USER'S MANUAL

COMPUTER APPLICATION PROGRAM

OPTIMUM

FOR BIOFILTER DESIGN OF SOFT CRAB AND CRAWFISH SHEDDING SYSTEMS

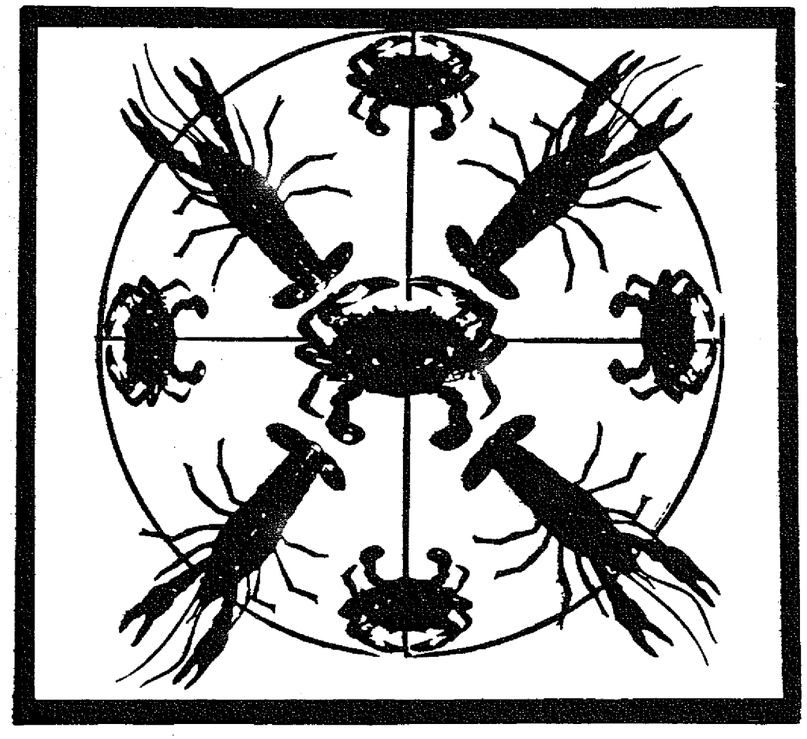

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TABLE OF CONTENTS

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1. INTRODUCTION

With the increased interest in recirculating shedding systems for both blue crabs and red swamp crawfish, system designs are in great demand. Because of the complexity of the biological filter, the majority of time spent on system design has been devoted to designing the filters. Filter design without the aid of a computer could take as long as 20 man-hours. The program OPTIMUM was developed to aid in designing filter systems, thus reducing the time and effort needed for designing shedding systems. This program employs the design parameters and procedures presented in the manuals, Design of Recirculating Soft Crawfish Shedding Systems and Design of Blue Crab Recirculating Blue Crab Shedding Systems by Ronald F. Malone and Daniel G. Burden. These two design manuals are available from the Louisiana Sea Grant College Program.

Program OPTIMUM accommodates shedding systems for both unfed blue crabs and fed crawfish. The user may choose any of three system configurations supported by this program for filter design. Once into the program, one important feature to note is the last line on the screen. This line, the Menu Line, shows what commands are available at that point in the program. The commands are prefixed with one of the following: F1, F2, F3, F4, F5, SPACE, ESC. The prefixes that begin with F refer to the function keys, the 10 keys on the far left of the keyboard or the 10 (sometimes 12) keys on the very top of the keyboard. SPACE simply refers to the space bar and always means "continue," while ESC refers to the escape key and always means "quit the program."

This manual is designed as a guide for learning program OPTIMUM, as well as a reference after the user is familiar with the program. Section 3 describes step by step how to run the program; the following sections provide details of advanced functions. The manual accompanies the program provided on the distribution diskette. It is not a substitute for the software.

2. GETTING STARTED

The distribution diskette contains two files: OPTIMUM.EXE and AUTOEXEC.BAT. OPTIMUM.EXE is the filter design program and AUTOEXEC.BAT is a program that automatically runs OPTIMUM when you reset or turn on your computer. This file is not required to run the program, but is included for your convenience.

Program OPTIMUM was written to run on IBM PC and compatible computers using DOS 2.0 or later versions. If your computer has graphics capabilities, OPTIMUM will depict the three system configurations supported

by this program. Otherwise, it will display only the name of each system. The same is true for the printout. If a graphics printer is available, then the selected system configuration is depicted graphically in the printout. Otherwise, only the name of the system is printed. The program requires 256 kilobytes of memory and only one disk drive is needed.

It is advisable to make a backup copy of the distribution diskette. The backup diskette should contain the DOS system files (a bootable disk). For information on how to do this, refer to your DOS User's Manual. Once a backup is made, you are ready to learn how to design filters.

To start the program automatically, make sure that the diskette containing the program also contains the AUTOEXEC.BAT file and the system files. Place the diskette into drive A and turn on the computer. If the computer is already on, simply place the diskette in the A drive and type A:OPTIMUM and then press RETURN. At this point, the A drive should become active, thus loading and running the program.

3. STEPPING THROUGH THE PROGRAM

This section is designed to acquaint you with the basic operation of program OPTIMUM by taking you step by step through a sample filter design. Once you have worked through this section, you will be able to use the program to help you design your system, using sections 4 through 12 as needed for reference.

If program OPTIMUM is not currently running on your computer, load the program as described in the previous section. Once the program is running, the first thing you will see is the Copyright Screen. This screen contains the Louisiana Sea Grant College Program logo and a brief copyright statement, and will remain for about 10 seconds or until you press the space bar, moving on to the Introduction Screen. The top line of the Introduction Screen shows the program name and version followed by the authors' names. The main text briefly describes the program's functions and operation. After reading the screen, press SPACE to continue.

The next screen is the Initial Selection Menu. Notice the bottom line of the screen, which indicates the available functions on this screen. The first thing that must be entered is the number of pounds to be supported by the recirculating system. Enter 1000, then press RETURN. Next, notice that the words "Fed Crawfish" and "Square Cross-Section" are highlighted. This signifies that these are the chosen species and filter geometry, respectively. For this example, we will use these default values, so simply press SPACE to continue.

The next step is to select a system configuration. For this example, we will be using System 3. If your computer has graphics capabilities, then the next screen will show a schematic of System 1. If not, then the next screen will list the three recirculating system configurations supported by this program and prompt you to decide which system you desire. If this is the case, when the selection screen appears, simply press the F3 key to select System 3. If your computer does support graphics, press SPACE twice, and a schematic of System 3 will appear on the screen. At this point, press 'S' to select this system.

Once the system configuration has been selected, the "System Summary With Suggested Filter Sizing" screen appears. This is the output screen with the filter sizing information needed for a 1000-pound crawfish shedding system. The suggested filters for this system are one fluidized bed with 16-inch sides and one upflow sand filter with 23-inch sides. Notice that the actual capacity of the system is 1022 pounds. This figure is obtained by rounding the sizes of the filters to the nearest inch. A more detailed explanation of the information on this screen is given in Section 8. To obtain a printout of this sample design, press the F1 key. Now you are finished with your first filter design. To restart the program, press F5; to exit the program, press ESC. When exiting the program, a final screen will appear providing information on the design manuals used to write this program.

4. ENTERING NUMBER OF POUNDS IN SYSTEM

Enter the number of pounds that you are planning to hold in your shedding system on the Initial Selection Menu. When the program first runs, the blank spaces that follow the "Enter pounds of animals then hit [RET]" prompt are blinking to indicate that the number of pounds must be entered before you continue. If you wish to change the number of pounds you have entered before leaving the Initial Selection Menu, press the F1 key. If you wish to change the pounds and are not at the Initial Selection Menu, then continue with the program until you reach the "System Summary with Suggested Filter Sizing" screen and press F5. This will restart the program, returning you to the Initial Selection Menu where you can press F1 to change the pounds.

When you are working with a crawfish shedding system, it is helpful to know that the standard 3' x 8' tray holds 24 pounds of crawfish (one pound per square foot). When working with crabs, you should know that there are approximately four crabs to a pound. Therefore, 4000 crabs can be held in a 1000-pound system.

5. SELECTING A SPECIES

Species selection is also made on the Initial Selection Menu. The program automatically selects crawfish. If you wish to change this, press the F2 key to select crabs. Pressing F2 again will reselect crawfish. As with the pounds of animals, if you wish to change the species and are not on the Initial Selection Menu, continue to the "System Summary with Suggested Filter Sizing" screen and press F5 to restart the program and return to the Initial Selection Menu. At this point, press F2 until you have selected the species you desire.

You may note that crawfish systems demand larger filters than crab systems with the same capacity. This program is designed to handle fed crawfish and unfed crab shedding systems. The waste produced by the fed crawfish, along with the uneaten food that deteriorates in the system, demands that fed crawfish systems have larger filters than unfed crab systems. If you are planning to have a fed crab system, this program is not applicable.

6. SELECTING FILTER GEOMETRY

Selecting the filter geometry to be used is the final decision made on the Initial Selection Menu. The default filter geometry is square. This can be changed by pressing F3 once to select a round filter. Each successive time the F3 key is pressed, the selected filter geometry will change. Again, if you wish to change the filter geometry but are not on the Initial Selection Menu, continue to the "System Summary with Suggested Filter Sizing" screen and press F5 to restart the program and return to the Initial Selection Menu, where you can press F3 until you reach the desired filter geometry.

A round, cross-sectioned design is recommended for pressurized filters. If you select square cross-sections and pressurized filters (System 2), a screen will appear warning that square cross-sections are not recommended with pressurized filters. You may then choose to have round pressurized filters with square unpressurized filters (F1), to make all filters round (F2), or to continue with no changes (SPACE). If you need more information on selecting filter geometry, refer to the design manuals listed in Section 1.

7. SELECTING A SYSTEM CONFIGURATION

After all decisions have been made on the Initial Selection Menu, simply press the space bar to initiate the selection of the system configuration to be modeled. If your computer has graphics capabilities, the next screen will list the three recirculating system configurations supported by this program and prompt you to decide which system you desire. For nongraphical computers,

press the function key corresponding to the system desired (i.e., F1 for System 1, F2 for System 2, F3 for System 3). For graphical computers, press the space bar until the system you wish to model appears on the screen and then press "S" to select that system. Once a system has been selected, the program will continue to the output screen

If you desire to change the system after you have selected one, press F5 on the "System Summary with Suggested Filter Sizing" screen to restart the program, press SPACE to continue past the Initial Selection Menu (assuming you don't want to change anything on that menu), and select the desired system as described above. To aid in choosing a system configuration, the following table delineates some advantages and disadvantages of each system.

Advantages and Disadvantages of Each System

System	Advantages	Disadvantages
System 1	High solids processing capabilities	Limited carrying capacity
	Uses small recirculating pump	Large expansion pump required
	Filters are accessible	
System 2	Low continuous pumping requirements	High construction cost
	High animal loading capacity	
System 3	Filters are accessible	Moderate energy costs associated with large flows
	High animal loading capacity	

8. THE OUTPUT SCREENS

There are two output screens available that give vital information concerning filter sizing and system information. The default screen is the one titled "System Summary with Suggested Filter Sizing." Additional, more

specific, information is available on the secondary output screen entitled "Detailed Design Dimensions and Corrected Flows." This secondary output screen is obtained by pressing F2 while on the default output screen.

The default screen highlights the choices you have made in designing your system (species, total capacity, system configuration, and filter geometry). Additionally, this screen displays design information needed to build the filters. The grain size and the depth of the filter media are constant while the number and dimensions of the filters, the actual total capacity, and the recirculation flow required are computed by the program.

The secondary screen (details screen) is an in-depth look at each filter. This screen provides information such as the volume of media in each filter and the flow through each filter at normal and expansion flow. All information on this is computed by the program unless the dimensions and number of filters are specified by the user (see Section 10).

9. CHANGING CONSTANTS

Several parameters in this program are fixed. These include constants such as the flowrate required to expand upflow sand filters and fluidized bed filters, the normal flux rate for upflow sand filters, the flushing rate to the holding trays, the packed bed depth in the filters, and the loading capacities of the filters. These constants are the same as those presented in the design manuals and are recommended for use in your design.

However, should you desire, several of the constants can be changed by pressing F3 from the default output screen. After pressing F3, a screen will appear listing the constants for the selected species. To change a value, press the letter corresponding to that value, enter the new value, and press the return key. The constants can be changed only within a range, and if a new value is out of range for a constant, a message will appear expressing this and prompting for a new value. Once you are finished making the desired changes, press SPACE to return to the output screen.

The values on the output screen will be revised to reflect the changes made. To reset the constants, restart the program by pressing F5 from the "System Summary with Suggested Filter Sizing" screen. If a constant is changed, a message will appear on the printout stating this.

10. MANUAL SELECTION OF NUMBER AND SIZE OF FILTERS

Program OPTIMUM automatically determines the number and sizes of filters needed for optimum performance. However, if only a certain size of

filter is available or if you are curious to know the impact of a different filter size or number, an option exists allowing the user to manually set the number or size of a particular filter. By pressing F4 from the "System Summary with Suggested Filter Sizing" screen, a filter-sizing window appears in the upper left of the screen. At this point, you can change the number or size of any filter.

Select the letter corresponding to the parameter to be changed, enter the new value, and press the return key. Once a new value has been entered, the output screen will instantly be updated to show the effects of the new values. Even though a manually selected filter configuration may support the capacity you desire, the filter configuration selected by the program will be the most efficient. Once finished with all changes, return to the output screen by pressing SPACE.

To reset the filter parameters to their original values, restart the program by pressing F5 from the output screen, press SPACE at the Initial Selection Menu, and select the system configuration desired. The output screen will reappear with the computer-generated values.

11. GETTING A PRINTOUT

By pressing F1 at the "System Summary with Suggested Filter Sizing" screen, the program will print out the information on the default output screen along with additional information, including flow through each filter, required water volume, required total tray area, required flow to trays, minimum expansion flow, and minimum circulation flow. In addition, the program will ask if you wish to have the graphical schematic of the system configuration printed out. Press "Y" (yes) if you want the graphical printout or "N" (no) if you do not. If your printer is not capable of printing graphics, you must answer "no" to this question. Program OPTIMUM will then ask if you would like to have a printout of the details screen and constants used. Again, press "Y" or "N".

At the bottom of the first page of the printout, a "Warnings List" will be printed if any parameters exceed recommended values. If a warning is encountered, refer to one of the design manuals to determine the appropriate course of action.

12. SPECIAL MESSAGES AND PROGRAM ENHANCEMENT

Program OPTIMUM was written and tested as part of an extensive research effort at Louisiana State University. Often, however, oversights may cause program errors. Provisions have been made to correct this. If at any

time while you are running program OPTIMUM, a screen appears stating that an error has occurred in the program, please follow the instruction given on the screen so that the error can be fixed with the least amount of delay.

This program was written to be as user-friendly as possible. If you find you are struggling with the program or would like to suggest an enhancement, please write to the Louisiana Sea Grant College Program at Louisiana State University in Baton Rouge with the information. All input will be reviewed and implemented when feasible. The output from this program does not constitute a final design and results should be reviewed by qualified personnel.