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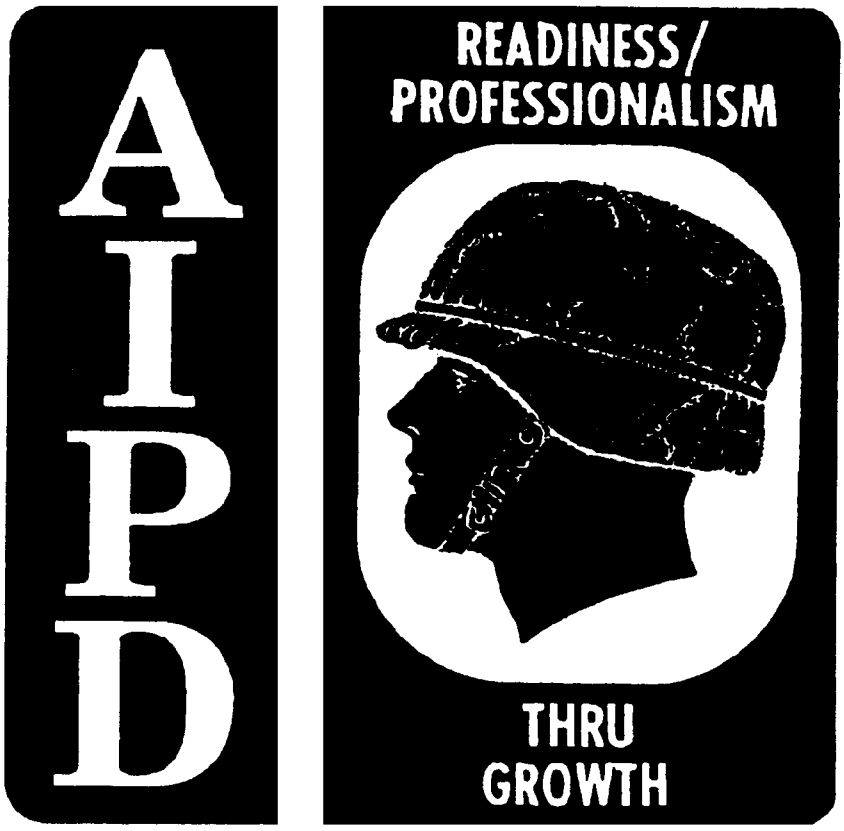
SUBCOURSE
QM5202

EDITION
A

BATCHING AND SCHEDULING



THE ARMY INSTITUTE FOR PROFESSIONAL DEVELOPMENT

ARMY CORRESPONDENCE COURSE PROGRAM

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BATCHING AND SCHEDULING

Subcourse Number QM5202

EDITION A

United States Army Combined Arms Support Command
Training Directorate
Fort Lee, Virginia 23801-6000

3 Credit Hours

Edition Date: September 1998

SUBCOURSE OVERVIEW

This subcourse is designed to teach you about petroleum and batching operations. This subcourse will assist you in developing an understanding on how to plan for successful, single and multiproduct fuel operations. You will be the petroleum expert.

There are no prerequisites for this subcourse.

This subcourse reflects the doctrine that was current at the time the subcourse was prepared. In your own work situation, refer to the latest official publication.

Unless otherwise stated, the masculine gender of singular pronouns is used to refer to both men and women.

TERMINAL LEARNING OBJECTIVE

ACTION: You will manage petroleum terminal operations and petroleum pipeline operations.

CONDITION: You will be the 92F responsible for supervising and providing both single product and multiproduct fuel in support of subordinate element missions.

STANDARD: To demonstrate competency of this task, you must achieve a minimum of 70 percent on the subcourse examination.

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LESSON

BATCHING AND SCHEDULING

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OVERVIEW

LESSON DESCRIPTION:

In this lesson, you will learn the duties of the pipeline dispatcher. You will prepare a monthly consumption graph, a monthly pipeline schedule, and a graphic progress chart. You will also review a daily pipeline order.

TERMINAL LEARNING OBJECTIVE:

ACTION: You will be responsible for supervising petroleum terminal operations and petroleum pipeline operations. You will also be responsible for determining the location of petroleum pump stations, terminals, and supply points. As the petroleum expert, you will also be responsible for planning a petroleum supply program in theater operations and petroleum distribution systems (Fixed Facility).

CONDITION: The 92F responsible for supervising and providing both single product and multi-product fuel support to subordinate elements.

STANDARD: Identify and explain the duties and functions of the chief dispatcher; prepare a consumption graph; and interpret daily and monthly schedules, graphic progress charts, and daily pumping orders according to FM 10-67-1.

REFERENCES: The material contained in this lesson was derived from the following publication: FM 10-67-1.

INTRODUCTION

In today's Army, our mission is to provide the right amount of fuel, at the right place and at the right time to meet all of the fuel requirements of all internal and external fuel operations. It is imperative to conduct an environmental assessment prior to beginning fuel operations. The unit environmental officer coordinates with the EPA representative, the unit petroleum officer, and the environmental regulators to make an assessment of the petroleum operation. This assessment is used to determine how the petroleum operation will affect the wildlife and local population within the unit's area of operation. Environmental compliance officers use the results from the assessment to verify whether or not the petroleum operation is IAW the prescribed environmental compliance. The unit environmental officer works with the following personnel: the environmental compliance officer, the EPA officer, the unit petroleum officer, and environmental regulators. As with any operation, the unit environmental officer must emphasize spill prevention.

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The unit environmental officer is also responsible for knowing the governing spill contingency policy, the installation policy, the CONUS policy and/or the OCONUS policy, and any host nation policy that is relevant to the rear in which the petroleum operation will be conduced.

The Quartermaster Corps is tasked with providing fuel to support deployments such as Desert Storm and Desert Shield, Bright Star, JRTC, NTC, and numerous humanitarian assistance operations. In each deployment, either single product or multiproduct fuel products were dispensed in support of petroleum fuel operations.

The petroleum NCOIC and petroleum OIC are often thought of as some of the most insignificant players when it comes to planning field training exercises or major deployments. Oftentimes, they are even left out of the initial planning phases. The bottom line is they are the subject matter experts. As the petroleum officer, the more knowledge you have, the easier it will be to train your subordinates to perform their daily mission. It is imperative that all subordinates under your supervision know and understand their responsibilities under the Army environmental stewardship program. Your soldiers definitely need to be educated in the event that there is some type of fuel spill. Generally, when dealing with fuel spills, one of the biggest problems is containment. It is your responsibility to ensure that each of your soldiers is able to apply environmental awareness techniques. Your soldiers must be able to make sound decisions that will not cause harm and/or damage to the training site or the deployment area. In the event that there is a fuel spill, every measure of effort must be taken to ensure that the spill is properly contained and cleaned up.

Remember accurate records and reports of receipt, storage, and shipments of petroleum products must be maintained at all times. This lesson has been broken down into six sections. In the first section, you will receive information about the terms and definitions associated with the batching and scheduling procedure. You will also receive information about dispatchers and their responsibilities. In the second section, you will receive information about the batching procedures; and in the third section, you will receive information about consumption graphs. Section four gives information about monthly pipeline schedules. In section five, you will receive information about the graphic progress chart. Finally, in section six, you will receive information about daily pumping orders.

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1. Terms. Here are some of the terms and definitions you will encounter in this lesson.

a. Pipeline -- Is a multi-product pipeline this means that more then one type or grade of product can be pumped through a single pipe.

b. Forecast -- A pipeline plan or schedule of products to be pumped.

c. Schedule -- A monthly, weekly, or daily plan of deliveries into and out of a pipeline at some point connected with the pipeline.

d. Dispatching -- The act of controlling the pipeline operation IAW a forecast/schedule.

e. Dispatcher -- A person responsible for scheduling the movement of product through the pipeline.

f. Chief Dispatcher -- The person in charge who controls all operations for the scheduling and movement of products in the pipeline. The chief dispatcher is usually located at the petroleum pipeline and terminal operating battalion or petroleum group headquarters.

g. District Dispatcher -- Controls the pipeline operations in his district IAW instructions from the chief dispatcher office. The district dispatcher is located at the petroleum pipeline and terminal operating company.

h. Shift Dispatcher -- Is responsible for control of the pipeline in the name of the dispatcher (for example, chief or district), depending on the office assigned to during a working shift.

i. Batch -- A specific quantity and type of product pumped into a pipeline.

j. Batching -- The sequence in which two or more products are to be pumped and introducing those products into the pipeline in a sequence that results in the least formation of interface material.

k. Interface -- The mixing or commingling between adjacent products in a multiproduct pipeline.

l. Cut -- Product withdrawn from a pipeline and routed into tankage.

m. Stripping (Split Streaming) -- The process of drawing off a part of the total product batch into an intermediate terminal tanks.

2. Chief Dispatcher Functions.

Now that you have become familiar with the terms related to batching and scheduling. We will now list the responsibilities and coordination of the chief dispatcher.

a. The chief dispatcher is responsible for knowing the following:

(1) Capacity of storage tanks at each storage location connected to the pipeline.

(2) Linefill of the pipeline and the throughput for each section of the pipeline.

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(3) Working pressures for each section of the pipeline and the maximum discharge pressure that each pump station can develop.

(4) Number and location of each pump station.

(5) Stock status and daily requirements.

b. The chief dispatcher and his office must also determine, coordinate, and perform the following:

(1) Type and quantity of product to be pumped.

(2) Destination of each batch.

(3) Interface size and estimated arrival times of interfaces at pump stations and terminals.

(4) Starting and stopping times of all pumping operations.

(5) Pump station pressures and flow rate.

(6) Type of cut to be made with each product interface.

(7) Development of the monthly and daily schedules.

(8) Relay of daily pumping orders to the district dispatchers.

(9) Records based on hourly reports from the pump stations and terminals must be maintained.

(10) Records must be maintained on the quantity of fuel: batched into the pipeline, delivered to locations along the pipeline, quantity remaining in the pipeline, and the quantity of fuel lost.

(11) Information must be reported daily to higher headquarters; (for example, HHC, QM (Petroleum and Water).

c. The chief dispatcher also has a scheduling and dispatching section. These sections are responsible for:

(1) Preparing the monthly pipeline schedule and a number of operational schedules used to control the pipeline.

(2) Ensuring that all pumping operations are started, adjusted, and stopped when scheduled to do so. The dispatching section is also responsible for issuing orders to the district dispatchers.

3. District Dispatcher Functions.

The district dispatcher controls pumping operations in their district according to the instructions from the chief dispatcher's office. A district dispatcher has certain freedoms of action in emergencies. The district dispatcher emergency responsibilities are as follows:

a. To isolate the affected section(s) in case of a line break.

b. To divert upstream pumping into empty storage tankage or order a line shutdown.

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c. To inform the chief dispatcher's office of all shutdowns, identify the shutdown section and take action.

4. Shift Dispatcher Functions.

Shift dispatchers are responsible for control. They act for the chief and district dispatchers during their work shift.

5. Batching Procedures.

a. Products likely to be batched in military multi-product pipelines primarily include MOGAS, diesel fuel, and jet fuels. Product such as kerosene have been used as a buffer at times in some of the pipeline operations but it is not a common practice for use in the military system.

b. Batching sequences are not fixed; however, batches should be arranged to protect critical products and to produce interfaces that can be used. In addition to creating usable interfaces, the batching sequence also aids in quality and quantity control.

c. Products closely related are adjacent in descending or ascending order of quality or gravity. Products most closely related in quality have the least difference in gravity. Batching sequences first schedule light products and then heavier products.

(1) Products form interfaces that spread less with distance. The interface lengthens quickly as it first starts downstream in the pipeline. About 65 percent of the interface will occur in the first 20 percent of the pipeline distance.

(2) Products are more easily disposed of in one or both adjacent fuels. This method of batching simplifies quality surveillance.

6. Interface.

The interface is a small mixture of the two adjacent products. Product cuts are used when dealing with the interface in a multiproduct pipeline. A number of factors must be considered when making such cuts. Interface size can be reduced by maintaining a pumping rate needed to keep the heaviest product in turbulent flow and by keeping the line pressurized during a shutdown.

7. Batch Designation.

Product batches are identified by use of a standard identification system. This system identifies the product, batch, and the quantity.

a. Product code numbers form the first part of a numerical batch designation.

(1) The following product codes are commonly used.

- MOGAS -- 1.
- Jet Fuel -- 2 (for example, JP-4, JP-5, JP-8).
- Diesel Fuel -- 3.

(2) Other products would be assigned continuing numbers by the dispatcher.

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b. A batch number forms the second part of the identification system. Batch numbers are assigned at the first of the fiscal year beginning with the number "1" for the first batch of any fuel.

(1) An example, 2-60 represents the 60th batch of jet fuel for the fiscal year.

(2) The dispatcher may elect to run the batch number in sequence regardless of product; (for example, 2-60/1-61/2-62).

c. The third number used represents the size or quantity of the batch in Mbbl.

NOTE: 20 Mbbl represents 20,000 barrels.

EXAMPLE: 2-40-20: is JP-8, the 40th batch, consisting of 20 Mbbl.

8. Detection of Batch Changes.

In control of product through the pipeline, it must be determined where one batch ends and another batch begins. The following methods are used:

a. Gravity difference -- the API or specific gravity between the two products will identify the change of products.

b. Color change -- where color (due to lead) differences are detectable, the different products may be determinable.

c. Liquid buffers -- a product such as MOGAS may be used to separate different products.

d. Physical buffer -- an object such as a pig, scraper, or ball placed in the line to cut down on the interface.

e. Dye plug -- color injected into the line to separate like products belonging to different customers.

(1) Disposing of interfaces. There are three alternatives for disposing of interfaces. The alternatives are as follows:

(a) All the interface mixture is cut into one or the other adjacent products, a head or tail interface cut.

(b) The mixture is divided between the two adjacent products, usually at the midgravity point.

(c) The whole interface is taken off into a slop tank and is blended at a later time. Note, this procedure is used in commercial industry but is not a practice in the military system.

(2) Type of cuts. There are four types of cuts that can be made (See Figure 1-1.)

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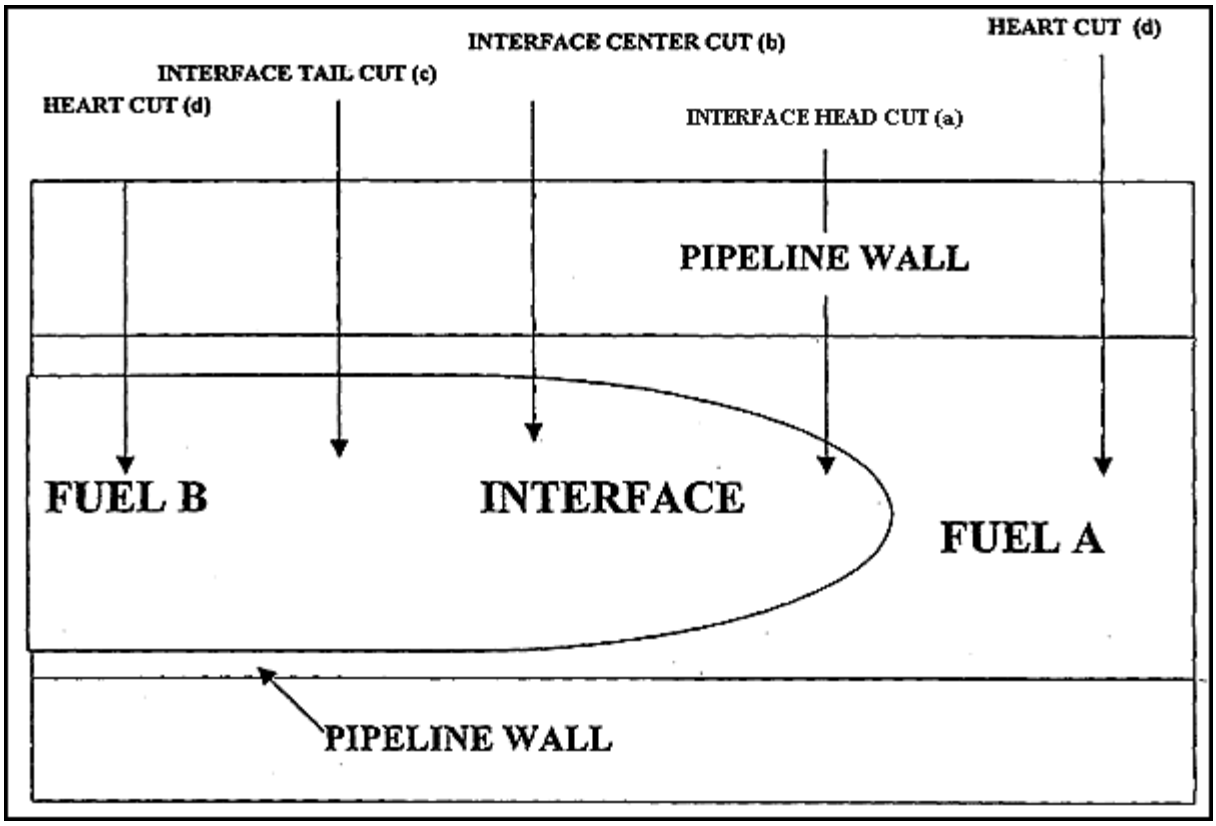

Figure 1-1. Product batch cuts

(a) Interface head cut -made at the front end of the interface at the last gravity of pure product.

(b) Interface midpoint or center cut -- the approximate midpoint gravity between the two adjacent products.

EXAMPLE: (JP-4 being pushed by MOGAS). Last API gravity of JP-4 corrected to 60 degrees is 53.8, with pure MOGAS corrected to 56.4 degrees. The midpoint between the observed API gravity is 2.6 degrees. To determine the midpoint cut, divide 2.6 by 2 then add the results to 53.8 (for example, 2.6 / 2 = 1.3); 53.8 + 1.3 = 55.1. The midpoint cut is 55.1 degrees API between JP4 and MOGAS.

(c) Interface tail cut -Made at the last of the interface mixture before pure product.

(d) Heart cut -Pure product cut made before or after the interface.

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(3) Determining time of cut. The type of batch change being made determines the time to make the cut. A line sampling station will be located before the manifold to allow the product cut to be made under normal flow.

9. Determining Length of Interfaces.

To determine the length of the interface requires the following data:

- The interface arrival - starting time.
- The interface passage - ending time.
- The total elapsed time between starting and ending times.
- The pumping rate per minute.

EXAMPLE: The interface arrives at the pump station starting at 1930. It passes the pump station at 2005. The pumping rate is 2,200 barrels per hour.

60 - 30 = 30 minutes 30 + 5 = 35 minutes

1930 - 2005 = 35 minutes for the interface to pass

2,200 Mbbls per hour / 60 = 36.6666 = 36.7 bpm

Total interface mixture: 35 x 36.7 = 1,284.5 bbl

10. Product Pumping Rate.

The product pumping rate is determined based on the quantity of a product batched into the pipeline each hour. The pumping rate of flow is further verified by reports from pump station along the pipeline and the receiving location as the batch arrives.

EXAMPLE 1: A batch of 2,200 barrels of product is started into the pipeline at 0100: The product batching is complete at 0200. The batching of this product into the pipeline required 1 hour.

NOTE: To determine the flow rate per hour, divide the quantity by time.

2,200 bbl / 1 hour = 2,200 barrels per hour.

a. Due to the volumes handled in a pipeline, we refer to rates of flow and quantities in Mbbl.

EXAMPLE 2: 2,200 barrels = 2,200 / 1000 = 2.2 Mbbl.

b. Knowing the rate of product flow, arrival times can be determined at each pump station and terminals notified of the expected arrival time.

c. Pipeline operations for planning purposes is for a 20 - hour day.

(1) This allows 20 hours to pump and 4 hours for maintenance during a 24-hour day.

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(2) The actual pumping day will depend on a number of factors (for example, control of the area along the pipeline, repair capability and security).

11. Consumption Graph

The dispatcher's office will maintain consumption graphs for each product handled, by location, in their area of responsibility. (See Figure 1-2 for example.)

- Chief dispatcher -keeps consumption graphs for each product at each storage point.
- District dispatchers - keeps the graphs for storage locations in its area of responsibility.
- Terminals -keep graphs for large volume users and to show the total available barrels.

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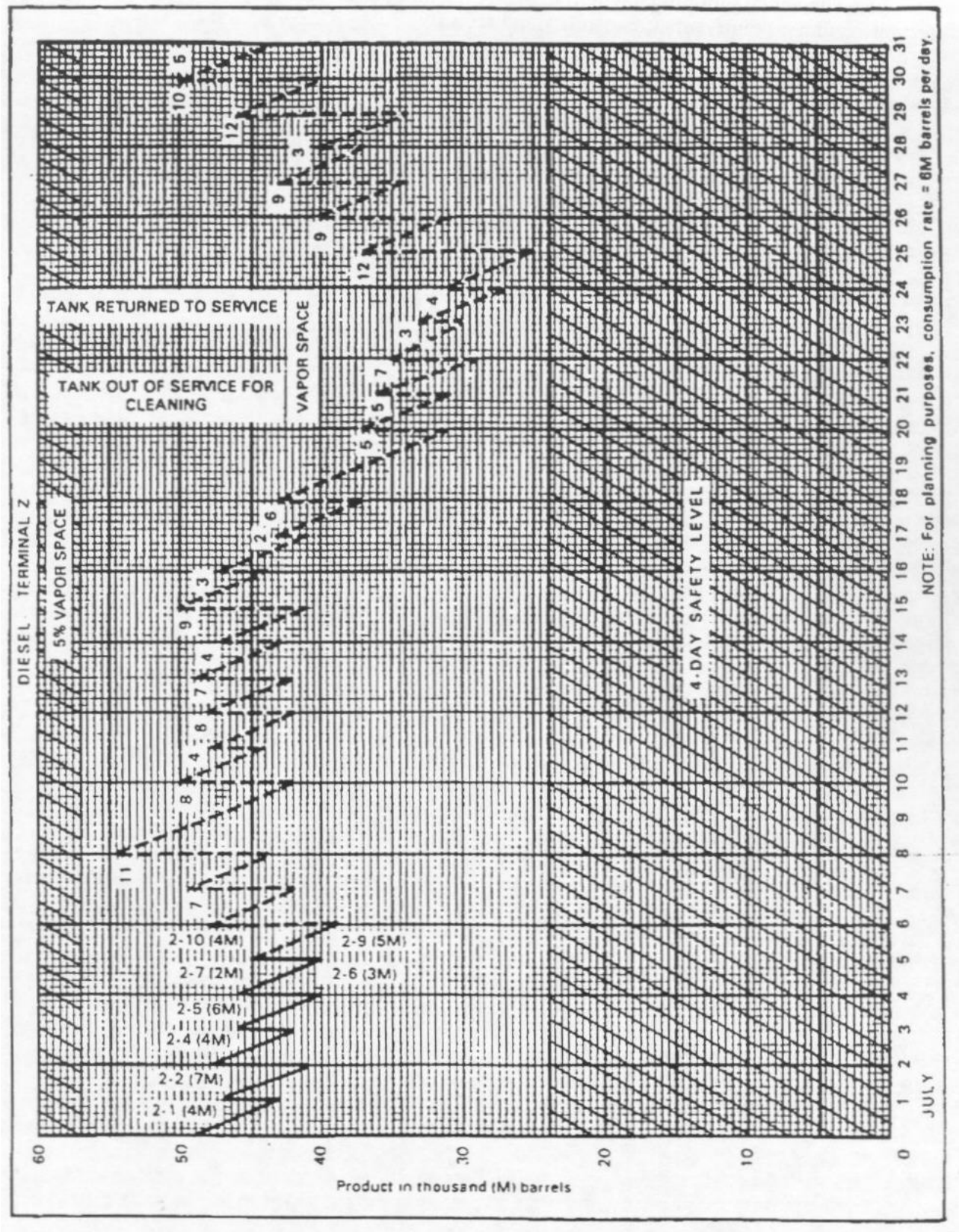

Figure 1-2. Consumption graph

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The consumption graphs are valuable for showing present and projected stockage. They show trends in consumption, sudden increases, and decreases.

a. The graph must show total barrels of a product at the storage point. The total barrels plotted on the graph must be adjusted for tankage taken out of or placed into service. (for example, tank cleaning).

b. Allowance for vapor space is calculated at 5 percent of the total available storage capacity. When a tank is taken out of service, you can not count that storage capability; (for example, the total storage for "X" product at "Y" location is: 70 Mbbl (70,000 bbl (7 each 10,000 bbl storage tanks)) the 95 percent fill capacity is: 66.5 Mbbl (66,500 bbl), to allow for the 5 percent vapor space).

EXAMPLE: To solve for the vapor space, you must multiply vapor space by the number of Mike barrels. Vapor space = 5 percent, which is equal to = .05. The vapor space for 80 Mbbl = 80 x .05 = 4 Mbbl

c. The graph is plotted covering a monthly period. Issues are shown starting at 0001 of one day to 0001 of the next day by a diagonal line. Receipts are plotted at the end of the day by a vertical line from the issue line.

d. The plotting of projected issues and receipts for the complete monthly period are shown by a dotted line. The actual issues and receipts are plotted with a solid line. (Note: By plotting the graph with the anticipated and the actual issues and receipts, the dispatcher can see what adjustments need to be made.)

e. The safety level is shown at the bottom of the graph. The safety level, number of DOS, is established at the theater command level. The safety level is based on the previous month's total daily issues, divided by the number of days during the issue period, and then multiplied by the DOS required by the theater.

EXAMPLE: 150 Mbbl of fuel were used during last month's field training exercise. That month consisted of 30 days. The safety level is 4 DOS.

150 Mbbl / 30 = 5 Mbbl

5 Mbbl x 4 = 20 Mbbl, the safety level is 20 Mbbl

12. Monthly Pipeline Schedule:

The monthly pipeline schedule shows programmed movements through the pipeline of products and the quantities required during the 30-day period. The schedule will show where the product is and what products are in the pipeline as well as the time to determine how long it will take the product to reach its destination. The monthly schedule is merely a graph which shows line capacity in barrels (distance) plotted against time (hours). The pipeline is depicted by a graph.

a. The number of hours that the pipeline is to be used each day must be determined. A pipeline could operate for up to a maximum of 24 hours per day.

NOTE: For the examples, will use a 20 - hour time period stating at 0001 and ending at 2000 which will allow for 4 hours of maintenance to the military pipeline system.

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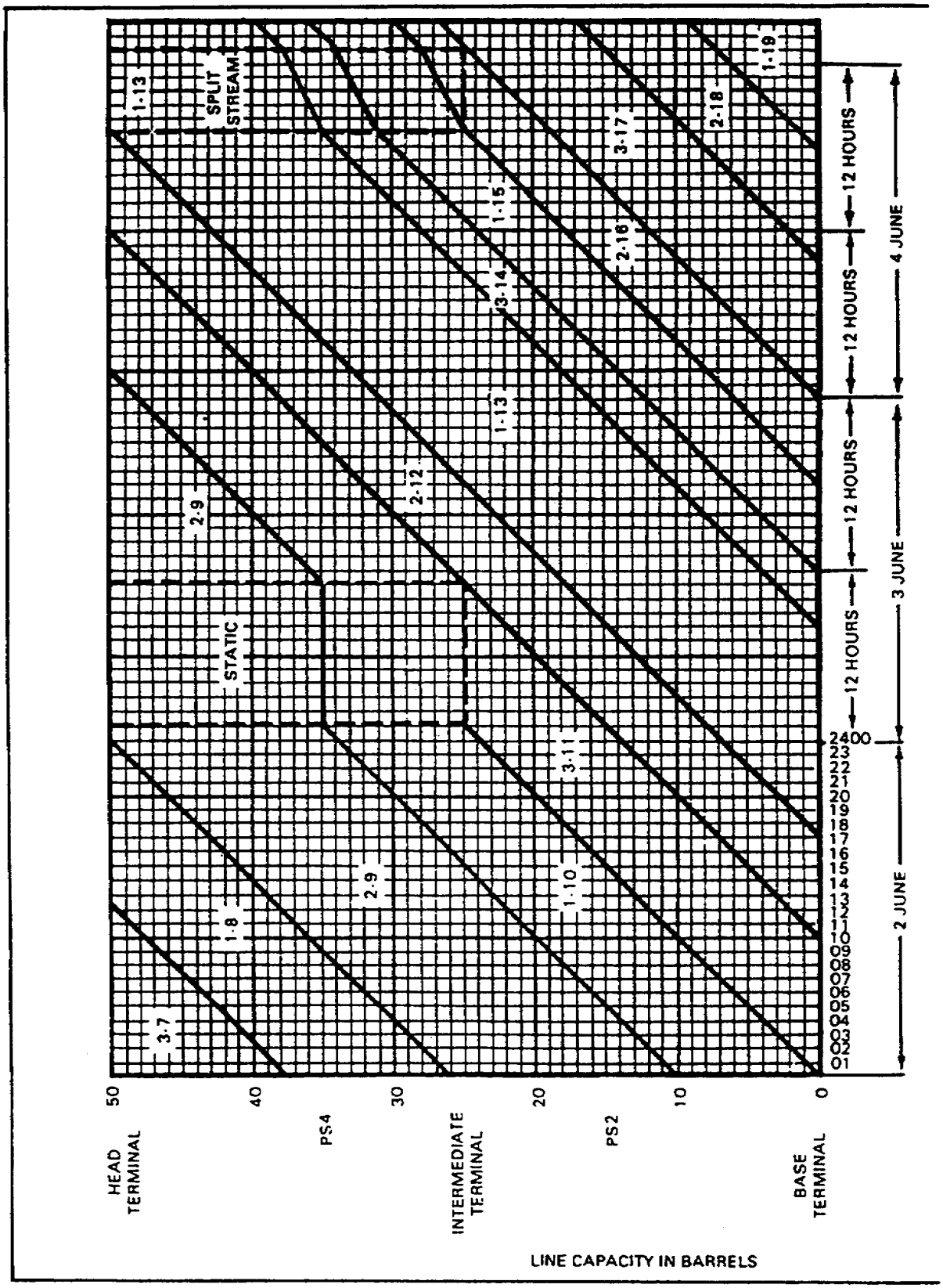

Figure 1-3. Monthly Pipeline Schedule

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b. Line fill is shown on the left - hand vertical scale. The location of terminals (base, intermediate, head), and pump stations are located by their line fill distance downstream from the base terminal.

c. The product batch identification within the line fill is marked on the graph indicating its beginning and ending points.

d. Time is plotted on the horizontal axis. Each day begins at 0001 and ends at 2000. However, if the demand for product is high, pumping could continue for 24 hours.

e. To determine product location in the pipeline, time distance is involved.

EXAMPLE 1: Batch 2-20-10 is batched at 0700. The pipeline fill (intermediate terminal) is 20 Mbbl and the pumping rate is 2 Mbbl per hour. Take the line fill which is 20 Mbbl and divide it by 2 Mbbl. This lets you know that the product started in the pipeline will take 10 hours to arrive at the head terminal. Take the 10 hours and add it to your start time of 0700. This lets you know that at 1700 hours your fuel will have reached the terminal. To find out how many hours it will take for your batch to pass, take the number of Mbbl of your batch and divide it by the pump rate. Then add that number to the number of hours that it took to get to the head terminal. For our example we found that it took 10 hours. So for our example, we will take our batch 2-20-<u>10</u>. Since we know that we have 10 Mbbl (this comes from the underlined Mbbl) we then divide this number by the pumping rate of 2 Mbbls which gives us 5 hours. We then add that 5 hours to our 1700 which gives us the grand total of 2200 for this batch to pass.

NOTE: You must always know the pumping rate.

EXAMPLE 2: By knowing when a product is started into the pipeline and knowing the quantity to be placed into the pipeline, you can determine the time the total batch is placed into the pipeline. Start 16 Mbbl of jet fuel into a pipeline at 0001 and pumping at 2 Mbbl the last of the batch is placed into the pipeline at 0800 (16 + 2 = 8).

f. Shutdown of the pipeline for scheduled maintenance, or due to unscheduled reasons such as sabotage or pressure loss does not stop time from continuing to pass.

NOTE: A shutdown is indicated with a dotted line at the point of time shutdown takes place. If the shutdown affects the complete pipeline, then the dotted line will extend from base to head terminal at the time shutdown starts and a second dotted line at the point of time that pumping operations start up again. If the shutdown affects only part of the pipeline, that part will be indicated by a dotted line indicating the part and time that shutdown affects. If the pipeline is between the base and intermediate terminal, then only the product that is being pumped out of the intermediate terminal to the head terminal is affected. The horizontal dotted line on the graph shows the intermediate terminal between the shutdown start time and ending time where the start-up begins.

g. Stripping occurs when the flow is split between a terminal and the pipeline. A product is being pushed up the pipeline and to a terminal along the pipeline. Product is received into the terminal while at the same time it continues to flow up the pipeline.

NOTE: A stripping action is indicated with dotted lines showing the location and period of time that the stripping action takes place. Where stripping takes, place the product flow changes. If the rate of flow prior to the point that stripping starts is 2 Mbbl, the flow rate at the point of stripping and on past is reduced by half during the period stripping occurs.

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EXAMPLE: Pumping 10 Mbbl of product prior to stripping requires 5 hours for the batch to pass a given point. The same batch during stripping has its flow rate reduced by approximately half (flow rate is now 1 Mbbl not 2 Mbbl) which lengthens the time to 10 hours in this case.

13. Graphic Progress Chart

The graphic progress (Figure 1-4) chart shows the position of batches and their progress through the pipeline. The chart is prepared one day in advance for what is to be in the pipeline at the beginning of the new pumping day and what is scheduled to be pumped into the pipeline on the new day. The chart is constructed primarily the same way that the monthly schedule is with the exception that it covers a 24-hour period.

a. The linefill terminal and pump stations are shown on the horizontal axis (across the top). The linefill is shown to the right of the midpoint (midpoint is located at base terminal).

b. The scheduled input is shown to the left of midpoint beginning at the point for input at the base terminal and from other locations at the scheduled input time, shown to the left of the input location.

c. All product batch inputs are represented by dotted lines. The dotted lines represent the point where the product crosses the stating location. Once the batch crosses this location, it is represented by a solid line.

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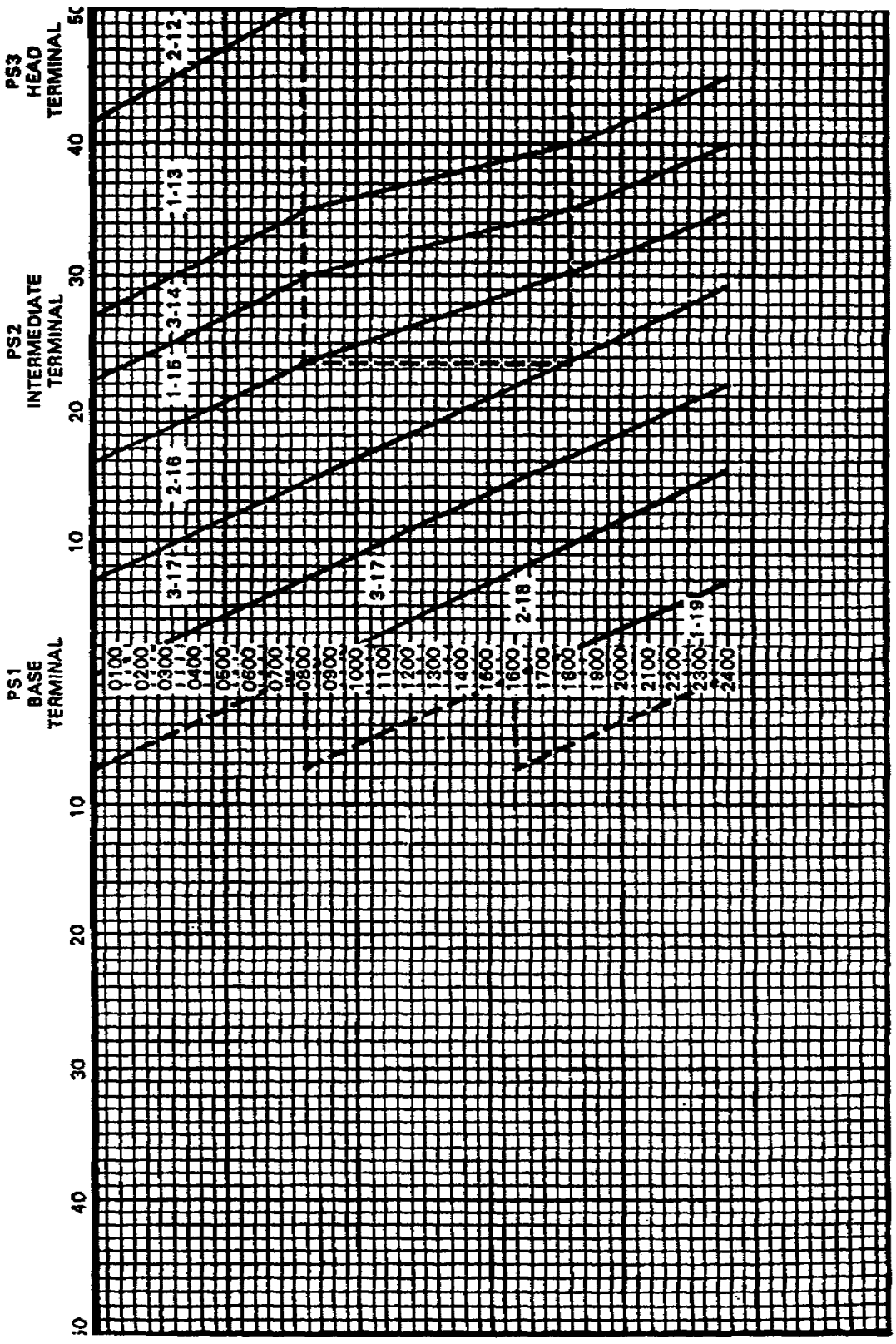

Figure 1-4. Graphic progress chart

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14. Daily Pumping Order.

There is no prescribed format for a pumping order; however, it should be written in such a manner that the personnel working on the pipeline understand exactly what is supposed to happen. See Figure 1-5 for a sample. Here are a few general guidelines to use when preparing the order:

a. Show the time in chronological sequence; for example, 0001 through 2400; give definite times for specific actions; show the arrival times of the interfaces.

b. Show each terminal from base (first) terminal through intermediate terminals and any pump stations to the head (last) terminal.

c. Give specific orders for the respective terminals and stations. State orders briefly but clearly.

d. Designate all products by batch numbers.

e. Specify amounts of products to be handled and type of interface cuts.

f. Remember simplicity is the most important factor and is the key to success.

EXAMPLE: Daily Pumping Order:

Date: 3 Jul.

Base Terminal:

0001 -- begin pumping "Batch, 1-67, MOGAS into the pipeline for 3 hours" (total product for batch 1-67 = 6 Mbbl)

0300 -- begin pumping "Batch, 2-50, jet fuel into the pipeline for 7 hours" (total product for batch 2-50 = 7 Mbbl)

1000 -- begin pumping "Batch, 1-68, MOGAS, into the pipeline for 6 hours" (total product for batch 1-68 = 12 Mbbl)

1600 -- begin pumping "Batch, 3-52, diesel, into the pipeline for 4 hours" (total product for batch 3-52 = 8 Mbbl)

Intermediate Terminal:

0800 -- pipeline static from intermediate through to head terminal. Line static from 0800 through 2000.

0800 -- begin receiving "Batch, 2-49, jet fuel, into the terminal for 5 hours"

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1300 -- begin receiving "Bach, 1-66, MOGAS, into terminal for 4 hours"

1700 -- begin receiving "Batch, 3-56, diesel fuel, into terminal until shutdown at 2000"

Head Terminal:

0001 -- begin receiving "Batch, 1-62, MOGAS, into terminal for 4 hours"

0400 -- begin receiving "Batch, 3-54, diesel fuel, into terminal until shutdown at 0800"

Pump Stations:

0001 -- pump station #1, bring station on-line when suction pressure of 20 psi is received

Link -- remaining stations go on-line with 20 psi of suction pressure.

NOTE: All stations report time on-line, suction, and discharge pressure. Stations will report hourly IAW SOP.

0800 -- pump station #4, will go off-line; pump station #3, will go off-line due to high pressure, idle of pumps, IAW SOP for packed line condition.

NOTE: Report off-line time IAW SOP.

2000 -- pump stations #1 and 2 will go off-line IAW SOP for packed line condition.

NOTE 1: Product receipt/arrival time is approximate.

NOTE 2: Location will conduct line sampling 15 minutes prior to expected interface.

NOTE 3: Interface cuts and disposition is responsibility of the terminal commander if not directed by this order.

The orders to all locations on the pipeline are listed in the daily pumping order for going on-line and off-line. Local SOPs should detail procedures for operations.

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TIMES	LOCATION	DESIRED ACTION
0001	Base Terminal	Pump DF, batch 3-17, 8,000 barrels at 1,000 barrels per hours.
	Pump Station 1	Pump 8,000 barrels of DF at 1,000 barrels per hour.
	Pump Station 2	Pump JP-4, batch 2-16.
	Intermediate Terminal	No action.
	Pump Station 3	Pump DF, batch 3-14.
	Pump Station 4	Pump MOGAS, batch 1-13.
	Head Terminal	Receive JP-4, batch 2-12, at 1,000 barrels per hour.
0800	Base Terminal	Switch from DF, batch 1-17, to JP-4, batch 2-18, and pump 8,000 barrels.
	Pump Station 7	Monitor the passage of interface, the end of batch 3-17, and the front of batch 2-18. Report.
	Pump Station 2	Monitor the passage of interface, the end of batch 2-16, and the front of batch 3-17. Report.
	Intermediate Terminal	Prepare to receive JP-4, batch 2-16. Check passage of interface, end of batch 1-15, and front of batch of 2-16. At API gravity of JP-4 , open JP-4 tankage and strip 500 barrels of JP-4 for 10 hours.
	Pump Station 3	Monitor passage of interface, end batch 1-15, and front of batch 2-16. Report.
	Pump Station 4	Continue to pump MOGAS, batch 1-13.
	Head Terminal	Switch from JP-4, batch 2-3, to receive MOGAS, batch 1-13. Receive 5,000 barrels for hours. Interface will be taken into MOGAS tankage.
1600	Base Terminal	Switch from JP-4, batch 2-18, to MOGAS, and batch 1-19.
1800	Intermediate Terminal	Pump 8,000 barrels. Close JP-4 tankage at good API gravity for JP-4. Monitor passage of interface, end of batch 2-16, and front of batch 3-17. Report.
	Head Terminal	Start receiving MOGAS, batch 1-13, at 1,000 barrels per hour.

Figure 1-5. Sample format for daily pumping order

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PRACTICE EXERCISE

The following items will test your grasp of the material covered in this lesson. There is only one correct answer for each item. When you complete the exercise, check your answers with the answer key that follows. If you answer any item incorrectly, study again that part of the lesson which contains the portion involved.

1. Who is responsible for ensuring that daily pumping orders are relayed to the district dispatcher?

   A. The district dispatcher
   B. The shift dispatcher
   C. The petroleum specialist
   D. The chief dispatcher

2. Your commander wants to know what the safety level is using his guidance of 3 safety days. You know that based on last month's training exercise (July 19XX) you used 140 Mbbls of fuel. Today is the 1 August 19XX. What is the safety level for August 19XX?

   A. 11.5 Mbbls
   B. 12 Mbbls
   C. 13.5 Mbbls
   D. 15 Mbbls

3. What is true of a consumption graph?

   A. Issues and receipts are shown over a 36-hour period.
   B. The safety level is always based on 4 days of supply (average daily consumption).
   C. The allowance for vapor space is 5 percent of the total storage capacity.
   D. A solid line represents projected issues and receipts.

4. Given 120 Mbbls; what is the amount of vapor space?

   A. 6
   B. 24
   C. 60
   D. 2400

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5. Which of the following represents batch number 1-37-50?

   A. The 37th batch of MOGAS for the calendar year
   B. The 37th batch of MOGAS for the fiscal year, 50 Mbbls
   C. The 37 Mbbls and the 50th batch of MOGAS
   D. The 50th batch of MOGAS for the fiscal year

Questions 6 and 7. Situation:
You are setting up your fuel site. You currently have a flow rate of 1900 barrels per hour. Your interface will arrive at the pump station at 2043. Your interface will pass the pump station at 2130.

6. What is the size of the interface in barrels?

   A. .7916
   B. 1.4883
   C. 791.6
   D. 1488.3

7. What would your answer be in Mike barrels?

   A. .8 Mbbls
   B. 1.5 Mbbls
   C. 2.5 Mbbls
   D. 792 Mbbls

8. What must a pumping order include?

   A. Shift supervisors
   B. Terminal capacity
   C. API gravity of product
   D. Arrival times of the interfaces

9. What is the purpose of a graphic progress chart?

   A. To indicate what is expected to take place 1 month in advance
   B. The same as the monthly schedule except it represents a 10-hour period
   C. To provide a means of visualizing the batch locations as they travel through the pipeline
   D. To indicate what is expected to take place 24 days in advance

10. What is the most important fact to remember about pumping orders?

    A. Simplicity
    B. To begin with shutdown instructions
    C. To follow the prescribed format
    D. To leave pumping in an idle mode

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LESSON

PRACTICE EXERCISE

ANSWER KEY AND FEEDBACK

Item Correct Answer and Feedback

1. D. The chief dispatcher.
   Relay of daily pumping orders to the district dispatchers. (page 4, para 2b(8).

2. C. 13.5.
   See example under para 1l(e). (page 11, para 11(e).

3. C. The allowance for vapor space is 5 percent of the total storage capacity. Allowance for vapor space is calculated at 5 percent of the total available storage capacity.
   (page 11, para 11 (b).

4. A. 6.
   See example under para l(b). (page 11, para 11(b).

5. B. The 37"' batch of MOGAS for the fiscal year, 50 mbbls.
   See example under para 7(c). (page 5, para 7(a), (b),(c).

6. D. 1488.3.
   See example under part 9. (page 8, para 9).

7. B. 1.5
   See example under para 9. (page 8, para 10(a).

8. D. Arrival times of the interfaces.
   .....when preparing the pumping order: .....; show the arrival times of the interfaces.
   (page 16, para 14).

9. C. To provide a means of visualizing the batch locations as they travel through the pipeline. The graphic progress (Figure 1-4) chart shows the position of batches and their progress through the pipeline. (page 14, para 13).

10. A. Simplicity.
    Remember simplicity is the most important factor and is the key to success. (age 16, para 14(f).