ADVANCING ARTIFICIAL LIFT WITH THE ARTIFICIAL LIFT RESEARCH AND DEVELOPMENT COUNCIL (ALRDC)

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INTRODUCTION

Virtually every oil production company and many gas producers, both major and independent, must use one or more forms of artificial lift to assist in producing their wells. Yet, most companies do not have artificial lift experts. In fact, many companies don't even have engineers trained in artificial lift. And almost no companies have artificial lift research and development programs. In fact, most companies must depend solely on the service companies to provide the artificial lift technology, products, and services they require.

But, all production companies face many challenges in the artificial lift arena to optimize the economic recovery of their hydrocarbon (both oil and gas) reserves. This is certainly true in the "green" field areas of horizontal, multi-lateral, deepwater, and sub-sea wells, and wells in challenging locations such as deserts, artic environments, etc. It is also true in "brown" fields where even small percentage improvements in artificial lift effectiveness and efficiency can make the difference between a profitable and an unprofitable operation.

If artificial lift is so important, and if "getting it right" is worth so much, why is there so little engineering focus on it? The answer seems to be that many companies consider artificial lift to be "old, existing, proven" technology, with little or no room for improvement. Many people feel that pumping or gas-lift is relatively simple. If the pump is going up and down, the well must be producing oil. If gas is being injected into the well, it must be producing by gas-lift.

While these "feelings" may be true to some extent, it is often (perhaps normally) the case that the artificially lifted wells that do not receive much attention are operating very ineffectively and inefficiently. They are producing much less than they could; they are costing much more to operate than they should; and often both capital and repair and maintenance costs are much higher than necessary.

This is not an idle claim. It has been proven, time and again, that an effective artificial lift surveillance program and application of appropriate artificial lift equipment and practices, can significantly increase production, reduce operating costs, reduce repair and maintenance costs, and often reduce capital expenditures. It has been proven that use of effective artificial lift processes, equipment, and practices can result in:

Beam pumping wells
- 5 – 10% more oil
- 15 – 20% less energy consumption
- 25 – 35% reduction in repair and maintenance costs

Gas-lift wells
- 5 – 10% more oil
- 5 – 10% less gas-lift gas
- Lower investments in compression equipment

Electrical submersible pumping wells
- 3 – ***5%*** more oil
- ***6*** - 12 months longer run times

Being realistic, this is not a "pitch" to have every oil and gas production company hire an artificial lift engineering staff or start an artificial lift R&D department. Realizing that this is not going to happen, there is currently an effort underway to form an industry-wide organization to focus specifically on advancing the technology and "business" benefits of artificial

lift by enhancing artificial lift technology, understanding, training, processes, equipment, practices, and applications. This industry initiative is called the Artificial Lift Research and Development Council (ALRDC).

WHAT IS ALRDC?

The Artificial Lift R&D Council (ALRDC) is a "not for profit," independent, global organization of Operating Companies, Supply/Service Companies, Universities and other Educational Institutions, Governmental Agencies, R&D Organizations and Laboratories, and Independent Consultants. It is not a commercial venture. Some of its services are available to the general artificial lift public; some are only available to member organizations.

ALRDC's two primary purposes are to:

- **Disseminate Artificial Lift information.** There is a great deal of existing artificial lift information and expertise that can be made available to those who have a need to know. ALRDC will maintain and disseminate a wide range of artificial lift information to anyone, anywhere in the world, who is interested in artificial lift. Some of this information will be freely available. Some will only be available to member organizations. ALRDC will disseminate information in the following ways:

  Discussion Forum. Provide a web-based discussion forum where any questions related to artificial lift can be posted and discussed. This differs from an e-mail discussion group. Here, the discussion will be kept "on line" so that anyone can see, review, and contribute to all pertinent discussion on any desired topic.

  Best Practices. Provide access to published guidelines, recommendations, and advice on the "best" ways to select, apply, operate, and maintain artificial lift systems for maximum economic advantage.

  Case Histories. Promote the sharing of stories of artificial lift successes and failures. The goal here is to help everyone who is interested in artificial lift learn from our collective experiences, to avoid making the same mistakes over and over.

  Yellow Pages. Provide and maintain a comprehensive "yellow pages" of organizations and individuals who are available to assist with various aspects of artificial lift.

  Artificial Lift Calendar. Maintain a comprehensive, up-to-date, calendar of all pertinent artificial lift conferences, workshops, symposia, training events, etc. Where possible and pertinent, this includes information and forms for registering to attend or participate in these events.

  Virtual Library. Maintain an easily accessible library of the hundreds (perhaps thousands) of books, reports, papers, articles, and notes dealing with many different artificial lift topics. Often these are very inaccessible. ALRDC will provide an easy way to search for and locate pertinent documents. Where possible and pertinent, this will include assistance in obtaining copies of desired documents.

  Conferences and Workshops. Organize and host focused conferences and workshops on selected artificial lift topics that are not covered by existing industry meetings. This will be an opportunity to have workshops on topics of current interest. It will also be an opportunity for either artificial lift users, or providers, to present needs or ideas for new artificial lift developments.

- **Promote Artificial Lift R&D**. Most Operating Companies don't have artificial lift R&D departments, yet most (perhaps all) have unfulfilled artificial lift needs. And, there are Service/Supply Companies, Universities, and others that can help fulfill these needs. ALRDC will help promote artificial lift R&D in the following ways:

  Prioritize Artificial Lift R&D Needs. Help facilitate the prioritization of artificial lift R&D needs by providing a forum where users of artificial lift technology can express their needs and providers of the technology can offer their resources and services. #en a need is expressed, ALRDC carr communicate with the global artificial lift community to determine the scope of the need and the resources that are available to help meet it.

  New Ideas. There are many new ideas, all of the time. Some of them are brilliant, some a junk. ALRDC will provide a sounding board where new ideas can be aired, discussed, and either adopted or rejected based on their

merit. ALRDC will be non-judgmental. It will not pass judgment on whether a new idea is worthy or not. However, it may help the originator to "fine tune" the idea so that it can receive the best possible hearing from the members of the organization.

Pooling of Funding. Sometimes, perhaps often, several artificial lift users have similar needs. Rather than each organization "going alone," there may often be an opportunity for several organizations to pool their funding resources and obtain the needed results more quickly and at a substantially reduced unit cost. ALRDC will help coordinate this by helping to bring together users who share a common need and are interested in sharing costs.

This will not be pertinent in those cases where a single user wants to develop, or have developed, a proprietary technology. However, even in this case, ALRDC may play a "match maker" role by helping the user with the need to be matched with a University or an R&D Organization that can develop the needed technology under a "confidentiality" agreement.

Pooling of Resources. It is often that case that a single University or R&D Organization does not have all of the needed resources — staff, test facilities, etc. — toconduct a needed R&D program in a timely fashion. Where pertinent, ALRDC will help coordinate this by bringing together different organizations that can work together to produce a desired artificial lift R&D result sooner and more effectively.

A good example of this may be where one University has the necessary staffing (e.g. graduate students) and lab facilities and another University or R&D Organization has the required field test well and facilities.

Disseminate R&D Status. Where permitted, that is where the R&D program is not proprietary to one or a limited number of companies, ALRDC will help to communicate the status of the R&D program to all interested parties. This will help facilitate communication on the project between customers (Operating Companies and/or Supply/Service Companies) and providers of the R&D.

Disseminate R&D Results. Typically, artificial lift R&D results are "disseminated" in the form of a graduate thesis. Often, these results are difficult to implement in the field. Where permitted, that is where the results are "public knowledge," ALRDC will help facilitate the delivery of the R&D results in the form of a usable report, computer program, etc.

BENEFITS OF ALRDC MEMBERSHIP

The benefits that should come to members of ALRDC are:

- **For all members**

Voice. All members will have an equal voice in setting the industry-wide direction for dissemination of artificial lift information and promoting the artificial lift R&D agenda. There will be a Director to manage daily activi ties, a Board of Directors to make policy decisions, and a general council with representation from all members organizations to set overall strategy. ALRDC is organized as a Division of the Petroleum Technology Transfer Council (PTTC).

Calendar. **All** members can access and contribute to a comprehensive, evergreen calendar of all pertinent artificial lift events, meetings, workshops, conferences, symposia, training sessions, etc.

Synergy. The multi-faceted sharing of information, funding, resources, etc. will undoubtedly lead to the devel opment of other, currently unforeseen artificial lift products and services.

For Operating Companies

One Artificial Lift R&D Organization. Operating Companies will, if they wish, be able to interface with one artificial lift R&D organization. ALRDC will serve as a focal point for them to help find R&D and other organization(s) to meet their various artificial lift development, implementation, and/or training requirements.

One R&D Program. ALRDC will help to offer one, coordinated artificial lift R&D program and will work with the R&D providers to help set (and keep) clear objectives and milestones.

Reduce Duplication. When each company does its own thing, there can be a serious degree of duplication. ALRDC will help to reduce duplication through coordinating both artificial lift requirements and new develop ments.

Common Vision over Time. For most (all?) companies, budgets are set annually, and any artificial lift develop ments depend on the ebb and flow of these budgets. For most Universities, R&D studies are often a little longer term, but may still change every year or two as students come, study, graduate, and leave, Yet, many artificial lift developments require a long-term vision and direction. ALRDC will help to provide this continuity.

Budget Continuity. ALRDC can't change corporate budget cycles, but by providing longer-term continuity of artificial lift developments, this will help companies better plan for the budget process from year to year.

Leverage. An individual company may not have enough resources (funds, people, etc.) to obtain the needed artificial lift development results. However, through coordination and pooling of resources, ALRDC will help to leverage limited funds to provide needed results sooner and at a lower unit cost to each user.

Quicker Access. Often, the lead-time to obtain a new artificial lift development can be years. By helping to coordinate and pool development resources, and by providing greater focus on objectives and milestones, ALRDC will help to accelerate the delivery of usable results to the end users.

Bottom Line. The "bottom line" is impacted when new artificial lift technology, products, or knowledge can be applied, in the field, to increase oil and/or gas production, or reduce costs. By helping to accelerate delivery and by helping to deliver better products, ALRDC will help Operating Companies more quickly realize direct economic benefits.

Easier Justification. Often it is difficult to justify investment in new artificial lift technology because the benefits are too slow in coming or are not clear enough. By helping to advance implementation of new techno- logy, by sharing best practices and case histories, and by helping to reduce the costs to individual companies through pooling, ALRDC will provide engineers and others with the ammunition they need to justify needed artificial lift developments.

Needed Services. By having direct access to the ALRDC "yellow pages" and other "connectivity" services, each Operating Company will be able to readily find any artificial services it needs.

Access to New Talent. By promoting frequent interchanges between Operating Companies, Universities, and others, ALRDC will help Operating Company personnel to be aware of students and new graduates who have an interest and expertise in artificial lift. These people may become potential employees.

These benefits are summarized in the table at the end of this paper. The benefits are typical for a major or large independent Operating Company.

- **For Service/Supply Companies**

Focus on Fewer R&D Proiects. By leveraging some developments that have been performed by others, Service/ Supply Companies will be able to prioritize and focus on fewer specific artificial lift developments on their own. Each company won't have to develop all aspects of every artificial lift system by itself. It can concentrate on those aspects that provide it with a proprietary competitive advantage. And even there, it may be able to outsource some of this proprietary development under a confidentiality agreement.

Leverage. As for Operating Companies, Service/Supply Companies will be able to gain leverage with limited R&D funds. They can do this by pooling funds for non-proprietary developments and then focusing their own efforts and primary investments on their own proprietary developments.

Quicker Access. As for Operating Companies, Service/Supply Companies will gain quicker access to proven, field-ready results. Again, this is primarily for the pooled, non-proprietary projects.

Identify New Opportunities. By closer communication with a wide audience of others who are involved in artificial lift, including many Independent Operators who are not currently "in the loop," Service/Supply Companies will potentially be able to identify new opportunities for new products or services, or for refinements to existing products or services.

For Universities / Educational Institutions

Predictable Funding. For many Universities and Educational Institutions, there is no guaranteed, steady source of funding for artificial lift projects. Sometimes this is administered through Joint Industry Projects. Sometimes it comes through government or industry grants. Sometimes desired funding for projects is missing. With the focus and coordination offered through ALRDC, Universities should be able to count on more predictable, stable sources of funding

Program Focus. By having a more focused, better-funded program, Universities should be able to improve their recruitment of students by offering them clearer educational objectives. This should also allow better focus of courses, improved recruitment of faculty and staff, development of more focused lab facilities, etc.

Clear Contributions. Some Universities may wish to concentrate and specialize in certain areas of artificial lift such as electrical submersible pumping, progressive cavity pumping, beam pumping, gas-lift, etc. With the added coordination and leverage provided with the assistance of ALRDC, this should be possible. And, with this focus, the Universities may be able to develop a greater level of expertise, contribution, and recognition in their chosen area.

Easier Placements. When the Universities have greater contact with Operating and Supply/Service Companies, their students will also have greater contact. This will naturally lead to easier placement for those students who work directly on artificial lift projects that are of interest to the "customers."

For Governmental Agencies / R&D Organizations / Labs / Consultants

Focus on Fewer Areas. As with Supply/Service Companies, these organizations will be able to better focus their activities. Each organization won't need to be an "expert" in every area. They can lean on ALRDC for this expertise in the forms of artificial lift that are outside of their primary focus area.

Hone Relationships. Often, these organizations have limited contact with key artificial personnel in Operating Companies, Supply/Service Companies, or Universities. By participating in ALRDC forums and workshops, and by "advertising" in ALRDC's "yellow pages," they will be able to better develop these relationships.

Coordinate Related Work. In some cases, there is work that is closely associated with artificial lift. An example is the effort to capture and learn from detailed diagnosis and analysis of failure information. Here again, close communication between all parties involved in artificial lift application and use will help to further the learning that comes from thorough comprehensive "cause of failure" analysis.

SUMMARY

ALRDC is a new organization. The idea was born in 2001 and most of 2001 was used to develop the idea and give birth to the organization. The organization was officially started as a Division of the Petroleum Technology Transfer Council (PTTC) in January, 2002. PTTC is also potentially interested in developing other similar organizations for other aspects of the industry, e.g. drilling and completions, facilities, pipelines, environment and safety, etc.

More information is available on the ALRDC web site at www.alrdc.com, or by contacting the author at cleon@alrdc.com.

Membership in ALRDC is open to any Operating Company, Supply/Service Company, University or Educational Institution, Governmental Agency, R&D Organization, Lab, or Consultant that is interested in applying or advancing the technology of artificial lift. Members can join for a modest fee. The fee is posted on the web site, along with application forms.

Table 1

Summary of ALRDC Benefits for Operating Companies

Category of Benefits	Summary of Actual Benefits
Deal with one artificial lift R&D organization	• Save 2 - 8 staff weeks per year
Have one focused program, with dear objectives, milestones	• Save 2 - 8 staff weeks per year • Receive same or better results with 80% or less of the total cost
Have a common artificial lift technology vision and direction over time	• Easier to communicate artifiaal lift plan to management • Earlier delivery of artifiaal lift capabilities • Potential acceleration of newfields or wells that depend on new artificial lift technology
Reduce duplication of effort	• Reduce current artifiaal lift R8D costs by 20+%
Have artificial lift RED budget continuity from year to year	• Make it easier for companies to have a long-term artificial lift R&D plan • Improve staffing continuity among R&D providers
Gain leverage from limited R&D funds	• Potentially share artificial lift R&D costs among several companies, thus significantly reducing the cod to any one company
Gain quicker access to proven, field-ready results	• Accelerate acceptance and use of new artifiaallifttechnology by 15 - 20% or more
Use these results to help increase oil and/or gas production, reduce operating costs	• New artificial lift capabilities can often be applied to many wells • This provides significant leverage to justify the cost of ALRDC membership many times over
Make it easier to justify financial support for artificial lift R&D efforts	• Save 1 - 2 staff weeks per year
Make is easier to find needed artificial lift services through ALRDC "yellow pages"	• Save 1 - 2 staff weeks per year
Gain access to highly qualified graduates as potential employees	• Continued flow of "newblood" to help meet growing artificial lift needs