | GRASP | Grid-type reservoir analysis and simulated performance model. Develops a 2 or 3 dimensional, unsteady state, reservoir production output for oil and gas. |
| | PARD | Analyzes various transient pressure performance data. |

| AUTHOR | PROGRAM NAME(S) | DESCRIPTION |
|---|---|---|
| Garrett Computing Systems | API14B | Subsurface safety valve sizing. |
| | CRAM | Calculation of reservoir and aquifer volumes by material balance. |
| | ...and many others... | |
| General Electric Company | ASTRA | Combines PERT and resource allocation into single report. |
| | CPM | Cost analysis for project management. |
| | GESIMTEL | Dynamic, probabilistic models to simulate ongoing systems. |
| | ...and many others... | |
| PSI Energy Software | GASFLOW | Calculates gas flow rates from orifice. |
| | DECLINE | Oil or gas schedules using all standard decline curve equations. |
| | RAPS | Reservoir accounting and production schedules. |
| | HALLPLOT | Hall technique for injection well analysis for water floods |
| | ...and many others... | |

| AUTHOR | PROGRAM NAME(S) | DESCRIPTION |
|---|---|---|
| West Texas Consulting Service, Inc. | G1 Special | Calculates absolute open flow for gas and types it on G1 form. |
| | BUILDUPTWO | Calculates, tabulates, and plots pressure vs. time. |
| | FLGSIBU | Calculates flowing and/or shut-in pressures and tabulates and plots pressure versus time. |
| Dwight's | Database | Production statistics on all individual producing gas wells & oil leases in an 11 state area. |
| P. I. Corporation | Database | Drilling Activity Analysis System. Drilling activity statistics on oil and gas wells. |
| Univ. of Oklahoma | Database | Production statistics on all oil and gas fields in North America. |