



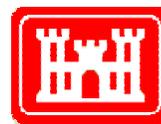
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# POL Interactive Manual Feasibility Study

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## Fuel Facilities Engineering Panel



**US Army Corps  
of Engineers®**

December 2003

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# Feasibility Report

## Petroleum, Oil, and Lubricants (POL) System Maintenance Interactive Manual



### Executive Summary

The DoD Fuel Facilities Engineering Panel (FFEP) includes representatives from the Air Force Civil Engineering Support Agency (AFCESA), Naval Facilities Engineering Command (NAVFAC), the US Army Corp of Engineers (USACE), and the Defense Energy Support Center (DESC). The development of a POL maintenance Uniform Facility Criteria (UFC) is desired by the agencies making up the FFEP. As a precursor to that development, the FFEP must determine the required content of the manual and the method in which the manual will be presented to user personnel. Users will include military, civilian, and contractor personnel at government owned and contractor owned facilities. Facilities will include bulk terminals, aviation hydrant systems, pipelines, receipt, storage, and ground vehicle servicing. HQ AFCESA contracted this effort on behalf of the FFEP representatives. Northrop Grumman Mission Systems' Installation Engineering Support Division (NGMS-IESD) at Tyndall AFB, Florida, accomplished a feasibility analysis summarized by this report.

### POL System Maintainer Survey

#### Background

An Internet-based survey was developed by NGMS-IESD and coordinated with the various services representatives on the FFEP. The survey was designed to collect information from field technicians and supervisors responsible for maintenance of Petroleum, Oil, and Lubricant (POL) systems. The survey collected information regarding POL system characterization, current information needs and typical use, sources of information and time spent researching, and desired features for a future support tool.



#### Results

The survey was posted on the Internet from 15 Sep 03 to 15 Nov 03. A total of 127 responses were received as of 15 Nov 03. Highlights of the survey include:

- 67% of POL systems surveyed were maintained in-house, 33% by contractor
- Average DoD system reported is about 32 years old, ranged from 0-85 years
- MIL-HNDBK-1022A universally used but service documents like Air Force UFC 3-460-3, Navy MO-230, and Army TM 5-678 were not well known beyond the respective service
  - No clear information requirement preference between maintenance procedures, policy, and other guidance among the above documents
- 68 additional documents listed (57% Operational, 15% Environmental, 19% Safety)
- Generally strong use of API, ASME, ASTM, and NFPA
- Significant number of installations spend 10 hours per month looking for information with strong use of Internet (survey collected over 60 web sites)
- Apparent need for reference information, maintenance guidance, training, and information cross-sharing

Survey results revealed a strong, general need for a wide variety of information from operations to training to policy. No one service had for example a pressing specific need. A single UFC as originally envisioned by the FFEP does not appear to be what the field needs. A knowledge resource center, customizable to each user's needs, appears to be a more appropriate goal to satisfy installation maintenance information requirements.

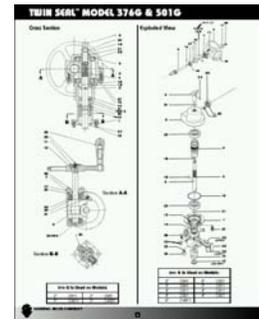
## Information Feasibility

### Background

Major POL system component manufacturers (example: Cla-Val, Velcon, Scully Systems) and related professional societies (example: API, ASTM, NFPA) were contacted to determine their willingness to support a DoD interactive Internet-based maintenance support tool. In addition to telephone contact, company/organization web sites were also reviewed. Future sources including development of content using Internet based media formats and the knowledge mining of the worldwide community of existing POL system maintainers was also considered.

### Results

There is a tremendous availability of existing and potential information to support a POL system maintenance support product. This information does not exist in a traditional UFC format but more as discrete information packages that will fit well into commercially available knowledge management tools. There is a sufficient variety of Internet based POL system maintenance material to warrant consideration of creating a common access point for POL maintainers. Manufacturers appear willing to allow unrestricted access to their sites, which, despite being product sales oriented, do offer a variety of manuals, parts catalogs, and other supporting information. Commercial professional organizations extensively restrict their intellectual property but the three services do currently subscribe to an Internet-based subscription providing access to over 350,000 standards from over 450 organizations to their design/construction agencies. Internet browsers and free media players for multimedia files like Flash (animation) and QuickTime (video) provide a no-cost environment to distribute a wide range of training and support information. Content creation using these and other industry standard tools is reasonably quick and low cost. Microsoft Office based files such as PowerPoint and Excel additionally provide excellent capabilities for both presentation and analysis. Finally, the POL system maintainers at installations and headquarters are a currently untapped resource of *common know-how* information. There are pockets of expertise based on years of experience and types of equipment within and among the services. This 'grass-root' corporate information can be captured and shared easily using modern software products off the shelf with no programming skills required and enhanced with professional content tools as required. The end-result will be less a fixed document as currently prescribed by UFC format standards and more a continuing work in progress as content is perpetually created/updated/deleted in a linked, searchable, interactive Internet medium.



## Software and Development Recommendations

### Background

This report examined methods to develop a means to create a common environment for POL system maintainers to find information. The original intent of creating a combined Uniform Facilities Criteria is not advised based upon content review and survey results. The focus shifted from development to

commercial applications designed to facilitate content and information sharing. An Internet search followed by vendor contact was used to gather information.

## **Results**

This is an excellent time to be looking at applications for Knowledge Management (KM) because the industry has a wide range of products, many are mature versions, and the DoD is already using a growing population of these applications. KM is a booming industry with a wide variety of products geared towards improving information management fundamentals from the creation stage, aiding in collaboration, categorizing for enhanced searching, and finally storing and disseminating. The study examined three major categories of applications including Enterprise KM packages, Content Management Systems, and Communities of Practice (CoP). CoP applications seemed the ideal match for providing a blend of content management, information sharing and collaboration, and helping with/searching for information. They are easy to use applications right out of the box and require little specialized training. All KM applications will benefit from a strong examination of the information to be organized but CoP tools tended to be extremely flexible in creating navigation structures and material, in part because the using community itself helps define the content as the tool is being used.

## **Overall Analysis**

### **Background**

The overall guidance from the FFEP was to examine the feasibility of developing a new DoD UFC for POL system maintenance to support the three services. Specifically requested was a structure and optimal methods to pursue and display, in an interactive environment, a single maintenance manual.

### **Results**

This report concludes that an effective maintenance support tool can be created and fielded quickly which would meet the implied intent of the FFEP. That is, a common service source of maintenance, policy, and other POL system related information that can be easily accessed, searched, and administered. The use of the term 'manual' and indeed UFC, whose structure is strictly defined in terms of a printed document, is not clearly applicable. The most effective Internet applications to achieve this belong to a class of collaboration based, information content sharing tools. Of particular note are the off-the-shelf programs supporting what is called a Communities of Practice (CoP). This extract from Graeme Browning's 13 May 02 article in Federal Computer Week summarizes what a CoP is all about:

"In most workplaces, people don't just pour themselves a cup of coffee and walk away. Instead, they tend to hang around, sipping and chatting with one another. They trade stories, hash over office problems and offer solutions. "This is how we did it. Why don't you try the same thing?" a worker will suggest to a colleague from down the hall. As a result, bonds are forged and the collective store of knowledge in the organization is enhanced. The same outcome occurs in a "community of practice," a group of workers who share their expertise and add to the collective wisdom in their field, often via electronic means and always in a way that bypasses official boundaries and transcends office hierarchy".

General features of CoP applications:

- Web based - Easy / rapid to deploy

- Intuitive user interface - Easy to configure, offers levels of access
- Create as many, or as few communities required
- Knowledge champions – provide a ‘Whose Who’ of community experts, find advice, and sign up to provide assistance to people in an area where you are most knowledgeable
- Document management - upload and version control documents using email and your web browser
- Context enabled search engine - finds people and documents
- Discussions and Frequently Asked Questions (FAQs)
- Built in survey, calendar, and other collaboration tools

All three services are already using CoP tools and the movement is growing. The Air Force contracted for a CoP capability and is looking to provide service wide at the Air Force [Knowledge Now site](#). Both the Navy and Army have mature CoPs supporting numerous communities. The Navy's Chief Information Officer web site offers a [CoP implementation guidebook](#) for championing, developing, and participating in Communities of Practice (CoPs). It provides conceptual roadmaps, operating principles, tools, examples, and a valuable set of resources for all stages of community development. The Army created a service-wide information exchange portal called [Army Knowledge Management](#) (AKM) and recently (Jun 03) procured an enterprise level software solution to support their future CoP and other knowledge management efforts.

The recommended CoP software solution could be implemented in about three months from the time an application server host was established and service approval granted for the application. Software and training would be less than \$100K. The report recommends a three-person team for the first year for approximately \$300K. This team would consist of two POL/maintenance experts who would provide the core start-up work in finding and defining content for the CoP tool. Seeding the site would be easy by merging common content from existing service documentation, using information from this report such as a master Internet link library and document index, and finally grouping unique service and/or POL system information. They would additionally travel to service selected installations to photograph and gather representative maintenance information for initial posting as well as train field personnel in using the CoP tool. A graphics expert should round out the initial start-up team to provide multimedia content. Annual sustainment costs would run about \$15K for software plus the personnel requirements, not less than one (\$100K), reevaluated as the FFEP's CoP site matures. Based on other successful CoP sites, the FFEP could conceivably employ a full time team of three individuals, one for each service, as the core POL maintenance KM office. The FFEP would benefit by providing a rapid solution to the field that captures corporate knowledge in a collaborative, flexible environment. Users would benefit by being able to quickly search, find, and share information, and over the long term, achieve grass-roots buy-in through creation, reviewing, and approving the information content themselves.

## Task Summary

The requirement for this study was to provide feasibility research into the structure and requirements of an interactive maintenance manual. The report recommends level and depth of technical content of this manual, and the optimal methods to pursue for development and display media. This is a new concept for a Unified Facility Code (UFC), which must draw information from multiple sources into a single user-friendly digital format intended for all Department of Defense fuel handling locations.

## Background

The DoD Fuel Facilities Engineering Panel (FFEP) includes representatives from the Air Force Civil Engineering Support Agency (AFCESA), Naval Facilities Engineering Command (NAVFAC), the US Army Corp of Engineers (USACE), and the Defense Energy Support Center (DESC). A POL maintenance UFC is to be developed for the agencies making up the FFEP. HQ AFCESA contracted this effort and coordinated all input with FFEP representatives. As a precursor to that development, the FFEP must determine the required content of the manual and the method in which the manual will be presented to user personnel. Users will include military, civilian, and contractor personnel at government owned and contractor owned facilities. Facilities will include bulk terminals, aviation hydrant systems, pipelines, receipt, storage, and ground vehicle servicing.

## Task Descriptions

The requirement included four major tasks:

- 1) **TASK 1: Develop a POL Survey Instrument.** Solicit comments from at least 80 maintenance, operations, and engineering personnel for the purpose of providing field level insight into the needed content of the Interactive POL Maintenance UFC. Comments are meant to solicit specific information that maintenance personnel need to see in a manual, to include system descriptions, types and brand names of system components, formatting, search options, references, and links as well as comments on the current UFC 3-460-3, Army TM 5-678, and MO 230 documents being used. Base personnel as well as experts from NAVAIR, the Air Force Research Lab, AF Petroleum Office, Naval Petroleum Office, NAVSEA, Army Petroleum Center, NFESC and others will be surveyed. NOTE: A requirement to visit three military installations to get a field survey and opinion was cancelled based on discussions during the survey development.
- 2) **TASK 2: Feasibility Report.** Contact various POL system component manufacturers to determine the feasibility of links to their company Internet-based information sources. Items to be discussed include but are not limited to copyright assignments, link capabilities, availability of needed information and potential problems. Additionally the contractor shall contact various national organizations such as, but not limited to, API, NEC, ASTM, SAE and ASME. The purpose of the discussion with these organizations would be to discuss access, limits of access, cost of access and ongoing fees that might be associated with connections to their sites and information data sites.
- 3) **TASK 3: Software and development recommendations.** Research information management software and related software development options and recommend at least two viable options for constructing the UFC. Input from the field, collected in tasks 1 and 2, was used to determine what types of information and what documents and other materials should be included. Look at other similar documents published outside the government such as vehicle and aircraft service manuals to determine the best formats and display options. The contractor will also determine compatibility with the Navy and Marine Corp Information systems.
- 4) **TASK 4: Overall Analysis.** The contractor shall combine all elements of the study, the survey results, the manufacturers and organizations queries and the software development options into a consolidated analysis for presentation to the Government. The contractor shall develop cost estimates for each option for the final published UFC.



Northrop Grumman Mission Systems personnel accomplished this work at HQ AFCESA, Tyndall AFB.

## Survey Overview

An Internet-based survey was developed to capture information from POL system maintenance personnel among all three services worldwide. The survey was created by the team at HQ AFCESA and coordinated with FFEP representatives.

## Survey Development

Brainstorming was used to create a range of topics for the survey. A series of questions were then developed and grouped into common theme areas of demographics, basic system description and components, requirements for information, information sources, and features. Initial review was done through e-mail using both MS Word and a conceptual visualization using MS PowerPoint. Dreamweaver MX was used to develop the Internet version, which incorporated html, active server pages, and JavaScript technologies, and MS Access was used to capture the data. The 33-question survey was designed to take about 20 minutes to complete by installation POL system maintenance personnel using simple drop down answer selections and radio buttons. The survey also included several open-ended questions to allow less restricted responses throughout the survey. JavaScript error trapping routines were used to check data entries, promoting data accuracy and eliminating missing or incorrect entries. Files were posted on the Army Corps of Engineer Huntsville server that also hosts the FFEP Internet site. An Adobe Portable Document file (PDF) version of the survey was included as a link for an alternate means of responding in case of Internet problems. The full text version and Internet screen shots are shown in Annex B. Each of the six sections is summarized below.

**Demographics.** This section contained the usual type of survey respondent information such as service, installation, name, and typical contact information. The e-mail field was used as a unique key in the database.

**POL Systems Description and Characterization.** The intent of this section was to get a quick feel about the age and source of maintenance, government or contractor. HQ AFCESA also inserted a question to get feedback on types of aviation systems used today.

**Systems Components.** A table of 11 major POL system categories was used to get an idea of the basic types of equipment in the field. Several of the categories were divided into more specific subcategories and respondents were asked to identify the frequency requirement for information. The intended results were a quantifiable measure of which system components generated the greatest need for maintenance information.

**Systems Components** (Section 3 of 6)

This screen lists the major components of a POL system. These categories will be used to outline the interactive manual design. Survey results will help prioritize where to begin on the new manual. Next to each component, please rate how often you need information about it. (NA: does not apply, Rarely: more than 6 months, Occasionally: monthly-quarterly, Frequently: daily-weekly).

	N/A	Rarely	Occasionally	Frequently
<b>Fuel Receipt</b>				
Pipeline	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Barge	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Rail	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Truck	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Bulk Shipment Containers (BSC)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other (Please State) <input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**POL Systems/LFM Information Requirements.** This section was critical towards understanding what types of information were most sought by maintenance personnel. Information need was ranked for use and importance. For example, how does recurring maintenance information relate to compliance or safety information? The survey also gauged the use of the existing service or DoD POL maintenance handbooks currently available and asked for reasons not used. The survey additionally inquired about the use of commercial reference sources such as professional organizations like the American Petroleum Institute (API) and the National Fire Prevention Association (NFPA).

**POL Systems/LFM Information Sources.** This section asked where and how information is currently obtained. The survey questioned how much time is spent looking for information and requested the top ten Internet sites used.

**Features.** The final section of the survey was mostly open-ended in an effort to get feedback on features and benefits end users might want to see in an interactive reference tool.

## Survey Results

The survey results are summarized by question. The Huntsville office of the Army Corps of Engineers hosted the survey on their web-server from 15 Sep to 10 Oct 03. An extension was made until 15 Nov to allow for greater survey return rate. There was a brief outage resulting from a computer attack to the Huntsville server. Additionally, many replies were received using the faxable paper version. The project team at AFCESA received a total of 127 replies from 114 unique installations. The Air force led with 51%, Army at 39%, and Navy/Marines had 10% of the replies. Where possible, contact was made with respondents to clarify response or complete missing data. The analysis of each question was based on the total number of usable replies but not all questions had the same number of responses. All questions concerning maintenance information use were based on the 127 total replies. Installation data was based only on the 114 unique installation replies. Annex D has detailed survey information.

### Tell Us About Yourself

There was a split between civilians and military but the majority of respondents listed themselves as supervisors versus technicians. Contractors also replied.

	DoD	Air Force	Army	Navy/Marine	Supervisor	Technician
Civilian	66	24	35	7	45	21
Military	45	35	5	5	35	10
Contractor	16	6	9	1	8	8
Installations	114	61	40	13		

### Who maintains your installation's POL system?

	DoD	Air Force	Army	Navy/Marine
Contractor	38 (33%)	11	20	7
Government	76 (67%)	50	20	6

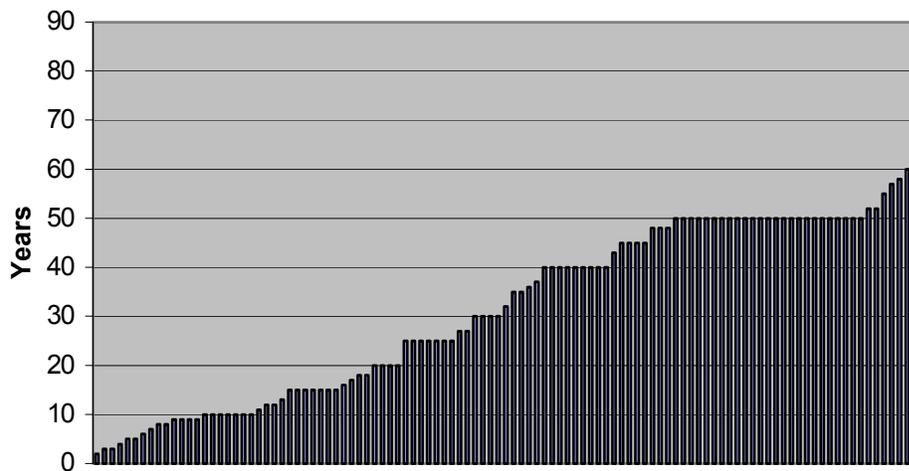
Of the replies received, the DoD maintains systems in-house by about a 2:1 ratio over contractors in the replies received. This result is skewed by the AF, which has a 5:1 ratio favoring in-house maintenance, while the other services are evenly split between outsourcing and retaining in-house.

**On average, how would you characterize the age of your POL facility system? Oldest systems are about how old? Newest systems are about how old?**

	DoD	Air Force	Army	Navy/Marine	Contracted	In-House
< 10 years	28	11	14	3	11	17
10 – 25 years	39	20	14	5	11	2
25 – 35 years	15	9	5	1	3	12
> 35 years	32	21	7	4	13	19
Oldest? (yrs)	85	58	50	85		
Newest? (yrs)	0	0	3	1		
Average (yrs)	31.6	36.3	24.4	30.3		

Clearly, the majority of the systems are considered by their caretakers to be on the older side with an overall simple average age of about three decades. *The median age of 32 years implies 50% of all the systems are older than 32 years.* The mode (most frequent reply) was 50 years of which the AF had 19, the Army had 5, and the Navy had one. The Navy had the unique distinction of identifying the oldest POL components at Guantanamo Bay at an amazing eighty-five years! On average, Air Force systems reported were somewhat above average in age and Army somewhat below. There appeared to be no correlation between age of system and if it was contracted out or remained in-house for maintenance. The following table illustrates the raw data on oldest systems:

### Oldest Systems are about how many years old?



**For aviation systems only: Do you have Pressurized Hydrants (Type 3-5), Hydrants (Type 1-2), Direct Fueling Systems (DFS), or Truck Refueling?**

	DoD	Air Force	Army	Navy/Marines
Type 3-5	37	33	1	3
Type 1-2	25	22	2	1
Direct Fueling Systems	12	3	6	3
Truck Refueling	85	52	21	12

Thirteen AF and one Army installations had both Hydrants (Types 1-2) and Pressurized Hydrants (Type3-5).

## System Components

This portion of the survey was intended to gather knowledge about which components of the installation's POL system appeared to have the greatest frequency of information use. The following table is a DoD consolidation that hides some of the service unique issues. The individual service tables are in Annex D. These results are important to any FFEP follow-on work because they assist in prioritizing where the maintenance information needs are and are not.

DoD Overall Frequency for Maintenance information by system component		<i>N/A</i>	<i>%</i>	<i>Rarely</i>	<i>%</i>	<i>Occasionally</i>	<i>%</i>	<i>Frequently</i>	<i>%</i>	<i>Blank</i>	<i>%</i>
<b>Fuel Receipt</b>	Pipeline	68	54%	16	13%	12	9%	26	20%	5	4%
	Barge	111	87%	4	3%	4	3%	2	2%	6	5%
	Rail	107	84%	4	3%	5	4%	3	2%	8	6%
	Truck	13	10%	27	21%	28	22%	37	29%	22	17%
	Bulk (BSC)	105	83%	11	9%	2	2%	1	1%	8	6%
	Other	1	1%	0	0%	0	0%	0	0%	126	99%
	Gas Station	13	10%	20	16%	27	21%	66	52%	2	2%
	Aviation Hydrant Systems	67	53%	6	5%	19	15%	29	23%	6	5%
	Ship Refueling	107	84%	7	6%	4	3%	4	3%	5	4%
	Truck Fill Stands	15	12%	21	17%	27	21%	60	47%	4	3%
<b>Fuel Storage Tank Types</b>	Manufactured	47	37%	19	15%	24	19%	30	24%	7	6%
	Field Constructed	51	40%	13	10%	27	21%	29	23%	7	6%
	Cut and Cover	81	64%	12	9%	12	9%	15	12%	7	6%
	UST	30	24%	15	12%	25	20%	52	41%	5	4%
	Tank Gauging/Monitoring	3	2%	18	14%	31	24%	72	57%	3	2%
	Transfer Pipelines	45	35%	25	20%	19	15%	35	28%	3	2%
	Secondary Containment Sys	22	17%	26	20%	32	25%	43	34%	4	3%
<b>Filtration Separation Systems</b>	Bulk Receipt	18	14%	20	16%	30	24%	57	45%	2	2%
	Truck Issue	10	8%	22	17%	33	26%	61	48%	1	1%
	Hydrants/DFS's	62	49%	10	8%	18	14%	31	24%	6	5%
	Controls	26	20%	13	10%	28	22%	44	35%	16	13%

For example, the following areas were the top five least (N/A plus Rarely) and most frequently required:

Least Required	Most Required
Bulk Fuel Receipt	Tank Gauging/Monitoring
Barge Fuel Receipt	Ground Fueling Station (Gas Station)
Ship Refueling	Truck Issue Filtration/Separation
Rail Fuel Receipt	Truck Fill Stands
Cut and Cover Tanks	Bulk Receipt Filtration/Separation

### Please rank order your information requirements for performing assigned tasks:

The survey requested respondents prioritize on a scale of 1 (high importance) to 5 (low importance) what their specific maintenance related information needs were among nine areas. The following table shows the overall DoD average followed by the individual service feedback tallied by percentage of votes for each score. The greatest most used areas included troubleshooting, recurring maintenance, testing and inspection, and safety. Component overhaul and electronic controls were least cited reasons for maintenance related information use.

Service Replies by % 1 – Use Most 9 – Use Least	DoD Avg	AF					Army					Navy/Marine				
		1/2	3/4	5	6/7	8/9	1/2	3/4	5	6/7	8/9	1/2	3/4	5	6/7	8/9
Troubleshooting data	3.83	51	25	9	9	6	27	17	14	27	15	16	31	23	23	7
Recurring Maintenance data	3.82	49	23	9	8	11	19	35	12	25	8	55	15	-	15	15
Minor Repair	4.65	28	25	9	23	15	15	37	13	15	20	31	15	31	23	-
Component Overhaul	6.13	17	23	12	18	30	4	6	13	21	56	23	8	15	23	31
Electronic Controls/PLC's	5.43	23	15	15	15	32	13	23	8	23	33	23	8	15	23	31
Testing and Inspection	3.82	29	31	17	17	6	44	29	13	6	8	23	23	23	8	23
Policy information	4.90	22	15	6	29	28	38	22	8	15	17	38	8	-	8	46
Compliance information	4.46	29	18	9	22	22	48	12	6	17	17	23	31	-	15	31
Safety Information	3.88	40	14	12	20	14	54	11	8	8	19	46	15	-	-	39

Individual preferences were again apparent as demonstrated by the Navy/Marine reply to policy information, compliance information, and safety information which all had balanced high and low scores with no middle ratings. One can conclude that individual, versus service driven needs, were reflected. The AF reported a 40% above neutral interest reply rate for component overhaul (scores 1-4) versus only 10% for the Army which may be reflective of the difference in equipment between the services.

**Please rank order your requirements for the following data:**

This table shows for each question a DoD average score between 1 and 5 for all the survey replies. The figures under each service show the percentage of replies for each rating choice.

Service Replies by % 1 – High Importance 5 – Low Importance	DoD Avg	AF					Army					Navy/Marine				
		1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Technical/Engineering data	2.56	43	20	21	9	7	18	17	17	17	31	46	31	-	15	8
Training information	2.32	35	34	20	9	2	37	20	16	16	11	23	23	8	15	31
General references	2.85	15	15	28	25	17	27	29	24	10	10	15	15	47	15	8
Project submission	3.32	18	20	11	26	25	14	14	16	19	37	8	15	31	31	15
State/Federal publications	3.22	20	12	15	17	36	35	10	8	10	37	23	23	8	-	46

Technical and/or Engineering Data was rated by the Army as the only service with a large below average percentage (48%) indicating a desire for this type of information. Both the AF (63%) and Navy/Marines (77%) responded with above average needs for this information.

Training Information was the overall highest rated requirement. Navy/Marine responses were evenly split at 46% at both above and below a neutral rating of 3.

General References (tables, formulas, etc.) received an overall average score. The AF had the least need with the Army citing the greatest interest.

Project submission and programming was the overall lowest rated category. There were distinct services differences however as the above neutral ratings were highest in the AF with a 38% score, Army in the middle at 28%, and Navy//Marine showing only 23% favoring this information.

State and Federal publications were almost perfectly split among all three services with the same number of above average interest as below average interest.

**Please indicate your current use of the following manuals. If not used, please answer why:**

	# DoD Use	% AF	% Army	% Navy/MC	Do Not Use	% AF	% Army	% Navy/MC	Why?
UFC 3-460-3	66	86	11	3	61	13	69	18	75% never heard of 20% said N/A
USA TM 5-678	19	11	84	5	108	58	31	11	70% never heard of 17% said N/A
USN MO 230	16	0	25	75	111	59	41	1	69% never heard of 20% said N/A
MIL-HDBK-1022A	81	60	25	15	46	35	63	2	74% never heard of 17% said N/A

This question provided valuable insight into the use of service created POL maintenance handbooks. The results clearly point to the fact that there is limited knowledge about the existence of other service handbooks, something the FFEP could easily address through this report's recommendation. A distant second reason cited was non-applicability of a document indicating possible bias that the document was too service oriented even though there is common ground between them. The Army was the only service to return positive replies on all four documents. Mil-Hdbk-1022A, Petroleum Fuel Facilities, was the most recognized and used reference across all the services. Merging information from these documents into a single reference will need to consider cultural and operational differences between the services.

**For the above manual used most, please rank order the reason used:**

A high AF return rate skewed the top manual used results to be #1) UFC 3-460-3, #2) TM-5-678, #3) MO 230. Proving that service loyalty is not absolute, three Army and 2 Navy replies cited using the UFC most, one AF reply cited using the TM, and one Army reply cited the MO as top choice.

Manual	Maintenance Procedures	Policy Guidance	General Guidance
UFC 3-460-3	68%	16%	16%
USA TM 5-678	50%	25%	25%
USN MO 230*	#1	#2	#3
MIL-HDBK-1022A	39%	11%	50%

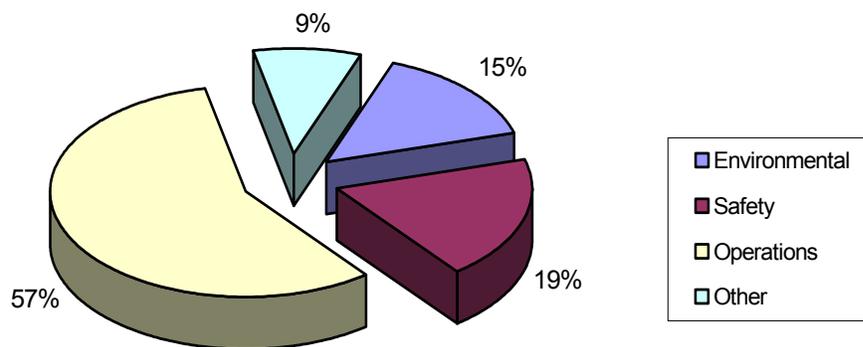
\* USN MO-230 ratings exceed 100% due to repeat scores, rank order used instead

The results shown in the above table reflect the priorities receiving the most votes. While there was not true consensus on each document, the survey data indicates that each service tends to use their

document mostly for maintenance related content. AF users were strongest in citing UFC 3-460-3 as a source of maintenance information. Policy guidance and general guidance were evenly split between second and third place among all the services. Conversely, MIL-HDBK-1022A, the most widely cited reference by all three services, was principally used for general guidance, perhaps as a well-fitting complement to the service manual.

**List any other government/DoD POL/LFM reference documents you use:**

A total of sixty-eight documents were identified of which about 78% were service publications and the remainder from federal or professional organizations. Since no professional organization responses were given in a subsequent question asking for commercial publications, there may be a belief that organizations such as the National Fire Protection Association (NFPA) are government entities. The titles were grouped by knowledge area to reveal that operations related, safety, and environmental were the top areas of reference. A full list of the titles is in Annex D.



**Please indicate your current use of Commercial references:**

The following organizations were identified during the survey development as having the most likely impact on the POL Maintenance community. The survey requested each be rated for use or lack of use along with a corresponding reason.

**American Petroleum Institute (API):** Mission is to influence public policy in support of a strong, viable U.S. oil and natural gas industry essential to meet the energy needs of consumers in an efficient, environmentally responsible manner. As the U.S. oil and natural gas industry’s primary trade association, API engages in federal and state legislative and regulatory advice that is based on scientific research; technical legal and economic analysis; and public issues communication; provides an industry forum to develop consensus policies and collective action on issues impacting its members; works collaboratively with all industry oil and gas associations, and other organizations, to enhance industry unity and effective in its advocacy. API also provides the opportunity for standards development, technical cooperation and other activities to improve the industry’s competitiveness through sponsorship of self-supporting programs.

**American Society of Mechanical Engineers (ASME):** Founded in 1880 as the American Society of Mechanical Engineers, today ASME International is a nonprofit educational and technical organization serving a worldwide membership of 125,000. Conducts one of the world’s largest technical publishing operations. Holds some 30 technical conferences and 200 professional development courses each year. Sets many industrial and manufacturing standards.





**ASTM International** is one of the largest voluntary standards developing organizations in the world. ASTM is a not-for-profit organization that provides a forum for the development and publication of voluntary consensus standards for materials, products, systems, and services. ASTM's members, representing producers, users, consumers, government, and academia from over 100 countries, develop technical documents that are a basis for manufacturing, management, procurement, codes, and regulations. More than 11,000 ASTM standards can be found in the 77-volume Annual Book of ASTM Standards.



**American Welding Society (AWS):** Founded in 1919 as a multifaceted, nonprofit organization with a goal to advance the science, technology and application of welding and related joining disciplines. From factory floor to high-rise construction, from military weaponry to home products, AWS continues to lead the way in supporting welding education and technology development



**National Fire Protection Association (NFPA):** The mission of the international nonprofit NFPA is to reduce the worldwide burden of fire and other hazards on the quality of life by providing and advocating scientifically-based consensus codes and standards, research, training and education.



**Society of Automotive Engineers (SAE):** Over 83,000 engineers, business executives, educators, and students from more than 97 countries form a network of membership who share information and exchange ideas for advancing the engineering of mobility systems. More than 16,000 volunteer leaders serve on the Board of Directors and many other boards, councils and committees. Technical committees write more new aerospace and automotive engineering standards than any other standards-writing organization in the world.

The API, ASTM, and NFPA/NEC were the top commercial sources with 69%, 58%, and 51% usage replies respectively. AWS and NACE were the least known and were used by less than 25% of the survey takers.

Tallied Count	Use	AF	Army	Navy Marine	Do Not Use	AF	Army	Navy Marine
API/IP	82	46	27	9	37	13	21	3
ASME	48	29	14	5	68	29	33	6
ASTM	68	32	26	10	50	26	21	3
AWS	13	7	6	-	95	47	39	9
NACE	24	15	6	3	90	43	38	9
NFPA NEC	59	36	18	5	57	22	29	6
SAE	37	23	9	5	78	35	36	7

The primary reasons for not using any reference were lack of awareness or believing to be non-applicable. This information is also revealing, because like the service-oriented manuals, there may be opportunities to improve communication and knowledge through better publicity of these sources among the entire POL maintenance community. The very few comments about dated information, too general or too hard to find information, and costs indicate these were not strong factors and probably reflect individual preferences and biases more than any other reason. The following table summarizes the reasons for not using these commercial sources:

Tallied Count	Cost	Never Heard Of	Not Applicable	Out of Date	Too Difficult to Use	Too General
API	3	19	7	1	5	2
ASME	3	34	17	-	9	5
ASTM	3	26	12	-	3	6
AWS	1	62	17	-	9	6
NACE	3	54	21	-	5	7
NFPA/NEC	4	32	13	1	4	3
SAE	2	38	24	-	6	8

**List any other commercial (not web sites) POL/LFM reference documents you use.**

Only a handful of replies were received to this question and they mostly reaffirmed the use of manufacturer information. One reply (Navy) identified Florida Dept. of Environmental Protection Agency.

**Please rate your dependence on Command guidance regarding systems maintenance/ inspection:**

**Please rate your familiarity with environmental regulatory requirements for your facility:**

**What do you feel your familiarity with environmental regulatory requirements should be?**

Rating Scale: 1 – Low, 5 - High	DoD	AF	Army	Navy Marines
Dependence on Command guidance	3.14	3.20	3.06	3.15
Familiarity with environmental regulatory requirements	3.96	3.95	3.94	4.08
Familiarity with environmental regulatory requirements should be?	4.56	4.55	4.57	4.54

These aggregated results tend to mask how the three services responded but do show a general indication that installation environmental regulatory familiarization could be improved. Dependence on command guidance was neutrally scored but environmental returns indicate a strong group focus in this area. The following table shows the tallied count of replies by service.

Tallied Count	AF					Army					Navy/Marine				
Rating scale: 1 – Low, 5 - High	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Dependence on Cmnd	11	9	14	11	16	10	9	9	6	13	3	1	3	3	3
Envir Familiarity Now	1	-	18	25	18	3	2	9	14	19	-	1	2	5	5
Envir Familiarity should	-	-	6	16	40	1	-	4	8	34	1	-	-	2	10

All three services had a better than 69% reply rate of 4 or 5 regarding present familiarity with environmental regulations. All three services also had a better than 89% reply rate of 5 regarding what familiarity with environmental regulations should be.

**How do you currently search for information regarding your systems?**

Survey replies indicated a fairly consistent approach beginning with any manufacturer's operation and maintenance manuals, schematics/as-built drawings, followed by research of Internet for any updates or further troubleshooting information. Telephone and e-mail is also used. Several Air Force

responses indicated use of AFM 85-16, the predecessor to UFC 3-460-3, because of the detailed reference tables that were eliminated in the newer document. A few people cited the DESC Help Desk. Other sources included shop manuals and instructions, career field training material, and consulting with other personnel (environmental, PWD Engineers Dept).

**On average, how much time per month do you spend maintaining and/or searching reference materials for your shop?**

Time per Month	DoD	Air Force	Army	Navy/Marine	System Age (Yrs)
< 1 hour	16	4	12	-	Range 1-50, avg 21
1 – 5 hrs	43	20	19	4	Range 0-57, avg 34
5-10 hrs	34	24	6	4	Range 1-85, avg 32
> 10 hrs	28	13	10	5	Range 0-50, avg 31

Better than 50% of the survey responses indicated that about one day per month is cumulatively spent looking for information. This is an interesting finding because it shows a significant process effort by POL system maintainers at every installation. There was no direct relationship to the time spent looking for information and the general age of the POL system.

**Please list up to 10 of your most used POL commercial maintenance reference/maintainer Internet sites.**

Over sixty web sites were identified by the survey. The following categories, shown in order of descending order of number of replies, were the most popular:

- Valve manufacturers (#1 Cla-Val, #2 General Valve)
- General suppliers (#1 Gammontech, #2 Grainger)
- Pump Manufacturers (7 companies)
- Filtration Suppliers (#1 Velcon)
- Flow Indicators (OPW-ES)
- Controls (6 companies)
- Meters (LC Meter)

Other sites included measurement, electrical components, safety equipment, and various reference information sites. Some of the sites were clearly unique to overseas support (Italian, Japanese). A full list of the sites is shown in Annex D.

**How would you like to see the information presented?**

This was the first question in a series designed to provide mostly open-ended feedback. Unfortunately, the respondents provided very little information for this overall section. Since there were so many blank replies only generalizations are possible. About two thirds of the surveys indicated a desire for a web base interactive program with links. About forty percent indicated color manufacturer manuals. Another third requested original equipment manuals. Surprisingly there were no responses for online discussion forums or stating any other desired choices. Reasons for the indifference towards online forums might lie in a general lack of understanding of what they are. Failing to provide other information may simply be the result of a combination of survey burnout by the final page combined with a general lack of understanding of what the FFEP desired end product is envisioned.

**What features would you like to see: Reference data/tables, training, etc.**

Comments fell into four principle areas:

- **Reference** – OEM Manuals, parts listings and numbers, detailed reference data/tables, technical data, and business points of contact
- **Maintenance** - Complete parts breakdown, required maintenance actions and frequencies, procedures, methods. Trouble shooting, problem solving. One comment was very specific:

“User friendly preventive maintenance program tailor for fuel systems that provide useful reports such as total number of scheduled maintenance actions with man-hours; total number of completed maintenance actions with man-hours; broken down by frequency i.e. monthly, quarterly, semi-annually, annually; bi- annually etc (Navy)

“General operating procedures for bulk petroleum storage issue and 1st echelon maintenance as those in FM 10-69 understandable environmental language” (Army)

- **Training** - Recurring training, Interactive media for training purposes, lists of training courses, Standard Operating Procedures, Data/table Training (e.g. how to use references), online training of new products/controls and even older products/controls, pulling up different types of reports, API 653 inspection certification training
- **Information Cross-sharing** - POL/LFM help line for technical issues, something like FAQ board. Specific comments included:

“Something interactive where a shop could talk to another base that might be or have experienced the same problem with a facility that you may be experiencing” (Air Force)

“It would be nice to see if anyone else has had a problem that you are having, and provide helpful information so you can fix the problem fast, and benefit from someone else's experience” (Air Force)

“Constant turnover of personnel placing a huge dependence on training and procedures” (Army)

“An ‘Ask Jeeves’ type search engine so that a vague question can be answered with links to reference material on that subject” (Air Force)

“Find out what other bases are doing better” (Navy)

**Would a frequently asked questions (FAQ) bulletin board for cross talk be helpful?**

All who answered this question replied ‘yes’.

**What benefits of an interactive manual will be useful to you?**

Responses indicate a desire to find information more quickly and find out if peers have related information. When joined with a preceding question on features, there appears to be interest in collaboration between locations to solve problems.

- Consolidated information site:

"It would solve the problem of trying to figure out where the answer to our questions reside"

"One stop source for information and a knowledge base"

"Locate information quicker. More information without having to have to look through numerous sets of manuals"

- Reference/Training: Reference materials, troubleshooting, maintenance procedures

"Live" talk with a fully qualified technician could speed solutions to technical issues through "Brainstorming" between individuals

"Better grasp of job needs"

"It could stay most current and it could show how systems should work in the real world"

"All aspects would be of use at some time or another if there were places you go to see if someone had the same problem elsewhere"

**Please provide any other information you think the feasibility study team should know.**

No useful replies received.

## Information Feasibility

A review of readily available commercial information was accomplished to see how much existing POL system maintenance information was readily available. Additionally, the review examined the willingness of content owners to allow hyperlinks in a future web-based support tool. The following data summarizes the review of potential information content sources within the POL commercial industry as well as professional societies relating to POL maintenance activities, compliance, and safety. Future sources of information, such as Internet multimedia content were also considered. Finally, the community of POL system maintainers themselves was seen as a very logical and lucrative source of experience and how-to information the FFEP could draw from.

## Commercial Professional Association Internet Sites

**Background:** Professional societies are commercial entities representing a specific focal point of interest. They are membership based and provide a variety of information such as standards, technical, training, and other specific support. The following organizations were contacted by phone and their Internet sites reviewed for useful content pertaining to POL system maintenance.

Organization	INTERNET Address	Telephone	Membership	Fee?	POC
API	<a href="http://api-ec.api.org">http://api-ec.api.org</a>	202 682 8000	Individual only	Yes	Erin Thomson
NEC/NFPA	<a href="http://www.nfpa.org">http://www.nfpa.org</a>	617 770 3000	Individual only	Yes	Jennifer Lancione
ASTM	<a href="http://www.astm.org">http://www.astm.org</a>	610 832 9585	License Req'd	Yes	Jennifer Rogers
SAE	<a href="http://www.sae.org">http://www.sae.org</a>	877 606 7323	Individual only	Yes	Steve Yeager
ASME	<a href="http://www.asme.org">http://www.asme.org</a>	800 843 2763	Individual only	Yes	Will Haywood

**Findings:** In general, there is little free content value to be found at these professional association Internet sites. The sites are typically well organized and presented in a professional manner. Essentially, most sites are limited to the following content:

- Documentation (for a fee). Typically may be downloaded as an Adobe Portable Document File (.pdf) or ordered as a printed document
- Links to related resources
- Event related information (conferences, workshops, etc.)
- Membership (Joining, benefits, etc.)

They typically offer access to an on line document library which is the key product line for each site. The following is a typical screenshot represented by the National Fire Protection Association (NFPA):

The screenshot shows the NFPA ONLINE website interface. The browser title is "National Fire Protection Association Home Page - Microsoft Internet Explorer provided by HQ AFCEA". The address bar shows "http://www.nfpa.org/catalog/home/index.asp". The website features a navigation menu with categories: ONLINE CATALOG, CODES AND STANDARDS, RESEARCH AND REPORTS, PUBLIC EDUCATION, PROFESSIONAL DEVELOPMENT, MEMBER SECTIONS, and NFPA JOURNAL®. A search bar is located at the top left. The main content area includes a "Welcome to NFPA Online" message, a "Calendar of Events" section with a "GET OUT! STAY OUT!" graphic, "highlights" and "news releases" sections, and an "NFPA FACT OF THE WEEK" section. A right-hand sidebar contains "NFPA RESOURCES" such as "Join NFPA or renew your membership", "Online Catalog", and "NFPA Codes Online". Other sidebar sections include "Periodicals", "Other Web Sites", "Members Only", and "International". Four yellow callout boxes highlight specific features: "Document Library" points to the "ONLINE CATALOG" menu item; "Membership" points to the "MEMBER SECTIONS" menu item; "Calendar of Events" points to the "Calendar of Events" section; and "Other Links" points to the "Other Web Sites" section.

These professional societies treat their intellectual material as a strictly controlled commercial product. No organization was willing to offer any of their documents to the DoD in any special licensing arrangement for open use. All organizations required that installations procure individual documents through traditional procurement. The licensing of these documents is also

strictly controlled which would preclude posting on any web or network environment. The following is a license agreement example from American Society for Testing and Materials:

“This document is copyrighted by the American Society for Testing and Materials (ASTM), 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959 USA. All rights reserved.

ASTM grants you a license as follows: The right to download an electronic file of this ASTM document for temporary storage on one computer for purposes of viewing, and/or printing one copy of the ASTM standard for individual use. Neither the electronic file nor the hard copy print may be reproduced in any way. In addition, the electronic file may not be distributed elsewhere over computer networks or otherwise. The hard copy print may only be distributed to other employees for their internal use within your organization. This documents is not for resale”.

ASTM additionally posted their Intellectual Property Policy (Approved 28 April 1999) at <http://www.astm.org/ltpolicy.pdf> which includes the following:

#### H. Electronic Networks.

1. The Copyright Act provides copyright protection for certain works fixed in any tangible medium expression, now or later developed, from which they can be perceived, reproduced or otherwise communicated, either directly or with the aid of technology.

2. As more and more sophisticated technology becomes available, it may become increasingly difficult to determine and enforce ownership of ASTM Intellectual Property rights. Therefore, inputting, uploading, downloading, reproducing, or transmitting ASTM Intellectual Property without ASTM’s prior written permission is prohibited, with the exception that ASTM is not intending to limit the applicability of the “fair use” doctrine developed under the Copyright Act.

UFC 3-460-3, for example, currently makes extensive reference to API standards that can cost around \$175 each. The FFEP may need to reconsider any desire to include standards and codes as part of an interactive support tool due to cost and licensing. Fortunately, the three services have already subscription support from API, ASME, ASTM, and NFPA (over 450 organizations and 350,000 documents) through a contract with [IHS](#). However, this subscription is limited in scope to the service’s construction design agencies and users must operate within a copyright restriction agreement. Since typical installation maintenance probably does not require much access to most of these documents, the limited existing availability should be sufficient to support infrequent questions as they arise. An alternative may be to consider development of DoD policy that could provide the same functional value without the content restrictions. Ultimately, the survey results did not present a clear mandate for this type of information as only several sources were widely used and there was not even consistency in information requirements such as technical/engineering data or safety.

## **Commercial Industry Internet Sites**

**Background:** Commercial sources were defined as the members of the manufacturing community for all POL systems, systems components, and service providers. The following organizations were contacted by phone and their Internet sites reviewed for useful content

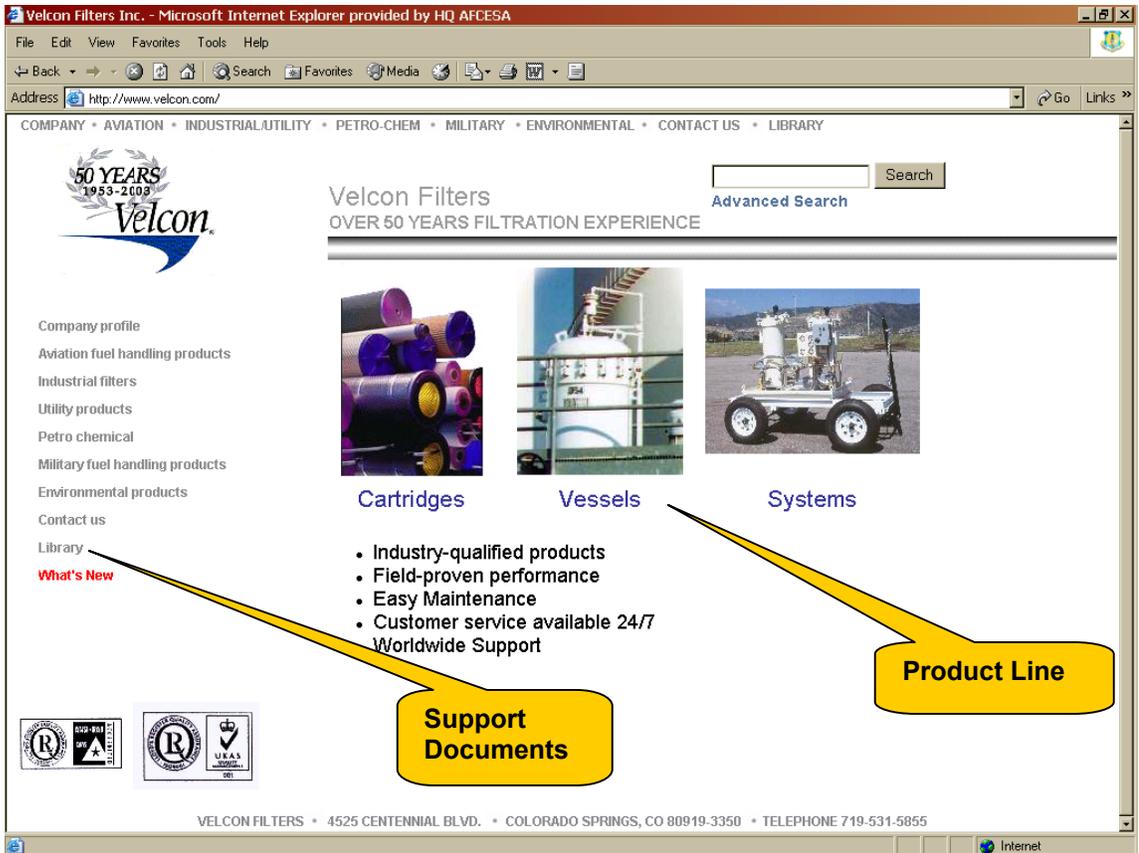
pertaining to POL system maintenance. A tabulation of sites submitted in the survey is shown in Annex D.

COMPANY	SITE	TELEPHONE	POC	LINK ?
Cla-Valve	<a href="http://www.cla-val.com">www.cla-val.com</a>	800 942 6326	Mike Uffer	Yes
General Twin Seal Valves	<a href="http://www.general-valve.com">www.general-valve.com</a>	800 926 2288	Adrian Hinstroza	Yes
Liquid Controls	<a href="http://www.lcmeter.com">www.lcmeter.com</a>	800 458 5262	Jeff Rizner	Yes
OCV Valves	<a href="http://www.controlvalves.com">www.controlvalves.com</a>	888 628 8258	Britt Radford	Yes
OPW Nozzles	<a href="http://www.opw-fc.com/ne">www.opw-fc.com/ne</a>	800 422-2525	Lois Hertzman	Yes
Orbit Valve (Cooper Cameron)	<a href="http://www.orbitonline.com">www.orbitonline.com</a>	800 488 6156	Brian Adams	Yes
Scully Systems	<a href="http://www.scully.com/index2">www.scully.com/index2</a>	800 272 8559	Elena Pechatnikov	Yes
Velcon	<a href="http://www.velcon.com">www.velcon.com</a>	800 531 0180	Dave Taylor	Yes

**Findings:** These sites are focused on sales and some support. All manufacturers were very agreeable to allowing DoD links to their Internet sites. Consultation with the Tyndall AFB military legal office confirmed it was acceptable to link to commercial sites providing a standard disclaimer was used in the government site. A copy of the statement is in Annex F. In general, commercial manufacturer Internet sites provide two basic types of information:

- Online parts catalog
- Documentation in downloadable pdf format:
  - Product brochures that typically illustrate features or specifications of products
  - Product support documents.

One of the difficulties with the manufacturer Internet sites is a lack of standardization in format making it more difficult to find information. Additionally, many of the components used by POL systems are not unique to POL applications, such as valves. There is much less specific POL related content at many of these sites that cover larger ranges of product lines.

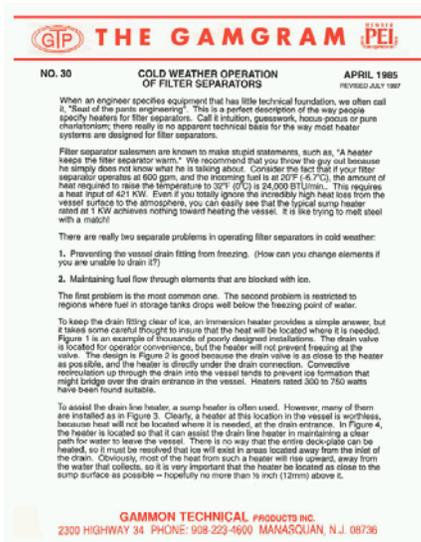


A typical manufacturer's Internet web site home page



An example of a support document library, typically one or two levels below the home page

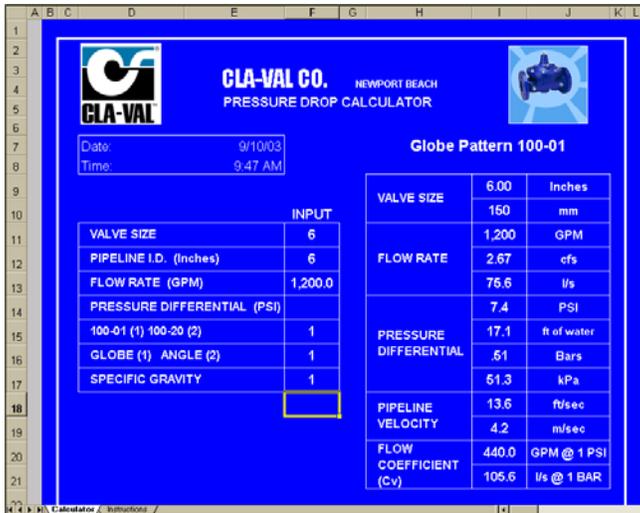
While most sites provided the basic information illustrated above, there were a few others that provided more knowledge oriented content such as the [GamGrams](#) from Gammon Technical Products:



The GamGram is a totally educational publication. You will find no advertising anywhere in a GamGram, nor will you find us promoting any of our products over those of other manufacturers. We offer the GamGram for educational use by schools, oil companies and fueling companies free of charge; we simply ask for acknowledgement that we are the source if you use our material. Other businesses wishing to use the GamGram should contact us for permission.

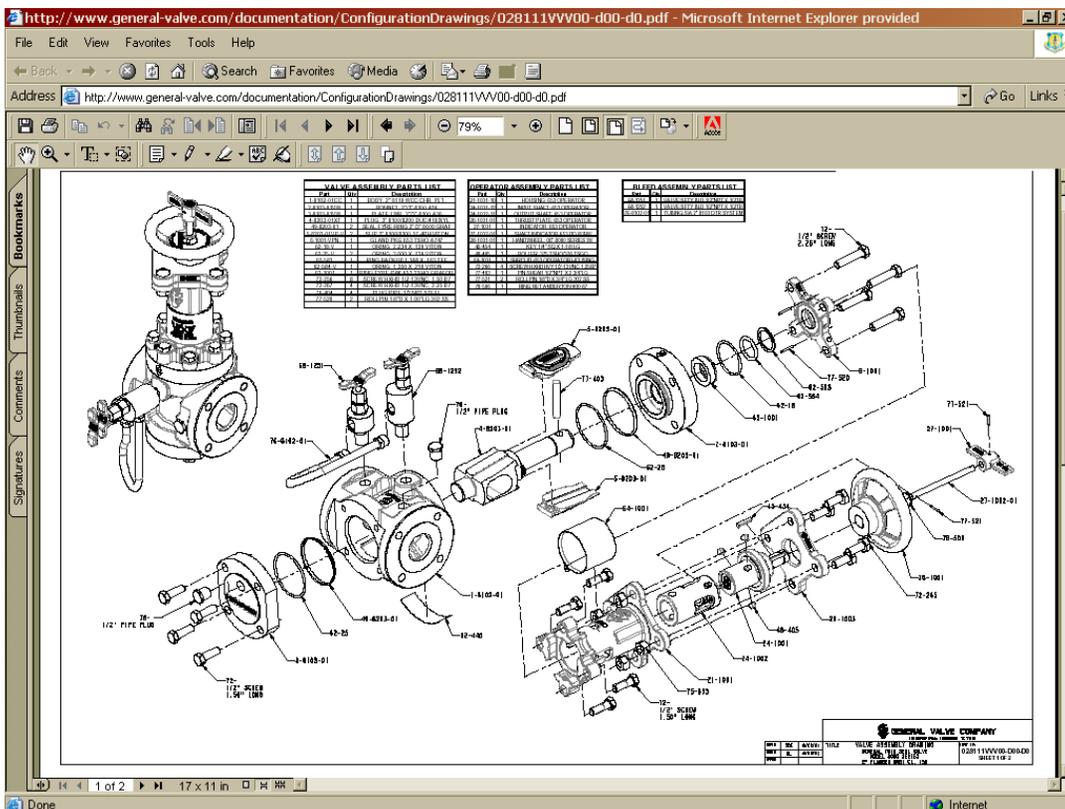
The GamGram is published two or three times each year by Gammon Technical Products, Inc., P.O. Box 400, Manasquan, N.J. 08736-0400.

The purpose of the GamGram is to pass on to our customers helpful ideas and useful bits of information. Our specialty is jet fuel handling so the GamGram deals almost exclusively with this subject. However, we are pleased to report that our customers who handle other fuels have found this publication very useful.



Example of an on-line calculator from the Cla-Val Company used to calculate pressure drop.

An example of a parts diagram is shown below. These are very common style documents. There were fewer documents shown in Annex G that went beyond just parts diagrams and actually described maintenance in greater detail.



Because some of this parts documentation is generic in nature, some sites also included a disclaimer typical to Velcon's show below:



- Vertical Filter Water Separators
- Horizontal Filter Water Separators
- Prefilters/Micronics
- Clay Treaters
- Monitor Vessels
- Small Filter Housings
- Accessories
- Relaxation Chambers

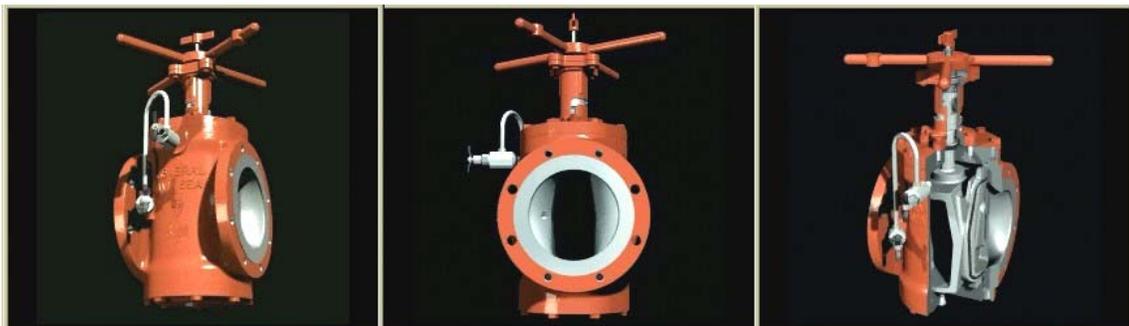
- [Filter/Separator Vessel Manual](#)
- [Filter Element Vessel Manual](#)
- [Clay Vessel Manual](#)
- [Monitor Vessel Manual](#)
- [Inside-Out Monitor Vessel Manual](#)
- [Relaxation Vessel Manual](#)

**Disclaimer:** This generic vessel manual is provided on the web for your information, with the understanding that each vessel manual sent out from Velcon is customized for the particular vessel, and contains accessory information not included in this document. This document makes reference to other pieces of literature, such as schematics, drawings, and installation instructions that are added to the manual as needed depending on the vessel parameters.

VELCON FILTERS • 4525 CENTENNIAL BLVD. • COLORADO SPRINGS, CO 80919-3350 • TELEPHONE 719-531-5855

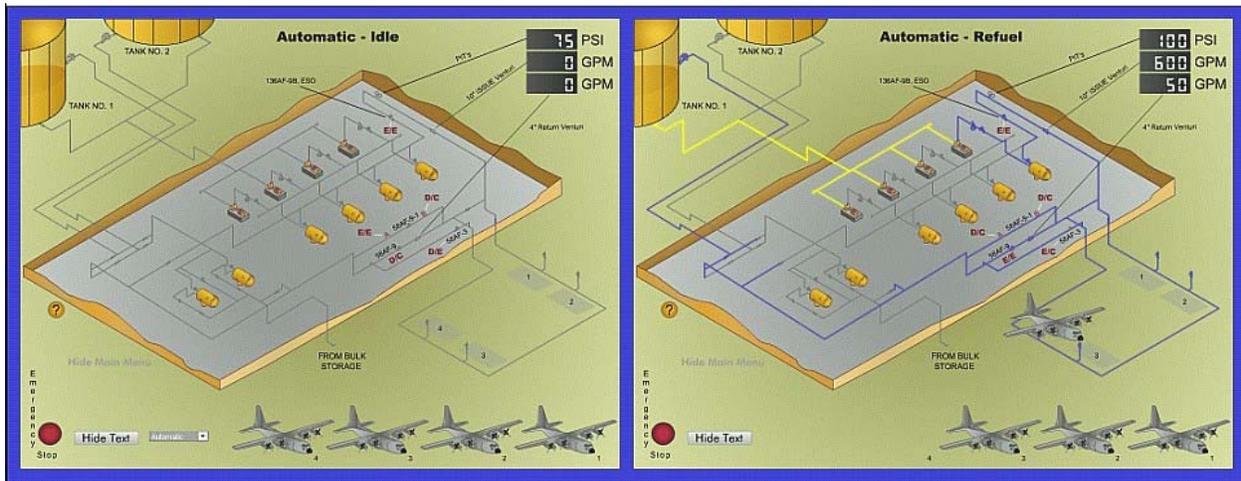
### Future Internet Content Development

The FFEP should consider developing additional content especially for the Internet. This new material would bridge the gap between the commercially available 'generic' information and the existing service POL system maintenance guides (UFC 3-460-3, MO-230, TM 5-678). These documents collectively contain excellent service oriented information designed for a printed document format. The Internet offers multimedia technologies that can meet the old adage of "a picture is worth a thousand words". This new content may be passive as in a simple self-running file or an interactive training tool. Files may either be downloaded first or run in a streaming environment to provide quicker response for large files. The following graphic (courtesy of General Valve) shows three frames extracted from an .avi movie file. The 3-D model rotates to show the valve and concludes by providing a transparent cut-away revealing the valve operation as the handle is turned to the closed position.



The result is an animation that clearly shows the hidden inner workings of the device. These types of files could be created for a variety of components and posted on the interactive support site. Another example uses a very common web-based animation tool, MacroMedia's Flash, to animate a typical Air Force aircraft fueling operation. Unlike the non-interactive movie file shown above, this animation requires user input to move aircraft to desired fueling points and activate a

desired operation (automatic, flush, receipt) resulting in specific sequences of actions. This presentation solution is an excellent choice to schematically illustrate how an entire system and the individual components function from a bird's eye view.



The software applications to create these files are typically very inexpensive. A particular advantage is that the players for these common files such as QuickTime, Flash, Shockwave, and Microsoft Media Player are no-cost downloads, which, typically are already on most computers. The cost of effort really lies in the time to create each file based on the amount of complexity involved, user interaction, sounds, etc. A practical approach would be to hire a full time graphics expertise capability for a fixed period of time to work against a master list of desired projects. This capability would be most effective if started a short time after the development of the basic interactive site using feedback from the initial development to define the priority of projects. The purpose of these products would not be to provide a comprehensive training course but as supplemental reference material solving common information gaps in the field. There are specific applications better designed for the comprehensive training environment but do not fit the scope of this project.

## POL System Maintenance Community

*Potentially the greatest source of information for an interactive site is the POL system maintenance community itself!* This community of professionals has a common theme in the practice of maintaining POL systems. Contained within this community of practice is knowledge about how things work. Specifically, maintenance technicians and supervisors, regardless of their branch of service, have a common, collective information pool of knowledge in the context of servicing, maintaining, and operating POL systems. Knowledge Management (KM) is the field of systematic processes providing support to create, capture, share, and leverage this information. The software applications in this report are KM tools. KM typically looks at a distinction between explicit and tacit forms of knowledge. Melisse Rumizon in her book *The Idiot's Guide to Knowledge Management* defines these terms as:

**Explicit Knowledge** encompasses the things we know that we can write down, share with others, and put into a database.

**Tacit Knowledge** is what we do not know that we know. It includes know-how, rules of thumb, experience, insights, and intuition.

The previous sections on commercial web sites discussed explicit knowledge already documented. The existing service manuals also fall within this category. The FFEP has an opportunity to tap the tacit knowledge base of the entire community with off-the-shelf applications supporting the KM processes. As mentioned in the report's opening, the communal coffee bar provides a location for the traditional swapping of stories and informally sharing information in a collaborative, loosely structured, learning environment. While this process works fine for each installation, there is limited exchange between installations. Conferences and workshops provide a new coffee bar forum for attendees whenever they are held. The recommendations of this report involve the establishment of a 'virtual coffee bar' so to speak using readily available KM tools. The FFEP can tap the collective corporate knowledge of POL system maintainers to provide a never-ending source of information sharing.

## **Conclusion**

There is a sufficient variety of Internet based POL system maintenance material to warrant consideration of creating a *common information access point for POL maintainers*. Manufacturers appear willing to allow unrestricted access to their sites which despite being product sales oriented do offer a variety of manuals, parts catalogs, and other supporting information. Standard DoD disclaimers exist to support external links. While all DoD documentation is available via the Internet, commercial professional organizations extensively restrict their intellectual property. Although installations cited use of a few major code and standard organizations like API and NFPA, there did not appear to be strong requirements in this area. Fortunately, the three services currently subscribe to an Internet-based subscription providing access to standards for their design/construction agencies. Although this service is geared towards design requirements, the respective service agencies, AFCEA, NAVFAC, and Corps of Engineers can get information need to resolve installation questions.

Readily available information does not exist in a traditional UFC format but more as discrete information packages that will fit well into commercially available knowledge management tools. The survey identified nearly seventy primary reference documents and over sixty web sites to serve as a starting point for grouping information by categories making sense to POL system maintainers. Specific files in .pdf format are available for hundreds of products on manufacturer web sites. An important finding is that the existing service POL maintenance documents are not well known outside their owning service. Common content exists which should be exploited and service unique information can still be grouped and linked as required. Internet browsers and free media players for multimedia files like Flash (animation) and QuickTime (video) provide a no-cost environment to distribute a wide range of training and support information. Content creation using these and other industry standard tools is reasonably quick and low cost. Microsoft Office based files such as PowerPoint and Excel additionally provide excellent capabilities for both presentation and analysis and *can be created by virtually anyone*.

Finally, the POL system maintainers at installations and headquarters are a currently untapped resource of *common know-how* information. There are pockets of expertise based on years of experience and types of equipment within and among the services. This 'grass-root' corporate information can be captured and shared easily using modern software products off the shelf with no programming skills required and enhanced with professional content tools as required. The end-result will be less a fixed document as currently prescribed by UFC format standards and more a continuing work in progress as content is perpetually created/updated/deleted in a linked, searchable, interactive Internet medium. This community should be used as a 24-hour/7 day a week live help desk. Culturally speaking, helping fellow practitioners of one's own community is as easy hurdle to overcome and in fact, the FFEP could consider an award program based on participation and peer based comments.

## Software Application Analysis

Knowledge Management (KM) was defined by the military in a 1999 report as an integrated and systematic approach to identifying, managing, and sharing information assets – including databases, documents, policies, procedures, and previously unarticulated expertise and experience.

*Knowledge management is the collection, maintenance, and dissemination of an organization's intellectual capital, with the goal of improving productivity and decision-making through access to relevant information.*

An effective knowledge management system should easily manage not only explicit knowledge, or the knowledge that is clearly documented and readily available; but also tacit knowledge, the elusive, hidden knowledge embedded in the minds of individuals and in a group's processes.

### Application Classes

KM is a booming industry with a wide variety of products geared towards improving information management fundamentals from the creation stage, aiding in collaboration, categorizing for enhanced searching, and finally storing and disseminating. This study accomplished an Internet search of vendors complemented by e-mail and telephone contact. Each application provides a slightly different approach to these fundamental processes and tends to specialize in a special area, for example document management versus training content. The applications are grouped by generalized categories defined by this study. Vendors tended to define their own application categories in order to differentiate themselves from the competition. Where possible, applications already in use with the military were examined. *The category deemed most applicable for the FFEP project is Communities of Practice (CoP), which is defined at the end of this section.*

### Enterprise Knowledge Management Applications

These products are more heavyweights in the field and best suited for larger scale, corporate or enterprise wide information management. They tend to be more data base driven seeking to collect vast amounts of information, categorized in highly structured lists (taxonomies), and capable of supporting a wide number of dispersed data sources and formats. They often focus on trying to discover knowledge that is not normally known by comparing many layers of information to produce new business insights, trend, and relationships. They also tend to be business process oriented, typically working in a 'top-downward' fashion. None were deemed appropriate for the FFEP task of supporting a POL maintenance community:

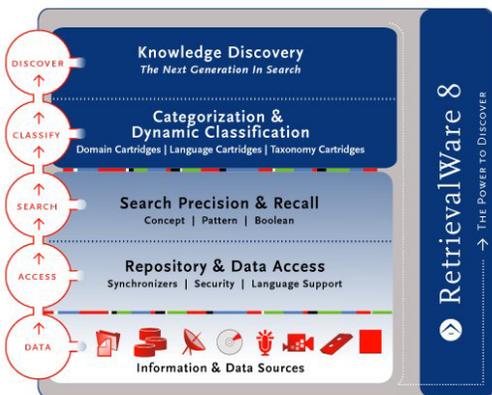
**Cognos** ([www.cognos.com](http://www.cognos.com)) is a collaborative, information-sharing environment that allows end-users to access, analyze, and report high-impact information. It requires a significant investment in development, both to identify and codify the knowledge and to structure and maintain the accompanying database. Enterprise Planning through use of a hierarchy of plans, measures, and reports that flow from broad strategic objectives to tactical plans across departments, divisions, and locations. Cognos delivers planning, budgeting, forecasting, modeling, consolidation, and financial reporting. Cognos can implement any form of performance management initiative: Balanced Scorecard, Six Sigma, TQM, or an internal system. Cognos delivers software that lets one create metrics, populate them with dynamic data, and link them to each other and the underlying data that provides detail. Access the information to make the best business decisions. Cognos offers a comprehensive set of business intelligence capabilities. People across the organization can create, modify, and distribute any type of report required with

our easy-to-use reporting. Use data visualization software to communicate complex information intuitively. Cognos links planning, scorecarding the performance, and business intelligence to report and analyze issues to manage what matters to an organization. Cognos provides a powerful modeling environment for planning and forecasting. This powerful, advanced database application for corporate performance management is not suited to the FFEP.



Corporate Performance Management depends on three interlinked capabilities: Enterprise Planning to drive your performance; Enterprise Scorecarding to monitor the performance of this plan; and Enterprise Business Intelligence to report and analyze issues for maximum effectiveness.

**Convera RetrievalWare 8** ([www.convera.com](http://www.convera.com)) is a leading provider of mission-critical enterprise search and categorization solutions. RetrievalWare optimizes mission-critical search and categorization by mapping unique inter-relationships between information and truly discovering knowledge. RetrievalWare is particularly helpful to users who need to identify essential information but do not know precisely what they might be trying to identify. RetrievalWare software analyzes vast stores of structured and unstructured information by providing scalable, fast, accurate and secure search across more than 200 information formats. Searching is done using a semantic network paradigm that finds related topics as well as those specifically requested. For example, the search engine “knows” that a poodle is a type of dog and would return all dog references unless specifically asked not to. In addition, it might return related references, such as pet food, pet stores, rabies immunizations, etc. The POL system maintenance community would need to develop a detailed classification hierarchy to get the most from this tool. RetrievalWare is used for information-intensive applications like intelligence gathering, homeland security, knowledge management, knowledge retention, large newspapers and diversified publishing companies, constituent communication and training. The Naval



Research Lab’s online TORPEDO Ultra digital library uses RetrievalWare to give 3,000 employees access to over a million articles from thousands of technical journals. The Air Force Research Lab also uses RetrievalWare. RetrievalWare 8 is a J2EE-based system meeting certain DoD information technology standards. It can retrieve documents in XML and PDF formats and can even access material in ZIP files along with about 190 other data formats. It can index media such as video presentations, audio, and scanned images, in addition to standard documents. It can also access material held in Documentum, a document management application. This product is not deemed suitable for the FFEP project because of its focus on searching and categorization of data.

**CYIOS Knowledge Office (CKO)** ([www.cyios.com](http://www.cyios.com)) is a suite of office tools integrating an organization’s information systems to create a knowledge map enabling the capture and sharing of the company’s processes and expertise. CKO captures, archives and categorizes corporate processes in a way that makes them instantly available for analysis. Rather than reinventing the wheel every time a task has to be done, team members can quickly review past efforts, refine and improve them. CKO can assist in monitoring strategies for success by allowing executives to see

the whole gamut of business objectives. CKO takes information and automatically creates reports. CKO provides information needed to aid in this decision making process such as:

- The status of each project.
- Who has done work?
- How much time has been spent on a project?
- How much time any individual has spent on a particular project or task?
- What remains to be done and who needs to do it.

It supports project management, documents sharing with check in and check out features, and email. It supports a knowledge library and collaboration. CKO enables identification of experts to aid in problem solving and information gathering. To use CKO, an organization has to create categories or terms, which are then associated with projects, documents, and other knowledge objects. CKO was determined to be better suited for project and task management, rather than for knowledge creation/sharing or access to third party information.

## **Content Management Systems (CMS)**

A CMS system should be capable of managing all of the unstructured information — or content — in an organization. At the most basic level, a CMS must provide universal access to content and features through a browser interface. This information exists in many digital forms: text documents, spreadsheets, still images, audio and video files, and many other file types and formats. CMS helps with the creation of content using common desktop applications like Microsoft Word and easy-to-use content authoring templates. Users must be able to work with their content in a format and application familiar to them without a learning curve. Use of templates enables users to publish content without having to learn new technical skills. CMS can also capture and incorporate existing content from a variety of sources. CMS applications tend to be focused on facilitating the manipulation of a wide variety of electronic content using easy to learn tools, within a web environment. The applications may also offer a variety of features such as collaboration and discussion forums that mirror features found in CoP tools. Two of these products were really designed with training content management as the focus including student logon and progress tracking. This class of applications would be the best alternative to CoP.

**Documentum** ([www.documentum.com](http://www.documentum.com)) provides enterprise content management (ECM) solutions that enable people to collaboratively create, manage, deliver and archive the content that drives business operations, from documents and discussions, to email, Web pages, records and rich media using one common content platform and repository. Documentum's eRoom provides a rapidly deployed and rapidly adopted Web-based collaborative workplace that enables distributed teams to work together to accelerate and improve development and delivery of products and services, optimize collaborative business processes, and improve innovation, problem-solving, and decision-making. eRoom is flexible and configurable, and can be adapted to support a wide range of business processes. Features of eRoom include:

- Flexible, highly intuitive work environment
- Configurable approval process and polling/voting capabilities
- Browser-based client access and end-user administration
- Structured project planning tool with Gantt charts and reporting features
- Site-wide search capabilities and search for content, members, and workplaces
- Drag-and-drop file sharing
- Server-side "My eRooms" with site-wide services and single sign-on authentication
- Customizable database and global rollups with task, project, program, and executive views

- Multi-topic, multi-threaded discussions and contextual version control
- Real Time Services (RTS) and Microsoft® Office integration
- Real-time and scheduled change notification
- Team calendars and project inbox
- Enterprise architecture with centralized management, administration, and services

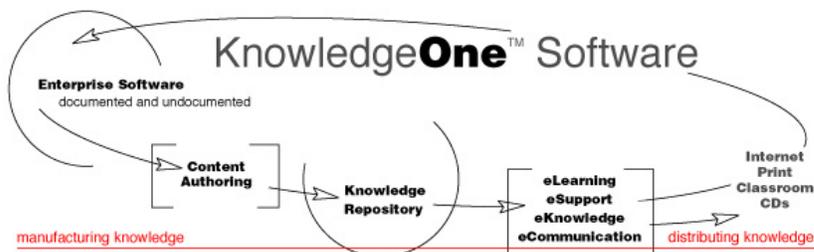
Documentum military clients include the US Army (Recruiting Command, Corps of Engineers) and the US Navy (Naval Air Systems Command, Bureau of Medicine & Surgery). The company offerings tend to be more enterprise in nature and while exceedingly capable, would be probably be more costly than other tools. The Documentum ECM platform is thoroughly standards-based and integrates support for the DoD standards and widely used programming languages in its core architecture including J2EE.

**Kashmere CMS** ([www.iplicity.com](http://www.iplicity.com)) is a web content management system. It includes content management, a user management, performance management, marketing management, and additional features implemented through add on web modules. Content management features include browser-based editing, web-based publishing, content versioning, file and image management, and real-time site updates. Kashmere includes file support for PDF, Word, Excel, PPT, and Graphic Images. Previews are supported through a stage preview area of the interface. User management features include user roles and groups assignments, permissions, access control, workflow and approvals, user authentication, and secure login. Performance management features include user statistics, referrer domains, page views, user navigation, and tracking and reporting. Marketing management features include email management, newsletters and information feeds. Additional features include ecommerce catalogs, shopping carts, event registration, calendars, chat forums, member directories, surveys, forms builder, polls, full text search, google search, profile management, video streaming, personalization, and discussion boards. Kashmere does not currently have DoD customers.

**Leading Way's Knowledge One** ([www.leadingway.com](http://www.leadingway.com)) is a very versatile content management system that supports indexing, distribution, and flexible reuse of digital content. Keyword and index search mechanisms are used to locate information and the software can be configured to deliver role-specific help. A standard Table of contents is one form of content navigations with maps of processes or products used to help the user drill down to the specific information sought. An "Ask the Expert" feature sends questions automatically to the appropriate subject matter expert. A comment feature allows users to share their insights by submitting information to the system manager for posting. The software creates reusable knowledge objects stored in a relational database. LeadingWay KnowledgeOne Content Manager™ allows organizations to create and publish eLearning courses, performance support content and instructional materials through a single development effort using Knowledge Objects. KnowledgeOne Content Manager™ 2.0 includes the modular components to create a total Knowledge System solution for LeadingWay customers and partners:

- Customized Microsoft Word template that seamlessly interoperates with Builder for knowledge content authoring by subject-matter experts
- Desktop content modification environment for developing Knowledge Objects for delivery as Web-based or CD-ROM eLearning courses, online performance support and paperbased instructional materials
- Web-based software engine for the delivery of world-class online training
- Web-based software engine for the delivery of on-the-job, online performance support
- Web-based learning management system (LMS) for administering student enrollment and providing detailed reporting
- Software program that publishes AICC required course files to allow easy KnowledgeOne™ integration with any AICC compliant LMS; also, easily publishes KnowledgeOne™ courses as HTML pages that can be run as standalone courses

- Repository that includes learning content stored as Knowledge Objects, media assets and presentation HTML
- Software Development Kit (SDK) - tools and Application Programming Interface (API) to integrate systems and write applications.



Leading Way claims the US Navy as a customer. This product is especially well suited to providing employee training and seen less as a general information resource as envisioned by the FFEP.

**Meridian Knowledge Solutions Inc. Knowledge Center** ([www.meridianksi.com](http://www.meridianksi.com)) is a dynamic, online learning and knowledge management system that integrates courseware delivery, performance reporting and documentation, collaboration tools, knowledge capture and sharing, and specialized applications. On the plus side, Knowledge Centre includes support for sharable content object reference model (SCORM) standards supporting DoD web-based training. However, although SCORM conformance is valuable for accessing third party training products, it has little relevance for accessing information stored in electronic documents. This system and it has a 508 compliant interface supporting disabled persons access. Knowledge Centre offers a robust infrastructure and an intuitive interface for integrating online and classroom course offerings, learning opportunities, content management, student tracking and documentation, collaboration, knowledge capture and mapping, competency modeling, and performance management. Specifically, the Knowledge Centre integrates: courseware delivery, content management, student tracking and documentation, knowledge capture, knowledge mapping, collaboration, competency modeling, and performance management. Teams can set up their own virtual spaces where they share content and participate in real time and threaded discussion. Various tools are available for searching the knowledge center for resources, best practices, and experts with specific skill sets. Using chat or threaded discussion on a bulleting Board System (BBS), users can communicate with each other. They can also upload and share documents. The library is the centralized knowledge repository for all reference materials. This section can also serve as a clearinghouse for compliance requirements, frequently asked questions, policies, industry specific information, and any other resources that support job performance. Meridian has a wide number of military clients including the USMC, US Army (INSCOM, O-JAG, MWR), US Navy, and the US Air Force where it serves as the engine behind the [Institute for Advance Distance Learning](#). This product is particularly suited for courseware and training management.

## Communities of Practice (CoP)

Most knowledge management systems begin with top-down centralized repositories of information. This top-down implementation frequently results in low participation by users and misses out on capturing important information from field experts. This CoP paradigm supports knowledge entries by users that add to the structured knowledge contained in documents and accessed through hyperlinks. Most notable is the use of forms for data entry enabling unsophisticated users to easily manage information. The flexibility of CoP tools is built on analysis of how individuals and groups of individuals really share (manage?) information at the informal organizational level. CoP applications tap a more

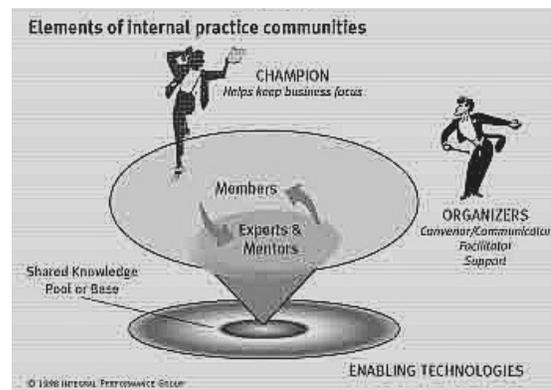
'grass-roots' style input to define what and how information is made available. The smaller size of the POL system maintenance community, to include headquarters, policy, and technical experts, is the ideal environment for this class of application.

According to Etienne Wenger in *Cultivating Communities of Practice*, "Communities of Practice are groups of people who share a concern, a set of problems, or a passion about a topics, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis." Fuels maintenance personnel who work on a specific kind of system may find it valuable to compare notes, relay tips and tricks, and discuss the intricacies of their maintenance tasks. Communities of Practice bring the power of the group to help the individual solve problems. Over time a body of common knowledge, practices, and approaches is built. Furthermore, the expertise collected through member interactions is still available even when the contributor no longer is.

***Why is Defense Acquisition University (DAU) Interested in Communities of Practice?***  
(extracts from DAU CoP Implementation Guide)

DAU is working to provide products and services that foster and facilitate knowledge sharing and collaboration throughout the Department of Defense and industry acquisition community. Communities of practice play a central role in realizing this vision. Communities of practice provide value to organizations in the following ways:

- Foster interaction between new/more junior employees and senior/more experienced practitioners;
- Facilitate the building of mentor-mentee relationships;
- Facilitate the rapid identification of individuals with specific knowledge or skills;
- Foster knowledge sharing across organizational boundaries ("boundary spanning");
- Promote and facilitate the capture and re-use of existing knowledge assets – and retention of organizational memory;
- Facilitate collaboration across different time zones.



An interesting note from the DAU that pertains to the FFEP: Membership in the DAU CoP is open to individuals from the Department of Defense, other government agencies (federal, state, and local), defense contractors, and educational institutions related to the communities. Since the start, members from beyond the traditional DoD organizations have proven to be very valuable and active members of the community, and all participants have clearly benefited from this diverse level of collaboration. The community workspace is an unclassified system – all contributions of content are unclassified, non-proprietary. A membership application-screening program maintains access control.

***Why is NAVSEA interested in communities of practice?*** (extract from NAVSEA CoP Practitioner's Guide)

"Have you ever thought: "I know someone in NAVSEA has completed this type of task before. I just don't know who...?" Communities of Practice provide the best means for enabling

organizations to share knowledge Enterprise-wide. Organizations are strengthened through an improved network of contacts and better results. Individuals benefit through peer-group recognition and continuous learning.” Communities of Practice (CoPs) are a key element of NAVSEA’s strategy for evolving a knowledge enterprise. CoPs offer a collaboration structure that facilitates the creation and transfer of knowledge. The CoP Practitioner’s Guide is designed to help emerging communities build and sustain evolving, meaningful forums for creating, storing, and transferring knowledge.

**Auxillium Performance Builder** (<http://www.auxiliumpg.com/auxilium/>) by Auxillium Performance Group is a software package that uses a forms-based interface similar to Tomoye’s Simplify. It combines functions such as knowledge management, document management, collaboration, e-learning, and web portals into one integrated product that requires no technical expertise. Features include information organized by classification scheme, threaded discussions, keyword and classification search of discussions, custom content views based on user profile, custom emails “blasts” to select user groups, support for multimedia content, creation of Flash animations without using flash, instructional and quiz templates, user activity tracking and reporting, and document sharing in several formats (.doc, .xls, jpg, .pdf, etc.). Users can view Files, Documents, e-Learning, Discussions, Links, and News. Auxillium is less feature rich, does not have military customers, and is about \$25K.

**Knowledge Now** (<https://afkm.wpafb.af.mil/ASPs/CoP/OpenCoP.asp?Filter=HR-KN-02>) is the Air Force centralized CoP web site. The AF Knowledge Now team at Wright Patterson offers support in standing up Communities of Practice for AF users at no charge using a service developed too set (not a commercial package). They provide a basic set of functionality typical of a CoP including: Document posting/sharing (searchable), discussion area (searchable), CoP points of contact email directory, search of CoP documents and selected web sites, knowledge owner control/update of web links on CoP pages, calendar with daily/monthly/yearly views, news ticker, mailing list , change alert feature, and selective access option. Additional functionality can be coded. The following screen shot shows and example of the capability and style.



**Knowledge Stream** ([www.upstreamdevelopment.com](http://www.upstreamdevelopment.com)) by Upstream Development is a performance centered knowledge management solution with modules for supporting workflow, performance support, training and simulation, knowledge management, collaboration, troubleshooting, and online administration. It was used for troubleshooting and performance support by Honda Motors and Johnson Controls. It is also used to support technicians and customer service reps installing, configuring, and troubleshooting Micro Motions line of Coriolis flow meter products for measuring fluids, gases, and slurries in industrial applications. It won the top award for best performance centered design at the Online Learning and Performance Centered Design Conference in 2002. Knowledge Stream's Java 2 Enterprise Edition (J2EE) architecture provides a platform independent solution for supporting Internet or intranet web or wireless clients. Collaboration, page notes, and knowledge management functionality provide continual feedback for improving performance support content and functionality. Content can be updated through online administrative interfaces. The knowledge base is object-oriented ensuring content reusability in documents, as training, etc. Context sensitive search is supported. Knowledge Stream has modules for Troubleshooting, Search, Training/Simulation, and Content/KM. The product requires expertise for installation and setup and is less an out of the box tool.

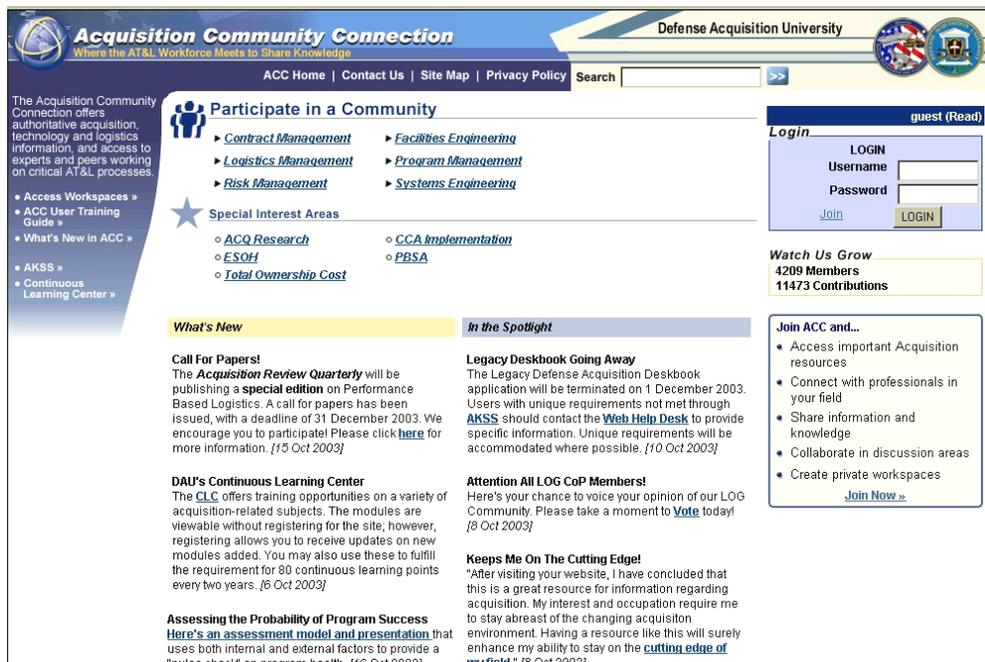
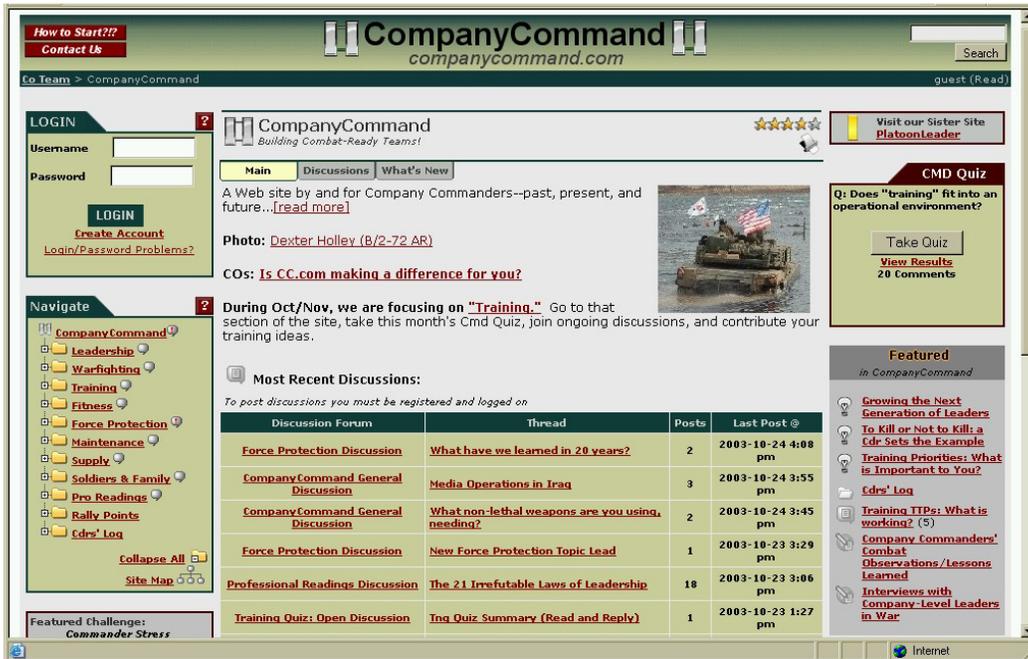
**Simplify 3.0.** (<http://www.tomoye.com>) developed by Tomoye, uses forms to collect data from users and includes a powerful semantic search engine to enable users to locate information. Simplify is an 'out-of-the-box' solution that can be up and running in a matter of hours. It includes cross-referencing functionality that enables users and topic managers to link knowledge objects with multiple topics. It includes a community library for documents storage. Documents can be uploaded, downloaded, rated, and commented on by users. Versions of documents are automatically archived and tracked. The interface consists of a series of "windows" which users may arrange to suit their information requirements. Topics are used to structure the information and discussions. It contains a member directory to enable members to find and converse with experts. Tomoye Simplify conforms to HTML, XML, CSV, SQL, and LDAP industry standards. The software contains ten levels of security to enable balancing control and participation. The web site has a good [Simplify demo](#). Tools for members

- Topic explorer. This intuitive navigation tool helps members find topics that interest them and important documents they need within those topics.
- Online discussions. These moderated discussion forums are created "in context" – directly in the document, topic, or business card members are discussing. Threaded discussions are mirrored in e-mail to keep busy members in the loop without having to visit the practice center.
- Member directory. This searchable address book of online "business cards" allows members to find experts, based on each member's contact information, photo, bio, area of expertise, and other data they choose to share.
- Personalized dashboard. This is a member's control panel that allows them to bookmark links to their favorite topics, subscriptions, documents, and members that are important to them.
- Community calendar. This tool lists important events, conferences, and milestones for each community area. Calendars from multiple areas of the practice center can be aggregated into a single global calendar.
- Community library. This tool allows members to organize documents, books, web sites, photos, and other useful resources. New entries can be highlighted and featured throughout the site.
- Global search/sort. These tools allow members to perform powerful metadata searches to locate and sort documents, members, and discussions posted throughout the practice center.

The company's primary clients are the Army (WestPoint - Company Command, 59th Signal Brigade (Alaska)) and Navy (Naval Audit Services, Naval Intelligence (NMIC) NAVSUP, N131(DON BUPERS)).

Simplify is also used by DAU - Acquisition Community Connection, Defense Modeling and Simulation Office, and Command General Staff College - S3XO. Simplify can support 3000 users and the GSA price for the server license is \$46,250.00 and *may be the best product for the FFEP.*

Example: Army CoP supporting company commanders worldwide by sharing lessons learned and providing a common access point to information. Defense Acquisition Community site based on Simplify using a different style.



Examples of some specific features of great value to the POL maintenance community include:

The screenshot shows the Tomoye web application interface. The main content area displays a topic titled "What are Communities of Practice?" with a brief description, a "Business Card" section, a "Multimedia File" section, and a "Discussion Forum" section. The interface includes a search bar at the top, a navigation menu on the left, and a community calendar on the right. Callouts point to specific features: "100% browser-based: familiar and easy-to-use." and "Global search: find all relevant topics, business cards, documents, etc." at the top; "Topic explorer: intuitive navigation tool." and "Member directory: find & have conversations with experts." on the left; "Community calendar: lists important community events." and "Cross-referencing: link any knowledge object with many topics." on the right; and "Subscriptions: get automatic email updates on favorite topics." and "Online discussions: always in context." at the bottom.

## Conclusion

There is a widening list of applications enabling organizations to better capture, store, and disseminate their corporate knowledge. These tools can bring groups together in a virtual environment to share among themselves on a 24/7 basis. This capability to tap members of a common community offers leaders an excellent opportunity to improve productivity, find out what real needs and concerns are, and provide dynamic support. Of the products reviewed, Tomoye's Simplify represents an excellent, 'out-of-box' solution that is already in place in two of the three services. Ease of use and an excellent feature set would greatly enhance the ability to serve information when and where needed. Extreme flexibility supports the survey data that indicates not all users needs or want the same information.

## Overall Analysis

### Background

This project was successful in examining the FFEP's goal of providing an enhanced POL system maintenance knowledge support tool. A survey of the installation technicians and supervisors revealed that a good deal of time is spent looking for information to support their maintenance efforts. The survey also showed that current reference documents are not well used outside the military branch of service that created them. There is a large amount of material readily available to support the FFEP

intent of enhancing information availability. Manufacturer's web sites are highly used already and they were supportive of DoD links to their material. Enhancing this content is technically easy and relatively low cost *if the FFEP subscribes to a continuing, phased effort versus an all-in-one massive UFC*. The survey suggests that maintenance information needs span a wide range, not limited to purely component maintenance. Environmental, safety, policy, and project programming are some examples of these additional community needs. A review of current off-the-shelf software applications shows there is a strong industry geared to facilitating knowledge management. Many of these tools are already in use in the DoD.

## **Conclusion/Recommendation**

This report concludes that a relatively low cost, quickly fielded solution is available to the FFEP to promote improved knowledge management regarding maintenance of POL systems. The following specific recommendations are offered for FFEP consideration:

- 1) Replace the concept of a single Unified Facility Criteria with the concept of a DoD POL system maintenance Community of Practice
- 2) Use a 'Vendor's Day' demonstration approach to select a candidate to implement. This report suggests a top candidate like Tomoye's Simplify not only for its excellent feature set, ease of installation and low cost. The fact that the product is serving both the Army and Navy today adds additional benefits of benefiting from other stand-up lessons as well as a CoP peer group for support. There may be other products also well suited.
- 3) Begin a search for application hosting. The Air Force has extensive requirements to field software on their servers that can take many months before the product can even be loaded. Other services may be easier to get approval; especially if the product is already being used somewhere.
- 4) Establish an initial team of at least two POL functional experts and one technical graphics/web content expert to launch the product over the first year. This CoP administrative team needs to be in a single location but could certainly have members from various service backgrounds (POL). This team would be the liaison between the users in the field and the application product itself. This team would be responsible for:
  - Training on the application, in turn training other service users
  - Categorizing the content summarized by this report to include existing documents, web links, training material, etc. to populate the application over a 90-day effort
  - Travel to installations recommended by the FFEP as best in class for particular systems to gather photos, maintenance information, and interview personnel to expand the content
  - Merge common content of the existing service maintenance manuals into the CoP application
  - Establish a 'Whose Who' of experts willing to support the CoP by answering questions in their field of expertise and experience
  - Create new web-base multi media content following priorities set by the field using the CoP
- 5) Establish review points at the 90-120 day 'kick-off' and about the 270 day point to determine the CoP activity level and decide on future year personnel support for the CoP

- 6) Establish a rewards and incentive policy for sharing knowledge. To ensure that such people will share their expertise, FFEP representative must make sharing more lucrative than hoarding knowledge.

This recommendation would be overall very economical. Experienced and mature CoPs may have a team of around three on a full time basis. This startup assumes a basic capability to launch the site and be able to do some site visits among the services (travel not included) to gather information and help train users. Annual costs currently show the loss of the full-time graphic artist although a budget for that capability may also be desired. The basic proposal to support this plan includes:

First Year Start Up Costs

Software	\$50-75K
Training (Initial for support team)	\$ 10K
Support Team to run the CoP application consisting of two POL functional experts	\$200K
Knowledge Management Consultant (assist in organizing the site)	\$ 25K
Graphics Artist	<u>\$100K</u>
	<b>~Total \$385-390K</b>

Annual Costs

Software Maintenance	\$7.5-12K
Personnel	<u>\$200K</u>
	<b>~Total \$210K+</b>

Other considerations include time necessary to stand up the application including where it will be hosted, security considerations of the hosting site, and fees associated with the site. Annual costs are based on the premise that at least two personnel will be fully engaged in both running the application (monitoring content, providing user help, and creating new content based on community inputs). The recommendation assumes full participation by each of the services and DESC in providing functional experts who will be the points of contact in the application for the maintenance community by specific area (type of system, equipment, policy, etc). This plan envisions a basic capability within 90 days of loading the application at an approved server and a 270-day review point to forecast annual needs base on CoP success.

## Annex Table of Contents

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<b>Title</b>	<b>Annex</b>
Survey POC Distribution List	A
Survey Paper Copy	B
Internet Survey Screen Shots	C
Survey Data	D
Knowledge Management Application Sources	E
Disclaimer Examples	F
Typical Maintenance Document	G

## Survey Development and Distribution POCs

Bob Bishop	robert.bishop@wpafb.af.mil
John Cummings	cummingsjr@navair.navy.mil
Bud Doll	bud.doll@scott.af.mil
Carl Drechsel , HQ ACC	carl.drechsel@langley.af.mil
Robert Filz	robert.filz@cetsc.ang.af.mil
SMSgt Tony Fullard	anthony.fullard@langley.af.mil
Henry Gorin	henry.gorin@dla.mil
Tim W. Greene	timothy.greene@afrc.af.mil
Jim Hugar	jhugar@usapc-emh1.army.mil
Randall King 16CES/CEOIF	randall.king@hurlburt.af.mil
Paul Kintz	pkintz@desc.dla.mil
Keith Koch J, HQ AMC/CEPD	keith.koch@scott.af.mil
Robert Lange	robert.lange@Peterson.af.mil
SMSgt Jim Lucas, HQ AFCESA	jim.lucas@tyndall.af.mil
Kevin Mclaughlin	kevin.mclaughlin@wpafb.af.mil
Pat Mumme, HQ AFCESA	pat.mumme@tyndall.af.mil
Sanford Oda	Sanford.Oda@hickam.af.mil
Dale Otterness	Dale.H.Otterness@HQ02.USACE.army.mil
Bill Pierce	william.c.pierce@navy.mil
Terri M Regin	reginTM@nfesc.navy.mil
Mike Rocha	mike.rocha@navy.mil
Doug Rowand	doug.rowand@ang.af.mil
John E. Russell Jr. P. E.	jrussell@desc.dla.mil
Lou Salvucci*	salvuccil@navair.navy.mil
Gerald Sanio	gerald.sanio@ramstein.af.mil
Garland Scott	garland.scott@Randolph.AF.MIL
Internet Web Server Support	
Sandy Wood	sandy.l.wood@hnd01.usace.army.mil

# POL/LFM Interactive Manual Survey

## Introduction

The DoD Fuel Facilities Engineering Panel (FFEP) is considering the development a Petroleum, Oils, Lubricants/Liquid Fuels Maintenance (POL/LFM) interactive maintenance information manual for the military services and the Defense Fuel Supply Points (DFSP). As a precursor to that development, the FFEP must determine the required content of the manual and the method in which the manual will be presented to installation maintenance personnel. Your input as an installation POL maintenance manager or technician is vital to getting this project off to a good start since you will be the ultimate user!

The FFEP includes representatives from the Air Force Civil Engineering Support Agency (AFCESA), Naval Facilities Engineering Command (NAVFAC), the US Army Corps of Engineers (USACE), and the Defense Energy Support Center (DESC). HQ AFCESA is coordinating this effort for the FFEP through a feasibility study contracted to Northrop Grumman at Tyndall AFB, FL. Please take a few minutes to complete this survey to provide field level insight into the needed content of the Interactive POL Maintenance Unified Facilities Criteria (UFC).

Survey Note: We suggest you first download a printed version of the survey. Please use the web survey as the primary means to reply. Once a section is finished, clicking the Continue button captures the data and you cannot return to the previous page. You must have cookies turned on in your browser as the survey writes one with a number uniquely identifying your input. If you have web problems, please FAX a copy of the printed version. Total time to complete is about 20 minutes. Survey ends 10 Oct 03.

## Tell Us About Yourself

All Fields mandatory entry

(Section 1 of 6)

This information is critical for analyzing the collected data. To uncover service, command, and position related trends, we must be able to map various responses by these categories. Contact information is required in case we need help understanding your responses.

**Service:** AF Army Marines Navy      **Command:** \_\_\_\_\_

**Installation:** \_\_\_\_\_

**Last Name:** \_\_\_\_\_ **First Name:** \_\_\_\_\_

**Category:** Military Civilian Contractor      **Position:** Supervisor Technician

**DSN Phone:** \_\_\_\_\_ **e-mail:** \_\_\_\_\_

## POL Systems Description and Characterization

(Section 2 of 6)

**Who maintains your installation's POL system:** Contractor Government (any Civ or Mil)

**On average, how would you characterize the age of your POL facility system?**

- |   |   |
|---|---|
| <input type="checkbox"/> Less than 10 years | <input type="checkbox"/> 25 to 35 years     |
| <input type="checkbox"/> 10 to 25 years     | <input type="checkbox"/> More than 35 years |

Oldest systems are about how old? \_\_\_yrs    Newest systems are about how old? \_\_\_yrs

For aviation systems only. Do you have:

- Pressurized Hydrants (Type 3-5)
- Direct Fueling System's (DFS)
- Hydrants (Type 1-2)
- Truck Refueling

**Systems**

(Section 3 of 6)

The following categories are the major components of a POL system. These categories will be used to outline the interactive manual design. Please mark N/A if category does not apply. Next to each component, please rate your requirement for information (**Rarely**: > 6 months, **Occasionally**: monthly-quarterly, **Frequently**: Daily-Weekly). Survey results will help prioritize where to begin on the new manual.

N/A      Rarely      Occasionally      Frequently

**Fuel Receipt**

Pipeline				
Barge				
Rail				
Truck				
Bulk Shipment Containers (BSC)				
Other (Please State) _____				

**Ground Fueling Stations (Gas Station)**

**Aviation Hydrant System/DFS**

**Ship refueling**

**Truck Fill Stands**

**Fuel Storage Tank Types**

Above Ground				
Manufactured				
Field Constructed				
Cut and cover				
Underground Storage Tank (UST)				

**Tank Gauging/Monitoring**

**Transfer Pipelines**

**Secondary Containment Systems**

**Filtration/Separation Systems**

Bulk Receipt				
Truck Issue				
Hydrants/DFS's				

**Controls**

**Other (Please State) \_\_\_\_\_**

--	--	--	--

Please rank order your information requirements for performing assigned tasks:

(1 Use Most, 9 Use least: no tie-scores)

- Troubleshooting data  1  2  3  4  5  6  7  8  9
- Recurring Maintenance data  1  2  3  4  5  6  7  8  9
- Minor Repair  1  2  3  4  5  6  7  8  9
- Component Overhaul  1  2  3  4  5  6  7  8  9
- Electronic Controls/PLC's  1  2  3  4  5  6  7  8  9
- Testing and Inspection  1  2  3  4  5  6  7  8  9
- Policy information  1  2  3  4  5  6  7  8  9
- Compliance information  1  2  3  4  5  6  7  8  9
- Safety Information  1  2  3  4  5  6  7  8  9
- Other (please state) \_\_\_\_\_ (No ranking required)

Please rank order your requirements for the following data:

(1 Most Important-5 Least Important, no tie-scores)

- Technical/ Engineering data  1  2  3  4  5
- Training information (career specific)  1  2  3  4  5
- General references (tables, formulas etc)  1  2  3  4  5
- Project submission and programming  1  2  3  4  5
- State and federal publications  1  2  3  4  5
- Other (please state) \_\_\_\_\_ (No ranking required)

Please indicate your current use of the following manuals. If not used, please answer why.

- UFC 3-460-3  Use  Do not use Why?  1  2  3  4  5
- USA TM 5-678  Use  Do not use Why?  1  2  3  4  5
- USN MO 230  Use  Do not use Why?  1  2  3  4  5
- MIL-HDBK-1022A  Use  Do not use Why?  1  2  3  4  5

**Why Codes:** 1 Never Heard of      2 Too difficult to locate data      3 Too general  
 4 Out of date information      5 Not applicable

For the above manual used most, please rank order the reason used:

I use \_\_\_\_\_ for: (1 Most Important-3 Least Important, no tie-scores)

- Maintenance procedures  1  2  3
- Policy guidance  1  2  3
- General guidance  1  2  3

List any other government/DoD POL/LFM reference documents you use.

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Please indicate your current use of Commercial references:

- |          |                              |                                     |      |                            |                            |                            |                            |                            |
|----------|------------------------------|-------------------------------------|------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|
| API/IP   | <input type="checkbox"/> Use | <input type="checkbox"/> Do not use | Why? | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 |
| ASME     | <input type="checkbox"/> Use | <input type="checkbox"/> Do not use | Why? | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 |
| ASTM     | <input type="checkbox"/> Use | <input type="checkbox"/> Do not use | Why? | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 |
| AWS      | <input type="checkbox"/> Use | <input type="checkbox"/> Do not use | Why? | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 |
| NACE     | <input type="checkbox"/> Use | <input type="checkbox"/> Do not use | Why? | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 |
| NFPA/NEC | <input type="checkbox"/> Use | <input type="checkbox"/> Do not use | Why? | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 |
| SAE      | <input type="checkbox"/> Use | <input type="checkbox"/> Do not use | Why? | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 |

**Why Codes:** 1 Never Heard of      2 Too difficult to locate data      3 Too general  
 4 Out of date information      5 Not applicable

List any other commercial (not web sites) POL/LFM reference documents you use.

---



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**POL Systems/LFM Information Sources**

(Section 5 of 6)

(1-Low, 5 High)

Please rate your dependence on Command guidance regarding systems maintenance/ inspection  1  2  3  4  5

Please rate your familiarity with environmental regulatory requirements for your facility  1  2  3  4  5

What do you feel your familiarity with environmental regulatory requirements should be?  1  2  3  4  5

How do you currently search for information regarding your systems?

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On average, how much time per month do you spend maintaining and/or searching reference materials for your shop?

- Less than 1 hour       1 to 5 hours       5 to 10 hours       More than 10 hours

Please list up to 10 of your most used POL commercial maintenance reference /manufacturer Internet sites. This will provide a starting point for us to contact manufacturers concerning their willingness, or unwillingness, to be part of a new comprehensive single information source.

1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	

**Features** (Section 6 of 6)

How would you like to see the information presented?

- Interactive computer based program with links to reference materials
- Full color manuals     OEM manuals     Online discussion forum
- Other \_\_\_\_\_

What features would you like to see: Reference data/tables, training, etc.

---



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Would a frequently asked questions (FAQ) bulletin board for cross talk be helpful? Yes No

What benefits of an interactive manual will be useful to you? (Open Ended)

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Please provide any other information you think the feasibility study team should know.

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Back Forward Stop Home Search Favorites Media Print

Address <http://www.hnd.usace.army.mil/ffep/survey/> Go Links



## Interactive Maintenance Manual Survey



The DoD Fuel Facilities Engineering Panel (FFEP) is considering the development of a Petroleum, Oils, Lubricants/Liquid Fuels Maintenance (POL/LFM) interactive maintenance information manual for the military services and the Defense Fuel Supply Points (DFSP). As a precursor to that development, the FFEP must determine the required content of the manual and the method in which the manual will be presented to installation maintenance personnel. Your input as an installation POL maintenance manager or technician is vital to getting this project off to a good start, since you will be the ultimate user!



The FFEP includes representatives from the Air Force Civil Engineering Support Agency (AFCESA), Naval Facilities Engineering Command (NAVFAC), the US Army Corps of Engineers (USACE), and the Defense Energy Support Center (DESC). HQ AFCESA is coordinating this effort for the FFEP through a feasibility study contracted to Northrop-Grumman at Tyndall AFB, FL. Please take a few minutes to complete this survey to provide field level insight into the needed content of the Interactive POL Maintenance Unified Facilities Criteria (UFC).



Survey Note: We suggest you first download a [printed version](#) of the survey. Please use the web survey as the primary means to reply. Once a section is finished, clicking the Continue button captures the data and you cannot return to the previous page. You must have cookies turned on in your browser as the survey writes one with a number uniquely identifying your input. If you have web problems, please FAX a copy of the printed version to 850-283-6336 (DSN 523-6336). Total time to complete is about 20 minutes. Survey ends 10 Oct 03.

Continue

Done Internet

Contact Information - Microsoft Internet Explorer provided by HQ AFCESA

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Address <http://www.hnd.usace.army.mil/flep/survey/contactinfo.asp> Go Links >>

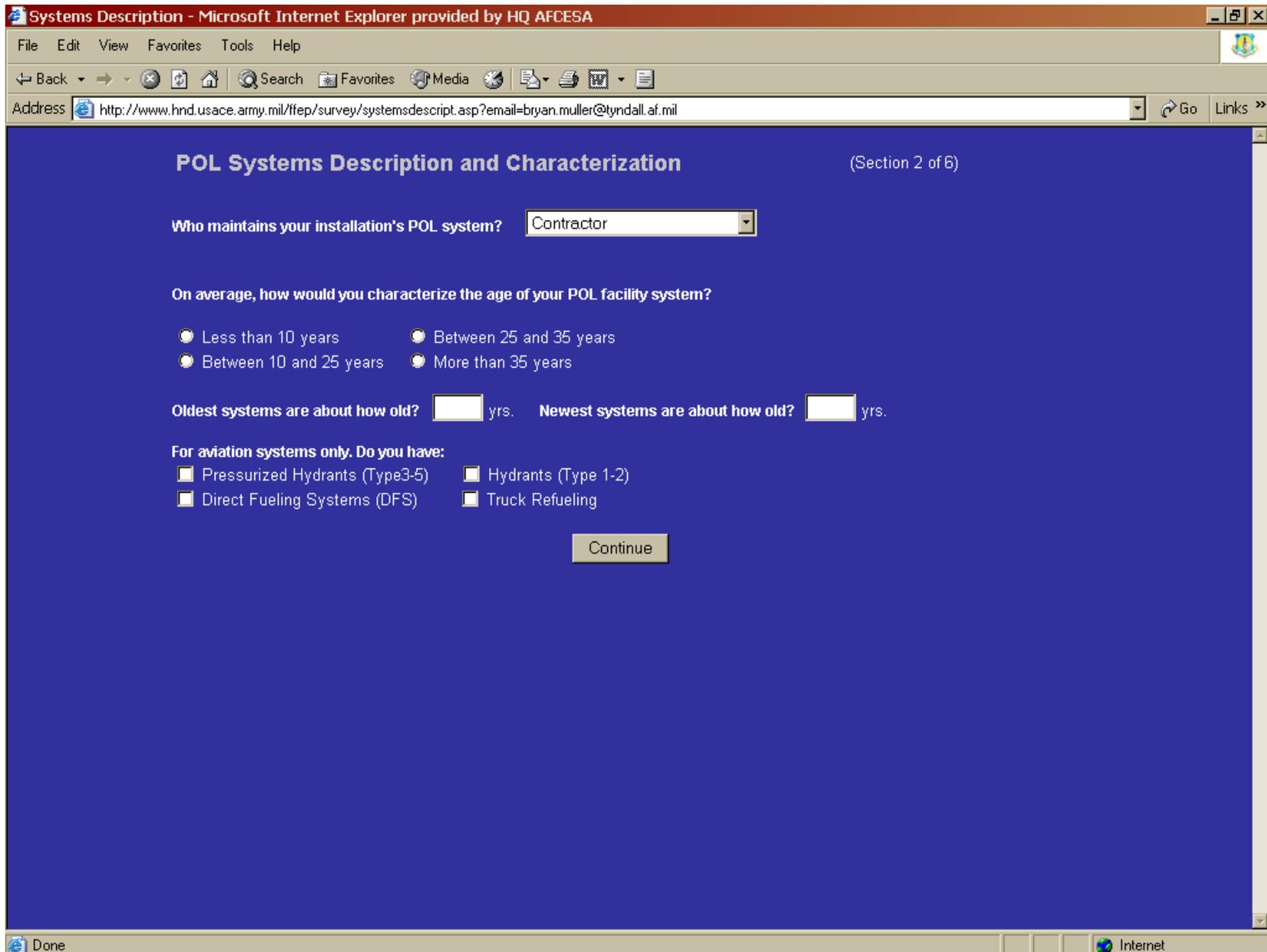
### Tell Us About Yourself [All fields mandatory entry](#) (Section 1 of 6)

Service	<input type="text" value="Please Select"/>	Command	<input type="text" value="Waiting for Selection"/>
Installation	<input type="text"/>		
Last Name	<input type="text"/>	First Name	<input type="text"/>
Category	<input type="text" value="Military"/>	Position	<input type="text" value="Supervisor"/>
DSN Phone	<input type="text"/>	e-mail	<input type="text"/>

This information is critical for analyzing the collective data. To uncover service, command, and position related trends, we must be able to map various responses by these categories. Contact information is requested in case we need help understanding your responses.

Done Internet

ANNEX C



ANNEX C

**Systems Components**

(Section 3 of 6)

This screen lists the major components of a POL system. These categories will be used to outline the interactive manual design. Survey results will help prioritize where to begin on the new manual. Next to each component, please rate how often you need information about it. (NA: does not apply, Rarely; more than 6 months, Occasionally; monthly-quarterly, Frequently; daily-weekly).

	N/A	Rarely	Occasionally	Frequently
<b>Fuel Receipt</b>				
Pipeline	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Barge	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Rail	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Truck	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Bulk Shipment Containers (BSC)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other (Please State) <input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Ground Fueling Stations (Gas Station)</b>				
<b>Aviation Hydrant System/DFS</b>				
<b>Ship refueling</b>				
<b>Truck Fill Stands</b>				
<b>Fuel Storage Tank Types</b>				
Above Ground				
Manufactured	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Field Constructed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cut and cover	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Underground Storage Tank (UST)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Tank Gauging/Monitoring</b>				
<b>Transfer Pipelines</b>				
<b>Secondary Containment Systems</b>				
<b>Filtration/Separation Systems</b>				
Bulk Receipt	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Truck Issue	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hydrants/DFS's	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Controls</b>				
Other (Please State) <input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Continue

ANNEX C

LFM Information - Microsoft Internet Explorer provided by HQ AFCESA

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Back Forward Stop Refresh Home Search Favorites Media Print

Address http://www.hnd.usace.army.mil/fep/survey/LFMInfo.asp Go Links >>

## POL Systems/LFM Information Requirements (Section 4 of 6)

**Please rank order your information requirements for performing assigned tasks:  
(1 - Use Most, 9 - Use Least. No ties.)**

<input type="checkbox"/> Troubleshooting data	<input type="checkbox"/> Testing and inspection
<input type="checkbox"/> Policy information	<input type="checkbox"/> Recurring maintenance data
<input type="checkbox"/> Minor repair	<input type="checkbox"/> Compliance information
<input type="checkbox"/> Component Overhaul	<input type="checkbox"/> Safety information
<input type="checkbox"/> Electronic controls/PLC's	Other (please state) <input type="text"/>

**Please rank order your requirements for the following data:  
(1 - Most Important, 5 -Least Important. No ties.)**

<input type="checkbox"/> Technical Engineering Data
<input type="checkbox"/> Training Information (career specific)
<input type="checkbox"/> General Reference (tables, formulas, etc.)
<input type="checkbox"/> Project submission and programming
<input type="checkbox"/> State and Federal Publications
Other (please state) <input type="text"/>

**Please indicate your current use of the following manuals. If not used, please answer why.**

UFC 3-460-3	<input type="radio"/> Use	<input type="radio"/> Do not need/use	Why? <input type="text" value="Please Select"/>
USA TM 5-678	<input type="radio"/> Use	<input type="radio"/> Do not need/use	Why? <input type="text" value="Please Select"/>
USN MO 230	<input type="radio"/> Use	<input type="radio"/> Do not need/use	Why? <input type="text" value="Please Select"/>
MIL-HDBK-1022A	<input type="radio"/> Use	<input type="radio"/> Do not need/use	Why? <input type="text" value="Please Select"/>

**For the above manual used most, please rank order the reason used.  
(1 - Most Important, 3 - Least Important. No ties.)**

I use  for:

<input type="checkbox"/> Maintenance Procedures	<input type="checkbox"/> Policy Guidance	<input type="checkbox"/> General Guidance
---	--	---

List any other government/DoD POL/LFM reference documents you use?

ANNEX C

LFM Information - Microsoft Internet Explorer provided by HQ AFCESA

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Back Forward Stop Home Search Favorites Media Print

Address http://www.hnd.usace.army.mil/ffep/survey/LFMinfo.asp Go Links >>

UFC 3-460-3	<input checked="" type="radio"/> Use	<input type="radio"/> Do not need/use	Why?	Please Select
USA TM 5-678	<input checked="" type="radio"/> Use	<input type="radio"/> Do not need/use	Why?	Please Select
USN MO 230	<input checked="" type="radio"/> Use	<input type="radio"/> Do not need/use	Why?	Please Select
MIL-HDBK-1022A	<input checked="" type="radio"/> Use	<input type="radio"/> Do not need/use	Why?	Please Select

**For the above manual used most, please rank order the reason used.**  
(1 - Most Important, 3 - Least Important. **No ties.**)

I use  for:

Maintenance Procedures  Policy Guidance  General Guidance

List any other government/DoD POL/LFM reference documents you use?

**Please indicate your current use of commercial references. If not used, please answer why.**

API/IP	<input checked="" type="radio"/> Use	<input type="radio"/> Do not need/use	Why?	Please Select
ASME	<input checked="" type="radio"/> Use	<input type="radio"/> Do not need/use	Why?	Please Select
ASTM	<input checked="" type="radio"/> Use	<input type="radio"/> Do not need/use	Why?	Please Select
AWS	<input checked="" type="radio"/> Use	<input type="radio"/> Do not need/use	Why?	Please Select
NACE	<input checked="" type="radio"/> Use	<input type="radio"/> Do not need/use	Why?	Please Select
NFPA/NEC	<input checked="" type="radio"/> Use	<input type="radio"/> Do not need/use	Why?	Please Select
SAE	<input checked="" type="radio"/> Use	<input type="radio"/> Do not need/use	Why?	Please Select

List any other commercial (not websites) POL/LFM reference documents you use?

## POL Systems LFM Information Sources (Section 5 of 6)

Please rate your dependence on Command guidance regarding systems maintenance/inspection.  1-Low  2  3  4  5-High

Please rate your familiarity with environmental regulatory requirements for your facility.  1-Low  2  3  4  5-High

What do you feel your familiarity with environmental regulatory requirements should be?  1-Low  2  3  4  5-High

How do you currently search for information about your systems?

On average, how much time per month do you spend maintaining and/or searching reference materials for your shop?

Less than 1 hour  1-5 hours  5-10 hours  More than 10 hours

Please list up to 10 of your most used POL maintenance reference/manufacturer Internet sites. This will provide a starting point for us to contact manufacturers concerning their willingness, or unwillingness, to be part of a new comprehensive single information source.

1.
2.
3.
4.

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Back Forward Stop Home Search Favorites Media Print

Address <http://www.hnd.usace.army.mil/flep/survey/features.asp> Go Links >>

## POL Systems LFM Interactive Manual Features (Section 6 of 6)

**How would you like to see the information presented?**

- Interactive web based program with links to reference materials
- Full color manuals
- OEM manuals
- Online discussion forum
- Other (please state)

**What features would you like to see? Reference data/tables, training, etc.**

**Would a FAQ (frequently asked questions) bulletin board for cross talk be helpful?**

yes  no

**What benefits of an interactive manual will be useful to you?**

**Please provide any other information you think the feasibility study team should know.**

ANNEX C

Thanks - Microsoft Internet Explorer provided by HQ AFCESA

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Address [http://www.hnd.usace.army.mil/flep/survey/thanks.asp?troubleshooting\\_data=1&testing\\_and\\_inspection=6&recurring\\_maintenance\\_data=7&policy\\_information=2&minor\\_repair=3&compliance\\_data=4](http://www.hnd.usace.army.mil/flep/survey/thanks.asp?troubleshooting_data=1&testing_and_inspection=6&recurring_maintenance_data=7&policy_information=2&minor_repair=3&compliance_data=4) Go

Google Search Web Search Site News Page Info Up Highlight



## Interactive Maintenance Manual Survey



You're finished!

Thank you very much for your participation. Survey results will be compiled and analyzed at HQ AFCESA and then sent to the service representatives. If you have any questions, please contact:

[Bryan Muller Cntr HQ AFCESA/CEO](#)  
DSN 523-6053  
Comm (850) 283-6053



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ANNEX C

Guestbook - Microsoft Internet Explorer provided by HQ AFCESA

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Welcome to the



**QUESTBOOK**

[return to main menu](#)



[Sign the Guestbook Now](#)

Read the Guestbook: Page 7

Page: << [7] [6](#) [5](#) [4](#) [3](#) [2](#) [1](#) >>

**174 Bryan Muller** <http://www.hnd.usace.army.mil/ffep/survey/>

Wednesday, September 17, 2003 8:20:42 AM

E-Mail: [bryan.muller@tyndall.af.mil](mailto:bryan.muller@tyndall.af.mil)  
Company: HQ AFCESA

The DoD Fuel Facilities Engineering Panel (FFEP) is considering the development a Petroleum, Oils, Lubricants/Liquid Fuels Maintenance (POL/LFM) interactive maintenance information manual for the military services and the Defense Fuel Supply Points (DFSP). As a precursor to that development, the FFEP must determine the required content of the manual and the method in which the manual will be presented to installation maintenance personnel. Your input as an installation POL maintenance manager or technician is vital to getting this project off to a good start since you will be the ultimate user! We're asking all DoD POL system maintainers to complete a survey at <http://www.hnd.usace.army.mil/ffep/survey/> by 10 Oct 03. Service and command POCs were provided this info to pass along. Thanks for your participation - we hope to have results for Petro 2003.

**173 Ed Poole**

Wednesday, September 17, 2003 6:29:45 AM

E-Mail: [claude.poole@halliburton.com](mailto:claude.poole@halliburton.com)  
Company: KBR

Hello Everyone,  
I work for KBR (Part of Halliburton)as the Fuels Manager for Northern Iraq. We need POL folks now. Email me or go to [www.kbrjobs.com](http://www.kbrjobs.com) and browse jobs then type in Fuels.If you submit resume on line put my name with your message. I don't get any extra money, but I might get your expertise in this part of Iraq. I hope it was OK to use this website for this, just trying to help out someone needing a job.  
Thanks, Ed

Done Internet

## Survey Data

### Survey Participants by Service

#### AIR FORCE

ACC	Barksdale AFB	ANG	Bangor Maine, 101st Air Refueling Wing
ACC	Beale AFB	ANG	161 ARW
ACC	Davis-Monthan AFB	ANG	164 TN. ANG Memphis
ACC	Dyess AFB	ANG	440th General Mitchell ARB
ACC	Holloman AFB	ANG	Alpena CRTC
ACC	Langley AFB	ANG	Des Moines
ACC	Mountain Home AFB	ANG	Ellington ANGB Houston Texas 77034
ACC	Nellis AFB	ANG	Joe Foss Field
ACC	Robins AFB	ANG	Key Field, Meridian, Ms. 186th. ARW
ACC	Seymour Johnson AFB	ANG	McGhee Tyson AB TN
ACC	Shaw AFB	ANG	McGuire AFB
ACC	Whiteman AFB	ANG	Niagara Falls
AETC	Altus, AFB	ANG	Tulsa ANG
AETC	Columbus AFB	ANG	Volk Field ANGB
AETC	Keesler AFB MS	PACAF	Andersen AFB
AETC	Lackland AFB	PACAF	Eielson AFB
AETC	Luke AFB AZ	PACAF	Elmendorf AFB
AETC	Randolph AFB	PACAF	Hickam AFB
AETC	Springfield Ohio ANG	PACAF	Kadena AB
AFMC	Arnold AFB, TN	PACAF	Kunsan AB
AFMC	Edwards AFB	PACAF	Misawa AB
AFMC	Robins AFB	PACAF	Osan AB
AFMC	Tinker AFB	PACAF	Yokota AB
AFRES	Homestead ARB	USAFE	Incirlık AB, Turkey
AFRES	Pittsburgh ARB	USAFE	Lajes
AFRES	Weastover ARB	USAFE	Moron AB
AFRES	Youngstown ARS	USAFE	RAF Lakenheath
AFSOC	106th Rescue Wing	USAFE	RAF Mildenhall
AFSPC	Patrick AFB	USAFE	Ramstein AB
AMC	MacDill AFB	USAFE	Rhein Main AB
AMC	Pope AFB		

#### ARMY

EURO	80th ASG (NSSG)	NWRO	Ft Riley, KS
EURO	Grafenwoehr training area , GE	NWRO	Pueblo Chemical Depot
EURO	Patton Barracks 26 ASG	NWRO	Tooele Army Depot
NERO	Aberdeen Proving Ground	NWRO	Umatilla Army Chemical Depot
NERO	Ft AP Hill, VA	PARO	Camp Hialeah, Korea
NERO	Ft Belvoir, VA	PARO	Camp Walker, Korea
NERO	Ft Detrick, Frederick MD	PARO	Chibana Compound Japan
NERO	Ft Dix	SERO	Anniston army depot
NERO	Ft Drum	SERO	Ft McPherson,GA
NERO	Ft Eustis, VA	SERO	Ft. Campbell KY
NERO	Ft Lee	SERO	Redstone Arsenal Aviation & Missile Cmnd
NERO	Ft Monmouth NJ	SWRO	Ft Bliss
NERO	Ft Myer Military Community	SWRO	Ft Hood, TX
NERO	Ft. George G. Meade	SWRO	Ft Huachuca
NERO	West Point	SWRO	Ft Sam Houston
NWRO	Dugway Proving Ground	SWRO	Ft Sill
NWRO	Ft Leavenworth	SWRO	Ft. Polk,La.
NWRO	Ft Leonard Wood	SWRO	White Sands Missile Range
NWRO	Ft Lewis, WA (DOL I Corp)	SWRO	Yuma Proving Ground (ATEC)
NWRO	Ft McCoy, WI		Training Site Command

## NAVY/MARINE

Naval Air Forces Pacific Fleet	NAS Fallon
Naval Air Forces Pacific Fleet	NAS Kingsville TX
Naval Forces Europe/Fleet Air Forces Mediterranean	NAS Sigonella
Naval Supply Systems Command	Guantanamo Bay
Naval Supply Systems Command	NAS Corpus Christi, Tx
Navy Region Southeast	NAS Atlanta
Navy Region Southeast	NAS Jacksonville
Navy Region Southeast	NAS Key West, FL
Navy Region Southeast	Naval Station Roosevelt Rds
Other	MCAS Iwakunil, JAPAN
Commander, Combined Airbases East	MCAS Cherry Point, NC
II MEF	MCAS New River
Other	MCAS Camp Pendleton

### Web Sites used in support of POL system maintenance:

<a href="http://api-ec.api.org/newsplashpage/index.cfm">http://api-ec.api.org/newsplashpage/index.cfm</a>	standards	
<a href="http://apsaviation.com/">http://apsaviation.com/</a>	general	American Petroleum Services, Inc
<a href="http://mesaproducts.com/Homepage/HomePage.htm">http://mesaproducts.com/Homepage/HomePage.htm</a>	cathodic protection	
<a href="http://opw-es.com/">http://opw-es.com/</a>	flow indicators	
<a href="http://safety.kirtland.af.mil/AFSC/RDBMS/Ground/">http://safety.kirtland.af.mil/AFSC/RDBMS/Ground/</a>	safety	
<a href="http://unaflex.com/">http://unaflex.com/</a>	hose/joints	
<a href="http://wkr.com/">http://wkr.com/</a>	controls	Whittaker Controls Inc
<a href="http://www.ab.com/">http://www.ab.com/</a>	controls	
<a href="http://www.allemano.it/english.htmlwww.allemano.it">http://www.allemano.it/english.htmlwww.allemano.it</a>	measurement	Italian site
<a href="http://www.appletonelec.com/index.htm">http://www.appletonelec.com/index.htm</a>	electrical	
<a href="http://www.arco-electric.com/">http://www.arco-electric.com/</a>	electrical	
<a href="http://www.argo-tech.com/">http://www.argo-tech.com/</a>	aviation fueling	
<a href="http://www.argo-tech.com/Cryogenic.aspx">http://www.argo-tech.com/Cryogenic.aspx</a>	pumps	Argo Carter Cryogenic Products Division
<a href="http://www.argo-tech.com/GroundFueling.aspx">http://www.argo-tech.com/GroundFueling.aspx</a>	ground fueling	was Carter Ground Fueling
<a href="http://www.bernardcontrols.com">http://www.bernardcontrols.com</a>	controls	
<a href="http://www.channelsupplies.com/">http://www.channelsupplies.com/</a>	measurement	
<a href="http://www.cla-val.com/">http://www.cla-val.com/</a>	valves	
<a href="http://www.convault.com/">http://www.convault.com/</a>	tanks	
<a href="http://www.corken.com/">http://www.corken.com/</a>	pumps	part of Idex Corporation
<a href="http://www.crouse-hinds.com/">http://www.crouse-hinds.com/</a>	electrical	Cooper Crouse-Hinds, Syracuse, NY
<a href="http://www.dempstertx.com/">http://www.dempstertx.com/</a>	pumps	Dempster Industries, TX
<a href="http://www.desc.dla.mil/">http://www.desc.dla.mil/</a>	general	
<a href="http://www.draeger.com">http://www.draeger.com</a>	detection	
<a href="http://www.emcoretail.com/index.html">http://www.emcoretail.com/index.html</a>	ground fueling	Emco Wheaton, North Carolina
<a href="http://www.entechsupply.com/">http://www.entechsupply.com/</a>	detection	
<a href="http://www.facetinternational.net/">http://www.facetinternational.net/</a>	filtration	
<a href="http://www.fjordav.com/">http://www.fjordav.com/</a>	general	
<a href="http://www.gammontech.com/">http://www.gammontech.com/</a>	general	
<a href="http://www.gasboy.com/">http://www.gasboy.com/</a>	dispensing	part of Gilbarco Veeder-Root
<a href="http://www.general-valve.com/">http://www.general-valve.com/</a>	valves	
<a href="http://www.gilbarco.com/index.cfm">http://www.gilbarco.com/index.cfm</a>	fuel dispensing	
<a href="http://www.grainger.com/Grainger/wwg/start.shtml">http://www.grainger.com/Grainger/wwg/start.shtml</a>	general	

<a href="http://www.greenham.com/">http://www.greenham.com/</a>	safety	UK
<a href="http://www.icllabs.com/">http://www.icllabs.com/</a>	calibration	ISO 17025 Accredited Calibration Laboratory
<a href="http://www.icmeter.com/">http://www.icmeter.com/</a>	measurement	Japanese site Industrial Maintenance and Plant Operations
<a href="http://www.impomag.com/scripts/default.asp">http://www.impomag.com/scripts/default.asp</a>	general	
<a href="http://www.johncrane.com/amer/english/home.html">http://www.johncrane.com/amer/english/home.html</a>	seals	
<a href="http://www.kunding.com/">http://www.kunding.com/</a>	controls	
<a href="http://www.labsafety.com/home.htm">http://www.labsafety.com/home.htm</a>	safety	
<a href="http://www.lcmeter.com/">http://www.lcmeter.com/</a>	meters	Liquid Controls Meters
<a href="http://www.martindalecenter.com/">http://www.martindalecenter.com/</a>	general	Martindales Reference
<a href="http://www.nfpa.org/catalog/home/index.asp">http://www.nfpa.org/catalog/home/index.asp</a>	standards	
<a href="http://www.niosh.com.my/">http://www.niosh.com.my/</a>	safety	
<a href="http://www.npma-fuelnet.org/index.asp">http://www.npma-fuelnet.org/index.asp</a>	general	
<a href="http://www.omron-ap.com/index.htm">http://www.omron-ap.com/index.htm</a>	controls	OMRON Asia Pacific
<a href="http://www.parker.com/">http://www.parker.com/</a>	fittings	
<a href="http://www.petroretail.net/">http://www.petroretail.net/</a>	general	online buyer's guide
<a href="http://www.pumps-ez.com/pumps/index.html">http://www.pumps-ez.com/pumps/index.html</a>	pumps	portal to 1313 manufacturers
<a href="http://www.purolator-facet.com/">http://www.purolator-facet.com/</a>	filters	Purolator Facet, Inc., North Carolina
<a href="http://www.scully.com/">http://www.scully.com/</a>	general	fuel delivery systems
<a href="http://www.swagelok.com">http://www.swagelok.com</a>	fittings	
<a href="http://www.unionpump.com/">http://www.unionpump.com/</a>	pumps	Textron
<a href="http://www.veeder.com/dynamic/index.cfm">http://www.veeder.com/dynamic/index.cfm</a>	tank gauging,	
<a href="http://www.velan.de/">http://www.velan.de/</a>	pumps	Red Jacket part of Veeder Root
<a href="http://www.velcon.com/">http://www.velcon.com/</a>	valves	Germany
<a href="http://www.warrenrupp.com/">http://www.warrenrupp.com/</a>	filtration	
<a href="http://www.warrick.com/">http://www.warrick.com/</a>	pumps	
<a href="http://www.warrick.com/">http://www.warrick.com/</a>	controls	Warrick Controls now Gem Sensors
<a href="http://www.wlwalker.com/">http://www.wlwalker.com/</a>	measurement	
<a href="https://global.ihs.com">https://global.ihs.com</a>	standards	
<a href="https://wmnet.eglin.af.mil/polrurk/">https://wmnet.eglin.af.mil/polrurk/</a>	contingency	

#### Other Military Guides

Title	Name
AF T.O. 00-25-172	Ground Servicing of Aircraft and Static Grounding/Bonding
AF T.O. 37-1-1	General Operations and Inspection of Installed Fuel Storage and Dispensing System
AF T.O. 42B-1-23	Management of Recoverable and Waste Liquid Petroleum Products
AF T.O. 42B-1-1	Quality Control of Fuels & Lubricants
AFI 23-201	Fuels Management
AFI 32-7044	Storage Tank Compliance
AFM 85-16	Maintenance of Petroleum Systems
AFOOSH Std 48-137	Respiratory Protection Program
AFOOSH Std 91-25	Confined Spaces
AFR 144-16	Organizational Fuel Tanks
AMCR 385-100	Safety Manual
API 653	Aboveground Storage Tank Inspector Certification Examination
AR 200-1	Environmental Protection and Enhancement

AR 385	The Army Safety Program
AR 55-355	Transportation and Travel - Traffic Management Regulations
AR 700-36	Overseas Laboratories for Support of Quality Surveillance on Petroleum Products
AR 703-1	Coal and Petroleum Products Supply and Management Activities
AR 710-2	Inventory Management Supply Policy Below the Whole Sale Level
AR 715-27	Petroleum Contract Quality Assurance Manual- Joint Service Publication
AR 735-11	Accounting for Lost, Damaged, and Destroyed Property
AR 750-25	Army Test, Measurement and Diagnostic Equipment (TMDE) Calibration and Repair Support Program
CFR 29, Part 1910	Occupational Safety and Health Standards (OSHA)
CFR 40, Part 112	Oil Pollution Prevention
CFR 40, Part 280-281	Code of Federal Regulations (CFR): Technical Standards and Corrective Action Requirements for Owners and Operators of Underground Storage Tanks (UST).
CFR 49	Hazardous Materials
COMNAVBASEGTMOINS	
T 13400	Location Specific
COMNAVBASEINST	
3440.4B	Location Specific
DA PAM 710-2-1	Using Unit Supply System (Manual Procedures)
DA PAM 710-2-2	Supply Support Activity Supply System: Manual Procedures
DOD 4140.25M	DoD Management Policy for Energy Commodities and Related Services
DOD 4145.19-R-1	Storage and Materials Handling
DOD 4500.9-R	Defense Transportation Regulation
FM 10-18	Petroleum Terminal and Pipeline Operations
FM 10-20	Organizational Maintenance of Military Petroleum Pipelines, Tanks and Related Equipment
FM 10-67-1	Concepts and equipment of Petroleum Operations
FM 10-68	Aircraft Refueling
FM 10-69	Petroleum Supply Point Equipment and Operations
FM 10-70-1	Petroleum References Data
FM 10-71	Petroleum Tank Vehicle Operations
Fort Riley Pam 710-14	Location Specific
MIL-HDBK 844 (AS)	Aircraft Refueling Handbook
MIL-HDBK-114A	Mobility Fuels User Handbook
MIL-HDBK-200	Military Standardization and Quality Surveillance Handbook for Fuels and Related Products
MIL-HDBK-201	Petroleum Operations
MIL-STD 161	Identification Methods for Petroleum Products Systems Including Hydrocarbon Missile Fuels
MIL-STD 457	Frequency for Inspection and Cleaning of Petroleum Fuel Operating
MIL-STD-3004	Quality Surveillance for Fuels, Lab & Ground Products
NAVAIR 00-80T-109	Aircraft Refueling NATOPS (Naval Air Training and Operating Procedures Standardization) Manual
NAVFAC MO-307	Corrosion Control
NAVOSH 5300.23	Navy's Occupational Safety and Health Program
NAVSUP Publication 558	Fuels Management Ashore
NECA 100-1999	Symbols for Electrical Construction Drawings
NECA 402-2001	Recommended Practice for Installing and Maintaining Motor Control Centers

## ANNEX D

	(ANSI)
NFPA 10	Standard for Portable Fire Extinguishers
NFPA 10A	Portable Fire Extinguishers—Maintenance and Use
NFPA 30	Flammable and Combustible Liquids Code
NFPA 385	Standard for Tank Vehicles for Flammable and Combustible Liquids
NFPA 407	Standard for Aircraft Fuel Servicing
OPNAVINST 5090.1B	Environmental and Natural Resources Program Manual
OPNAVINST 5100.23F	Navy Occupational Safety and Health Program Manual
OSHA 1010.106	Personal Safety & Health
PEI RP 400-02	Testing Electrical Continuity of Fuel-Dispensing Hanging Hardware
TM 10-1101	Petroleum Handling Equipment and Operation
TM 5-848-2	Handling of Aircraft and Automotive Fuels
TM 743-200-1	Storage and Materials Handling
UFC 3-570-06	Operation & Maintenance of Cathodic Protection Systems
US Army Guide for UST Mgt	
USAFE Jet Fuel Storage Installations, Vol 2, Maint & Repair	Location Specific

## Navy/ MC

		N/A %	Rarely %	Occasionally %	Frequently %	Blank %
Fuel Receipt	Pipeline	7 53.85%	2 15.38%	0 0.00%	3 23.08%	1 7.69%
	Barge	11 84.62%	1 7.69%	0 0.00%	0 0.00%	1 7.69%
	Rail	10 76.92%	0 0.00%	0 0.00%	1 7.69%	2 15.38%
	Truck	4 30.77%	1 7.69%	2 15.38%	6 46.15%	0 0.00%
	Bulk (BSC)	10 76.92%	1 7.69%	1 7.69%	0 0.00%	1 7.69%
	Other	0 0.00%	0 0.00%	0 0.00%	0 0.00%	13 100.00%
	Gas Station	4 30.77%	1 7.69%	1 7.69%	7 53.85%	0 0.00%
	Aviation Hydrant Systems	6 46.15%	1 7.69%	1 7.69%	5 38.46%	0 0.00%
	Ship Refueling	10 76.92%	1 7.69%	0 0.00%	2 15.38%	0 0.00%
	Truck Fill Stands	0 0.00%	2 15.38%	0 0.00%	11 84.62%	0 0.00%
Fuel Storage Tank Types	Manufactured	4 30.77%	3 23.08%	0 0.00%	3 23.08%	3 23.08%
	Field Constructed	3 23.08%	1 7.69%	3 23.08%	6 46.15%	0 0.00%
	Cut and Cover	7 53.85%	1 7.69%	1 7.69%	4 30.77%	0 0.00%
	UST	6 46.15%	1 7.69%	1 7.69%	5 38.46%	0 0.00%
	Tank Guaging/Monitoring	0 0.00%	2 15.38%	1 7.69%	10 76.92%	0 0.00%
	Transfer Pipelines	1 7.69%	4 30.77%	2 15.38%	6 46.15%	0 0.00%
Filtration/Separation Systems	Secondary Containment System	2 15.38%	3 23.08%	2 15.38%	6 46.15%	0 0.00%
	Bulk Receipt	2 15.38%	2 15.38%	1 7.69%	8 61.54%	0 0.00%
	Truck Issue	1 7.69%	1 7.69%	2 15.38%	9 69.23%	0 0.00%
	Hydrants/DFS's	6 46.15%	1 7.69%	1 7.69%	5 38.46%	0 0.00%
	Controls	2 15.38%	1 7.69%	3 23.08%	6 46.15%	1 7.69%
	Other	5 38.46%	0 0.00%	0 0.00%	0 0.00%	8 61.54%

## Army

		N/A %	Rarely %	Occasionally %	Frequently %	Blank %
Fuel Receipt	Pipeline	41 83.67%	0 0.00%	3 6.12%	1 2.04%	4 8.16%
	Barge	42 85.71%	1 2.04%	1 2.04%	1 2.04%	4 8.16%
	Rail	42 85.71%	0 0.00%	2 4.08%	0 0.00%	5 10.20%
	Truck	1 2.04%	4 8.16%	10 20.41%	14 28.57%	0 0.00%
	Bulk (BSC)	41 83.67%	2 4.08%	1 2.04%	1 2.04%	4 8.16%
	Other	1 2.04%	0 0.00%	0 0.00%	0 0.00%	48 97.96%
	Gas Station	7 14.29%	5 10.20%	5 10.20%	32 65.31%	1 2.04%
	Aviation Hydrant Systems	39 79.59%	0 0.00%	6 12.24%	0 0.00%	4 8.16%
	Ship Refueling	42 85.71%	0 0.00%	2 4.08%	1 2.04%	4 8.16%
	Truck Fill Stands	14 28.57%	7 14.29%	8 16.33%	18 36.73%	2 4.08%
Fuel Storage Tank Types	Manufactured	20 40.82%	6 12.24%	6 12.24%	14 28.57%	3 6.12%
	Field Constructed	27 55.10%	5 10.20%	7 14.29%	4 8.16%	6 12.24%
	Cut and Cover	35 71.43%	4 8.16%	3 6.12%	2 4.08%	5 10.20%
	UST	6 12.24%	2 4.08%	9 18.37%	29 59.18%	3 6.12%
	Tank Guaging/Monitoring	1 2.04%	3 6.12%	10 20.41%	34 69.39%	1 2.04%
	Transfer Pipelines	34 69.39%	3 6.12%	4 8.16%	6 12.24%	2 4.08%
Filtration/Separation Systems	Secondary Containment System	17 34.69%	6 12.24%	9 18.37%	15 30.61%	2 4.08%
	Bulk Receipt	13 26.53%	4 8.16%	9 18.37%	21 42.86%	2 4.08%
	Truck Issue	9 18.37%	4 8.16%	12 24.49%	24 48.98%	0 0.00%
	Hydrants/DFS's	36 73.47%	1 2.04%	2 4.08%	6 12.24%	4 8.16%
	Controls	19 38.78%	4 8.16%	4 8.16%	11 22.45%	11 22.45%
	Other	0 0.00%	0 0.00%	0 0.00%	0 0.00%	49 100.00%

## Air Force

		N/A	%	Rarely	%	Occasionally	%	Frequently	%	Blank	%	
Fuel Receipt	Pipeline	20	30.77%	14	21.54%	9	13.85%	22	33.85%	0	0.00%	
	Barge	58	89.23%	2	3.08%	3	4.62%	1	1.54%	1	1.54%	
	Rail	55	84.62%	4	6.15%	3	4.62%	2	3.08%	1	1.54%	
	Truck	8	12.31%	22	33.85%	16	24.62%	17	26.15%	2	3.08%	
	Bulk (BSC)	54	83.08%	8	12.31%	0	0.00%	0	0.00%	3	4.62%	
	Other	0	0.00%	0	0.00%	0	0.00%	0	0.00%	65	100.00%	
	Gas Station	2	3.08%	14	21.54%	21	32.31%	27	41.54%	1	1.54%	
	Aviation Hydrant Systems	22	33.85%	5	7.69%	12	18.46%	24	36.92%	2	3.08%	
	Ship Refueling	55	84.62%	6	9.23%	2	3.08%	1	1.54%	1	1.54%	
	Truck Fill Stands	1	1.54%	12	18.46%	19	29.23%	31	47.69%	2	3.08%	
	Fuel Storage Tank Types	Manufactured	23	35.38%	10	15.38%	18	27.69%	13	20.00%	1	1.54%
		Field Constructed	21	32.31%	7	10.77%	17	26.15%	19	29.23%	1	1.54%
		Cut and Cover	39	60.00%	7	10.77%	8	12.31%	9	13.85%	2	3.08%
UST		18	27.69%	12	18.46%	15	23.08%	18	27.69%	2	3.08%	
Tank Guaging/Monitoring		2	3.08%	13	20.00%	20	30.77%	28	43.08%	2	3.08%	
Transfer Pipelines		10	15.38%	18	27.69%	13	20.00%	23	35.38%	1	1.54%	
Secondary Containment Systems		3	4.62%	17	26.15%	21	32.31%	22	33.85%	2	3.08%	
Filtration/Separation Systems	Bulk Receipt	3	4.62%	14	21.54%	20	30.77%	28	43.08%	0	0.00%	
	Truck Issue	0	0.00%	17	26.15%	19	29.23%	28	43.08%	1	1.54%	
	Hydrants/DFS's	20	30.77%	8	12.31%	15	23.08%	20	30.77%	2	3.08%	
	Controls	5	7.69%	8	12.31%	21	32.31%	27	41.54%	4	6.15%	
	Other	18	27.69%	1	1.54%	0	0.00%	2	3.08%	45	69.23%	

## TOTAL

DoD Overall Frequency for Maintenance information by system component

		N/A	%	Rarely	%	Occasionally	%	Frequently	%	Blank	%	
Fuel Receipt	Pipeline	68	54%	16	13%	12	9%	26	20%	5	4%	
	Barge	111	87%	4	3%	4	3%	2	2%	6	5%	
	Rail	107	84%	4	3%	5	4%	3	2%	8	6%	
	Truck	13	10%	27	21%	28	22%	37	29%	22	17%	
	Bulk (BSC)	105	83%	11	9%	2	2%	1	1%	8	6%	
	Other	1	1%	0	0%	0	0%	0	0%	126	99%	
	Gas Station	13	10%	20	16%	27	21%	66	52%	2	2%	
	Aviation Hydrant Systems	67	53%	6	5%	19	15%	29	23%	6	5%	
	Ship Refueling	107	84%	7	6%	4	3%	4	3%	5	4%	
	Truck Fill Stands	15	12%	21	17%	27	21%	60	47%	4	3%	
	Fuel Storage Tank Types	Manufactured	47	37%	19	15%	24	19%	30	24%	7	6%
		Field Constructed	51	40%	13	10%	27	21%	29	23%	7	6%
		Cut and Cover	81	64%	12	9%	12	9%	15	12%	7	6%
UST		30	24%	15	12%	25	20%	52	41%	5	4%	
Tank Guaging/Monitoring		3	2%	18	14%	31	24%	72	57%	3	2%	
Transfer Pipelines		45	35%	25	20%	19	15%	35	28%	3	2%	
Secondary Containment Sys		22	17%	26	20%	32	25%	43	34%	4	3%	
Filtration Separation Systems	Bulk Receipt	18	14%	20	16%	30	24%	57	45%	2	2%	
	Truck Issue	10	8%	22	17%	33	26%	61	48%	1	1%	
	Hydrants/DFS's	62	49%	10	8%	18	14%	31	24%	6	5%	
	Controls	26	20%	13	10%	28	22%	44	35%	16	13%	

## Knowledge Management Applications

Company - Product	POC Name	GSA Listed	Phone	Email
<a href="#">Cognos</a>		Yes, by seat license	Phone: 800-426-4667 or 781-229-6600 Fax: 781-229-9844	
<a href="#">Convera - RetrievalWare 8</a>		Yes, \$407K	Phone: 800-788-7758	<a href="mailto:info@convera.com">info@convera.com</a>
<a href="#">CYIOS Knowledge Office</a>		No	Phone: 202-895-1373	<a href="mailto:411@CYIOS.com">411@CYIOS.com</a>
<a href="#">Documentum</a>		Yes, multiple products	Phone: 800-607-9546	<a href="mailto:salesinfo@documentum.com">salesinfo@documentum.com</a>
<a href="#">Kashmere CMS</a>		No	Phone: 703-964-8000 Fax: 703-964-0160	
<a href="#">Leading Way – Knowledge One</a>		No	Phone: 949-453-1112 Fax: 949-453-8115	<a href="mailto:info@leadingway.com">info@leadingway.com</a>
<a href="#">Meridian Knowledge Solutions - Knowledge Center</a>	Roy Haythorn	Yes, \$65K	Phone: 585-214-2450 Mobile: 585-315-7959	<a href="mailto:info@meridiansi.com">info@meridiansi.com</a>
<a href="#">Auxilium – Performance Builder</a>	Bill Hauserman	No	Phone: 877-867-8988 ext. 245	<a href="mailto:bhauserman@auxiliumpg.com">bhauserman@auxiliumpg.com</a>
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# Typical Manufacturer Maintenance Document

## TWIN SEAL™ MODEL 375 H

### Exploded View

Item No.	375 H Part No.	Description	Req'd
1	21-419	Operator Housing	1
2	22-417	Upper Stem	1
3	22-418	Lower Stem	1
4	27-418	Indicator Shaft	1
5	27-419	Indicator Flag	1
6	28-406	Handwheel	1
7	45-411	Key	1
8	46-425	Bushing	1
9	48-402	Roller	1
10	50-402	Grease Retainer	1
11	82-92	O-Ring	1
12	84-415	Protector	1
13	84-417	Insipria Role	1
14	85-402	Grease Seal	1
15	86-409	Ball Bearing	1
16	72-5	Cap Screw	4
17	74-6	Screw	1
18	74-9	Set Screw	1
19	75-434	Nut	1
20	76-411	Lube Filling	1
21	77-407	Guide Pin	1
22	77-429	Drive Pin*	1
23	77-439	Roll Pin	1
24	78-413	Retaining Ring	1
25	78-414	Retaining Ring	1

### Cross Section

### 375 H Is Used on Models:

2"	CA811
2"	CA821
3"	CA811
3"	CA821

### OPERATOR DIS-ASSEMBLY

- Unscrew (17) and remove indicator flag (5).
- Remove the stem protector (12).
- Remove the handwheel nut (19), handwheel (6), key (7) and grease retainer ring (10).
- Remove the retaining ring (25) and pull out the upper stem (2) with lower stem (3), bearing (15), roller (9) and indicator shaft sub-assembly (4) out through the top of the housing (1).
- Remove set-screw (18) from bottom of lower stem and push indicator shaft sub-assembly (4) out through the bottom of the lower stem.
- Separate the stems and remove the retaining ring (24) and the bearing (15) from the upper stem.
- Remove grease seal (14) and bushing (8) (if req'd) from top of upper stem (2).
- Remove O-Ring (11) from inside of housing (1).

### OPERATOR ASSEMBLY

- Install O-Ring (11) in housing (1).
- Place the bearing (15) on the top of the upper stem (2). Install retaining ring (24).
- Apply a liberal coating of grease to all surfaces of upper stem (2) and inside and outside of lower stem (3).
- Thread the upper stem and lower stem together such that the drive pin (22) in the upper stem comes against the shoulder at the TOP of the lower stem (3) and the detent recess in the upper stem is exactly in line with roller opening in the lower stem.

NOTE: This operation may require several attempts as the threads are multiple start and do not always assemble correctly with the first try.

- Install the indicator shaft sub-assembly (4) up through both stems. Align the detent hole in the indicator disc with the threaded hole in the lower stem and fasten with set screw (18). Set screw must be below the outside surface of the lower stem.
- Place the roller (9) in the side opening of the lower stem. A liberal application of grease will hold the roller in position.
- Place the stem assembly into the housing taking care that roller is aligned with roller groove in housing. Push the entire assembly down until the bearing rests on the shoulder in the housing.
- Install the retaining ring (25) in the top of the housing (1).
- Install grease retainer (10) in handwheel (6) and place handwheel and key (7) on upper stem. Install bushing (8) and grease seal (14) in handwheel nut (19). Screw the nut on the upper stem and tighten down on handwheel securely.
- Install stem protector (12).
- Install indicator flag (5) and secure with screw (17).

\* not available separately

**GENERAL VALVE COMPANY**

Extract from excellent General Valve Twin Seal manual available in pdf format at <http://www.general-valve.com/MaintManual.asp>.