



Shell Oil Company
Interoffice Memorandum

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SUBJECT: D-D@ SOIL FUMIGANT OPTIONS

The following summary is provided to form a basis for consideration of options for future conduct of the D-D Soil Fumigant business. The final section on options includes a brief review of the base option and the factors to be considered in the primary decision regarding the future conduct of this business. The remainder of the discussion addresses alternatives which occur following the initial decision to continue or exit.

BACKGROUND

D-D, as marketed by Shell Chemical Company, is a mixture of short chain (C_3) chlorinated hydrocarbons. It is the oldest of the present Agricultural Chemicals Business Center products having been in use in excess of 30 years. D-D and competitive products similar to D-D are used by farmers prior to planting to control nematodes, microscopic worms that attack plant roots and which are particularly damaging to root crops such as sugar beets, potatoes and carrots.

The most biologically active component of D-D is 1,3-dichloropropene(1,3-D). The 1,3-D is approximately equal parts cis and trans isomers which in total amounts to slightly more than 50% of the technical D-D by weight. The other major component (ca. 25% by weight) of D-D is 1,2-dichloropropane(1,2-D), a much less reactive molecule. The remainder of the D-D is a mixture of 3,3-dichloropropene, 2,3-dichloropropene and related chlorinated hydrocarbons which are also less active than the 1,3-D. D-D is labeled as "D-D Soil Fumigant 100% Active Ingredients" with the Environmental Protection Agency.

Early in the evolution of the soil fumigant business, Dow marketed Vidden-D, a soil fumigant with essentially the same composition as Shell's D-D. In the late 1960s, Dow replaced Vidden-D with Telone, which contained approximately 70% by weight 1,3-D. In the 1970s, Telone was in turn replaced by Telone II, which contains about 92% 1,3-D. Dow is the

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only other U.S. producer of this type of soil fumigant. Outside the U.S. Dow, Shell International Chemical Company, several Shell operating companies and several Japanese firms manufacture and/or market 1,3-D type soil fumigants. Dow reportedly uses both staged chlorination and distillation to achieve the higher 1,3-D concentrations and feeds the residuals from distillation into their chlorinated solvents processes.

MARKETING/SALES

D-D sales average ca. 3.5 million gallons (ca. 35MM lbs.) per year. D-D is produced as a co-product of allyl chloride production at Norco and Deer Park. Through the use of contract tankage and occasional spot purchases from SICC, a long-term balance has been maintained between sales demand for D-D and production from the allyl chloride units.

The principle markets for D-D are in the Western U.S.A. for use on potatoes, sugar beets, trees and vines, and vegetables. Smaller markets for soil fumigants exist in Florida (vegetables), Texas (vegetables), Michigan (potatoes and vegetables), New York (Long Island potatoes) and the Carolinas (tobacco). The future marketing forecast for D-D consumption indicates there is little reason to expect significant changes upward or downward in the demand. No alternative/competitive products appear to be under development and little change is forecast in the acreage planted to the principle crops on which these soil fumigant types are used. Assuming continued availability of 1,3-D soil fumigants, no major change is forecast to occur in the number of acres which are infested with nematodes. The end-use markets can be defined as stable, mature and secure from replacement product competition through the LRP time frame.

PROFITABILITY

In 1981, the D-D business yielded a CIBT, adjusted for out-of-pocket expenses, of approximately \$6.3MM. When combined with a savings of \$3.2MM from cost avoidance for disposal in the allyl chloride operation, the total benefit to Shell was approximately \$9.5MM at the CIBT level.

Note: CIBT = Cash Income Before Taxes

Future contribution and CIBT are forecast to remain at or near the same level as in 1981 on a constant dollar basis. Future profitability forecasts (STOP/SES/LRP) take into consideration the fact that \$8MM to \$10MM in research expense for toxicology, environmental and other types of studies will be required over the next 3 to 10 years beginning in 1983 and peaking at the point when the EPA calls for the reregistration of D-D Soil Fumigant. The current best estimate for D-D reregistration call is the 1985 to 1987 time frame unless some specific event triggers an earlier decision.

HEALTH, SAFETY AND ENVIRONMENT

D-D is labeled for application to bare ground at rates up to a maximum of 60 gallons per acre on land intended for crops other than trees and vines