ETM
ENGINEERING & TECHNOLOGY MANAGEMENT

Title: Determination of an Annual Production Plan for a Multiplant Operation

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Abstract: A linear programming model is developed to maximize profits of an international corporation which faces a problem of scheduling available resources to produce a more competitive product. The company produces mobile industrial equipment and has manufacturing plants in Europe and the U.S. It serves the market in both areas. A plant of limited capacity is available in each area. The company prefers to use existing plants to exploit unused capacity, rather than to build a new factory. The alternatives are to dual-source the product, or choose a plant for worldwide distribution.

DETERMINATION OF AN ANNUAL PRODUCTION
PLAN FOR A MULTIPLANT OPERATION

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EMP - P8803

EXECUTIVE SUMMARY

The project involves an international corporation that produces mobile industrial equipment. The company has two manufacturing plants in Europe and in the United States. It also serves the market in both areas.

In its venture to produce new products, the company faces production problem of scheduling the available resources to produce a more competitive model. A manufacturing plant of limited capacity is available in each area. Although it is possible to build a new factory, the company prefers to use an existing plant to exploit unused capacity and maintain employment. The altertnatives are to dual-source the product, or choose a plant for worldwide distribution.

The problem is a realistic one in that the data was based on actual information provided by the company. The team developed a linear programing model to optimize profitability. The LINDO linear optimization was utilized to solve the model. Likewise, LINDO was used to provide a sensitivity analysis that would define the effect of different exchange rates on the production planning decision.

The team concludes that profit objective should be in the order of $ 2.5 million. Production plan should be based on production for local markets in both areas, except in the third and fourth quarters. The former 13 units produced in U.S.A. should be exported to Europe and the latter 17 units to the United States. Demand on both markets is expected to be

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satisfied completely, and plant capacity to be utilized fully.

This report has been prepared to present the details of a project undertaken in partial fulfillment of the requirements of EAS 543.

EAS 543 - SPRING 1988
GROUP PROJECT MEMBERS

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INTRODUCTION

An international manufacturer of industrial equipment is
faced with a classic production planning problem: the
scheduling of available resources to produce a new product.
The company serves two market areas, one in the United
States and the other in Europe. One manufacturing plant of
limited capacity is available in each marketing area to
produce the product.

The problem is based on an actual situation. Detailed input
information is presented in the following section. That
information includes plant overhead and labor rates, product
assembly time, cost of materials, shipping and duty rates,
and plant capacity limitations with and without overtime.
The market size for this particular product is well
established. Specialists in each market area have developed
demand curves relating sales price and unit volume.

The new product of interest replaces an older less
competitive model. For the purposes of this evaluation, the
engineering costs to develop the new product are considered
sunk costs, as are manufacturing investments in plant and
equipment. These costs would have to considered in a
broader analysis of return on investment and overall product
success.

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The primary objective of this evaluation is to optimize
corporate profitability. A sensitivity analysis of
particular interest is to define the impact of different
exchange rates on the production planning decision. This
is a topical issue of critical importance to international
corporations because of the recent history of exchange rate
fluxuations.

As a final note, the term project assignment was "To apply
linear optimizaton and methodoly to a complex problem,
preferably chosen from an actual situation." Inspection of
the input information reveals that the problem is complex,
and financial ramifications for the company and decision
maker are significant. However, upon further study, it was
discovered that the objective function involved a non-
linear relationship relative to product price. This led to
a separate study of product demand and price elasticity.
Price level was subsequently optimized -- outside of the
linear programming model -- by application of eonomic
theory. Results of the price level optimization are
included in the Problem Solution section of this report. It
is included because it was part of the learning process for
the project team, and it is representative of a typical
problem solution phase that might exist in an actual
situation.

PROBLEM DESCRIPTION INFORMATION

One manufacturing plant is located in the United States and the other in Great Britain. All European costs are converted to U.S. dollars assuming an exchange rate of $1.90 to £1.00 (pound sterling). Some product components are purchased from companies in other European countries and Japan. These components represent a relatively small part of total product costs, and the impact of exchange rate fluxations on these costs will be ignored in the problem formulation.

1. LABOR COSTS INCLUDING PLANT OVERHEAD:
   - U.S.= $65 per standard hour, $72 per overtime hour.
   - Europe= $70 per standard hour, $77 per overtime hour.

2. ASSEMBLY TIME PER PRODUCT:
   92 hours at either location.

3. SHIPPING AND DUTY COSTS:
   - $1400 from Europe to U.S. with no duty.
   - $1400 from U.S. to Europe with a 1% duty on the manufacturing cost of the product.

4. COST OF PURCHASED ITEMS:

   $28,800 per product at either location. At current
   exchange rates there is cost parity between the U.S.
   Europe. However, this is subject to change in the
   future. The source of purchased items in terms of
   currency exposure is as follows:

   U.S. MANUFACTURE

   - 60% in $

   - 40% in £ -- no duty

   EUROPEAN MANUFACTURE

   - 60% in £

   - 40% in $ with a 1% additional import duty

   - Duty does not apply to items reexported to U.S.

5. TIME DELAY WHEN SHIPPING FROM ONE MARKET TO ANOTHER:

   - 2 month delay because product must be shipped in a
       container by a sea-going freighter.

   - Note: this effectively increases inventory costs.

6. TOTAL MARKET SIZE FOR THE PRODUCT:

   - U.S. = 1470 per year

   - Europe = 990 per year

7. MARKET PRICE TO SALES VOLUME RELATIONSHIP:

- U.S.= $51,000 net sales price yields 125 units sold

    $44,300 net sales price yields 195 units sold

- Europe= $54,000 net sales price yields 148 units sold

    $46,260 net sales price yields 197 units sold

- A linear relationship exists between net sales price and sales volume.

8. PLANT CAPACITY CONSTRAINTS:

PLANT CAPACITY - STANDARD HOURS						
		CONSTRAINT BY CALENDAR QUARTER				
PLANT	MEAS.	QUARTER-1	QUARTER-2	QUARTER-3	QUARTER-4	TOTAL
U.S.	HOURS	4,600	4,600	4,600	2,760	16,560
	UNITS	50	50	50	30	180
EUROPE	HOURS	4,140	4,140	1,840	5,330	15,450
	UNITS	45	45	20	57.93	167.93

PLANT CAPACITY - OVERTIME HOURS						
		CONSTRAINT BY CALENDAR QUARTER				
PLANT	MEAS.	QUARTER-1	QUARTER-2	QUARTER-3	QUARTER-4	TOTAL
U.S.	HOURS	700	700	500	250	2,150
	UNITS	7.61	7.61	5.43	2.72	23.37
EUROPE	HOURS	600	600	200	400	1,800
	UNITS	6.52	6.52	2.17	4.35	19.57

9. SEASONAL PRODUCT DEMAND BY CALENDAR QUARTER:

STRENGTH OF PRODUCT DEMAND					
		RELATIVE DEMAND BY CALENDAR QUARTER			
MARKET	MEAS.	QUARTER-1	QUARTER-2	QUARTER-3	QUARTER-4
U.S.	UNITS	2.20	1.00	1.20	2.00
EUROPE	UNITS	1.67	1.00	1.17	1.50

EXAMPLE OF PRODUCT DEMAND USING AN ASSUMED TOTAL OF 160						
		RELATIVE DEMAND BY CALENDAR QUARTER				ASSUMED
MARKET	MEAS.	QUARTER-1	QUARTER-2	QUARTER-3	QUARTER-4	TOTAL
U.S.	UNITS	55	25	30	50	160
EUROPE	UNITS	50	30	35	45	160

10. MISCELLANEOUS FINANCIAL INFORMATION:

- Currency exchange rate assumption = $1.90/£1.00.
- Time value of money = 15% (capital could be invested elsewhere with this rate of return).
- Staff and non-manufacturing costs = $6,800 per unit.
- Net income tax rate = 35%.
- Cost of purchased items increase by 5% if annual quantity is below 150 units at either plant location.

PROBLEM SOLUTION

A. DETERMINATION OF OPTIMUM PRICE AND VOLUME

It was originally hoped to solve for price and volume
simultaneously, as part of the production planning linear
program. However, it was discovered that the objective
function involved a non-linear relationship relative to
product price. This led to the following study of product
demand and price optimization based upon application of
economic theory.

Marketing specialists developed demand curves for the U.S.
and Europe as described in the preceeding section.
Variables are defined as follows:

P = Price (net sales price)
P_{us} = Product price in the U.S.
P_e = Product price in Europe
Q = Quantity of finished units demanded
Q_{us} = Quantity demanded in U.S.
Q_e = Quantity demanded in Europe
Z = Profit
Z_{us} = Profit in the U.S.
Z_e = Profit in Europe
Z_t = Total profit = $Z_{us} + Z_e$
C = Manufacturing cost per unit
C_{us} = Manufacturing cost in U.S. per unit
C_e = Manufacturing cost in Europe per unit

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The following information was given for the U.S. market:

    (1) P=$51,000 and Q=125 units at one condition

    (2) P=$44,300 and Q=195 units at a second condition

    (3) There is a linear relationship between the two points described above.

The equation for a straight line can be solved using the general formula:

$$P_{us}-P_1 = ((P_2-P_1)/(Q_2-Q_1))(Q_{us}-Q_1)$$

Substition yields:

$$P_{us}-51,000=((44,300-51,000)/(195-125))(Q_{us}-125)$$

$$P_{us}-51,000=(-6700/70)(Q_{us}-125)$$

$$P_{us}-51,000=(-95.7)(Q_{us}-125)$$

$$P_{us}-51,000=-95.7Q_{us}+11,964$$

$$P_{us}=51,000+11,964-95.7Q_{us}$$

$$P_{us}=62,964-95.7Q_{us}$$

The straight line equation for Europe is solved similarly, resulting in the following:

$$P_e=77,378-158Q_e$$

The demand curves are depicted graphically below:

DEMAND CURVE

PRICE- $ vs. ANNUAL QUANTITY PER MARKETING AREA-UNITS

Legend: △ EUROPE, ⊟ USA
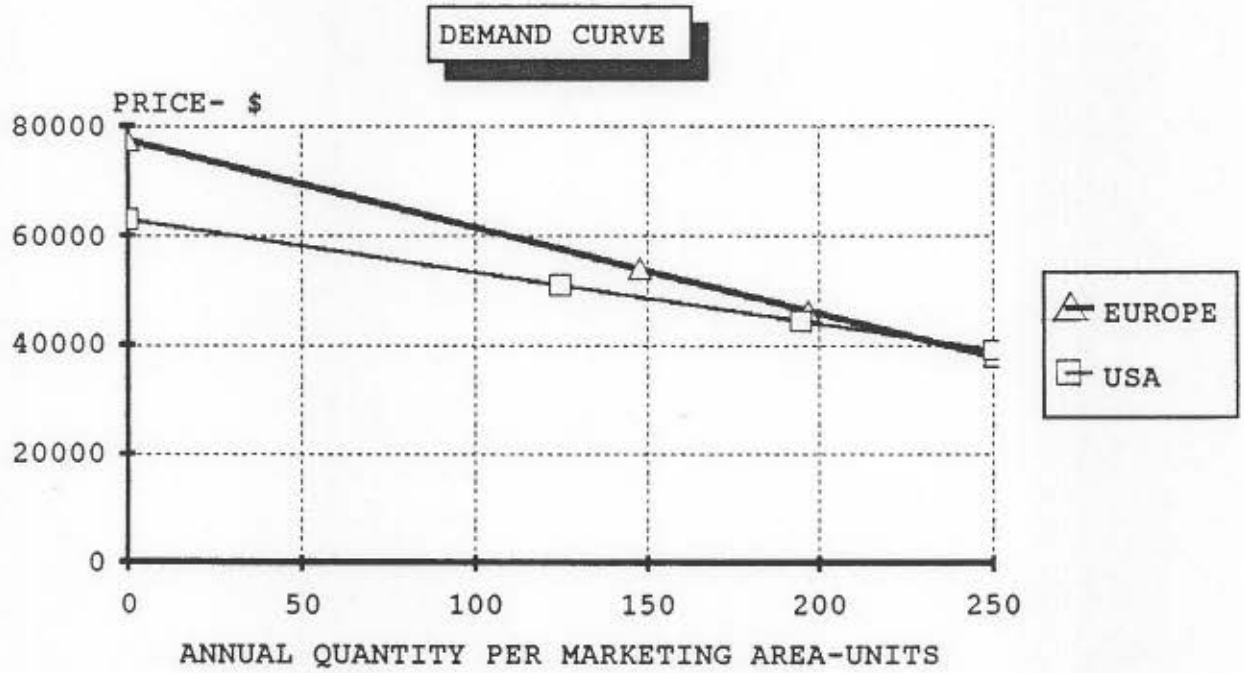
The manufacturing cost per unit consists of:

Cost of purchased items

+ cost of labor and overhead

+ cost of staff and non-manufacturing overhead

Recall that the cost of purchased items increases by 5% if the annual sales quantity is equal to or less than 150. Thus manufacturing costs in the U.S. for Q>150 are as follows:

$$C_{us} = \$28,800 + (92 \text{ assembly hours} (\$65/\text{hour})) + \$6,800$$

$$C_{us} = \$28,800 + \$5,980 + \$6,800$$

$$C_{us} = \$41,580$$

For Q⩽150:

$$C_{us} = \$30,240 + \$5,980 + \$6,800$$

$$C_{us} = \$43,020$$

Similarly for Europe:

$$C_e = \$42,040 \quad \text{for Q>150, and}$$

$$C_e = \$43,480 \quad \text{for Q⩽150}$$

Unit profitability relationships are shown graphically on the following page.

UNIT PROFITABILITY - U.S.

PROFIT-$

```
65,000 ┤
60,000 ┤
55,000 ┤
50,000 ┤
45,000 ┤
40,000 ┤
35,000 ┤
       └──┬────┬────┬────┬────┬────┬──
          0    50  100  150  200  250
```

QUANTITY, UNITS

— UNIT PRICE
▬ UNIT COST
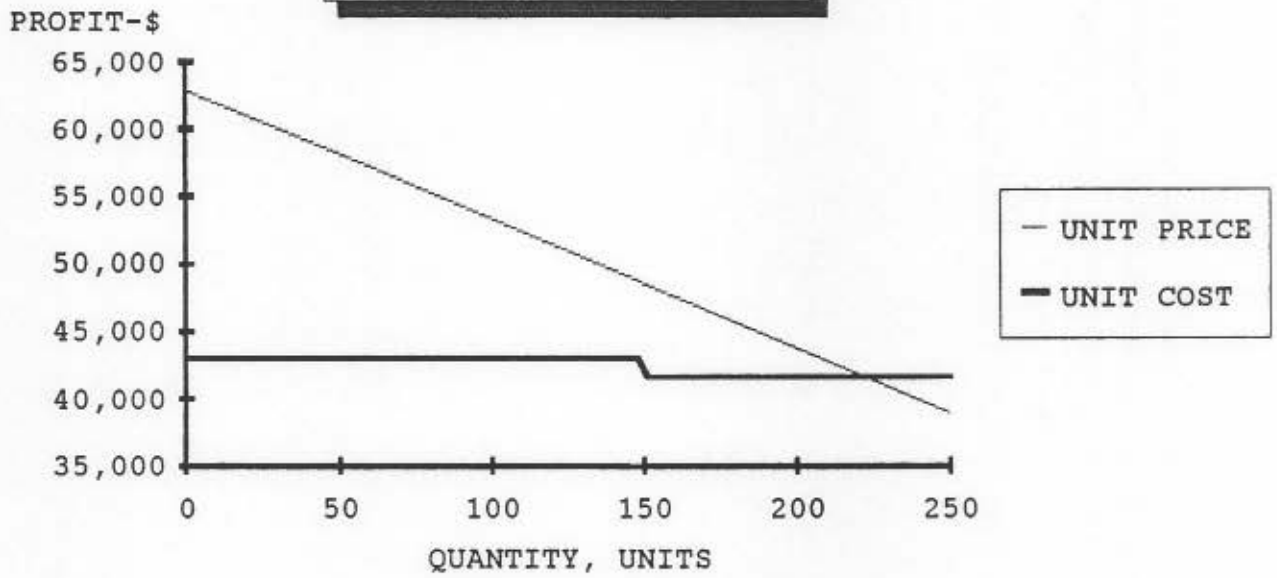
UNIT PROFITABILITY - EUROPE

PROFIT-$

```
80,000 ┤
70,000 ┤
60,000 ┤
50,000 ┤
40,000 ┤
30,000 ┤
       └──┬────┬────┬────┬────┬────┬──
          0    50  100  150  200  250
```

QUANTITY, UNITS

— UNIT PRICE
— UNIT COST

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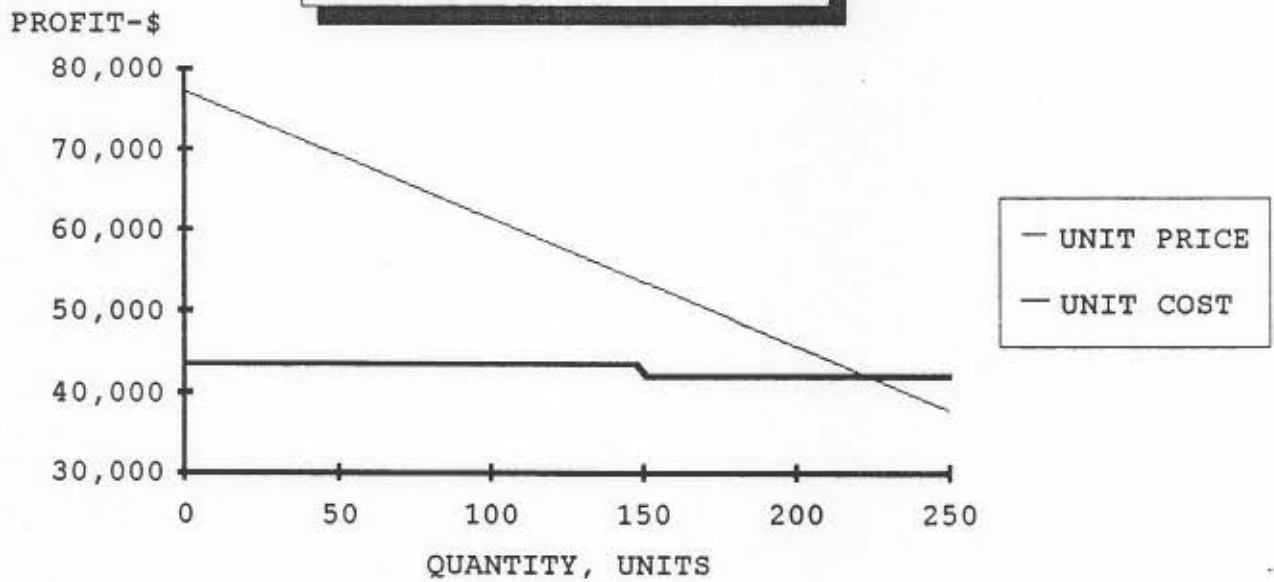
Profitability can now be computed using the relationship:

$$Z=(P-C)Q$$

Substitution yields for the U.S. marketplace for $Q>150$:

$$Z_{us}=((62,964-95.7Q_{us})-41,580)Q_{us}$$

$$Z_{us}=(21,384-95.7)Q_{us}$$

$$Z_{us}=21,384Q-95.7Q^2$$

for $Q\leq150$

$$Z_{us}=((62,964-95.7Q_{us})-43,020)Q_{us}$$

$$Z_{us}=19,944Q-95.7Q^2$$

Similarly, for the European marketplace:

for $Q>150$

$$Z_e=35,338Q-158Q^2$$

for $Q\leq150$

$$Z_e=33,898Q-158Q^2$$

Total profit can now be computed using the relationship:

$$Z_t=Z_{us}-Z_e$$

The profitability functions produce the parabolic curves shown on the following page.

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PROFITABILITY ANALYSIS

ANNUAL PROFIT-$

optimum: Q=104, Z=$2,855,500

Q=160, Z=$2,580,800

TOTAL

EUROPE

USA

ANNUAL QUANTITY PER MARKET AREA-UNITS
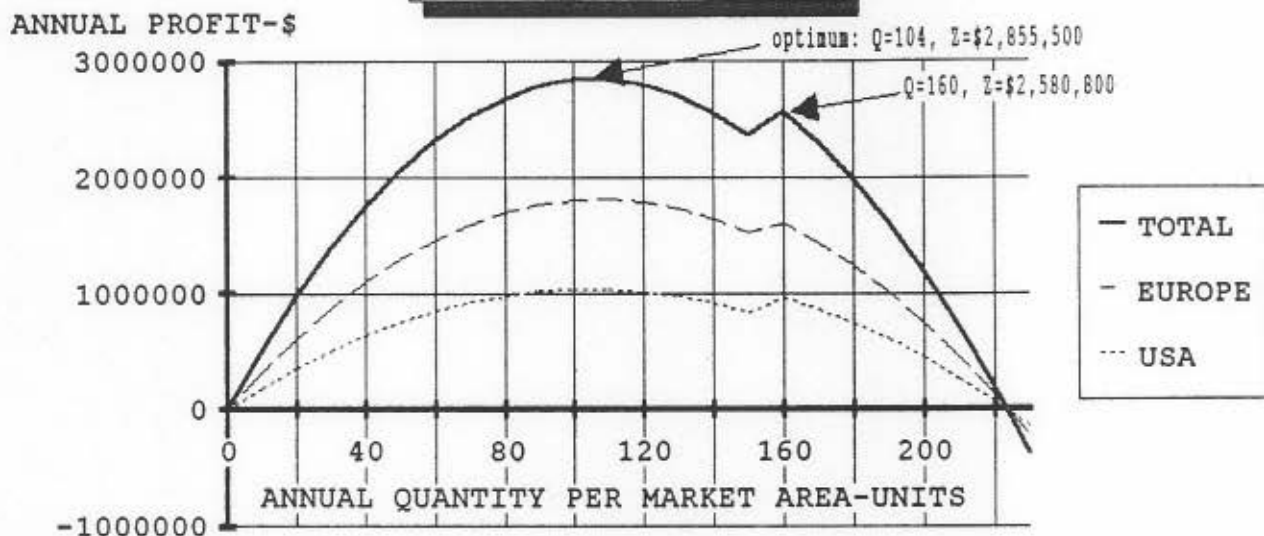
Optimum profitability can be determined by inspection of the above graph, or it can be determined mathmatically. For example, the optimum Z_{us} for Q≤150 is computed mathmatically as follows:

$$Z_{us}= 19,944Q-95.7Q^2$$

the slope of the curve is merely

$$\frac{dZ}{dQ} = 19,944-191.4Q$$

At the optimum condition, the slope is equal to zero. Solving for Q:

$$0=19,944-191.4Q$$

$$Q=19,944/191.4$$

$$Q=104$$

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At this quantity, the unit price can be computed from
the relationship:

$$P = 62,964 - 95.7Q$$
$$P = \$53,011$$

The theoretical optimum price and volume was then known for
both market areas. However, Project Team 2 decided at a
group meeting to select a price and volume different from
the optimum. It was decided to take advantage of the price
break that occurs when the quantity exceeds 150. An annual
quantity of 160 was selected per market area. This decision
was made for the following reasons: 1) market share
increases from 9% to 13%, 2) manufacturing plants would be
utilized at near full capacity, 3) lucrative spare parts
sales would be enhanced in the future, and 4) a general
feeling that higher volumes would be better for the long
term outlook of the company.

It was acknowledged that the higher unit volumes would
result in a lower annual profit in the short run. The
penalty is shown on the profitability analysis graph to be:

$$\$2,855,500 - \$2,580,800 = \$274,700$$

This completes the optimization of price and volume by application of economic theory. It is realized that certain simplifications were made -- for example, overtime costs and exchange rate variations were ignored. Nevertheless, it could be shown that those factors have little impact on the optimum condition, which is largly driven by competitive market pricing levels.

LINEAR PROGRAM MODEL FORMULATION

CALCULATION OF COST

I) Cost calculations (per unit) for product
   manufactured in USA and sold in USA market.

TYPE OF COST

	REGULAR TIME	OVERTIME
MATERIAL	$17280 + 6033L	$17280 + 6033L
LABOR	$5980	$6624
INDIRECT	$6800	$6800
TOTAL (EQUATION)	$30060 + 6033L	$30704 + 6033L

TOTAL

(L = $1.0)	$36093	$36733
(L = $1.6)	$39713	$40357
(L = $1.9)	$41522	$42166
(L = $2.2)	$43333	$43977

II) Cost calculations (per unit) for product
   manufactured in USA and sold in European market.

TYPE OF COST

	REGULAR TIME	OVERTIME
MATERIAL	$17280 + 6063L	$17280 + 6063L
LABOR	$5980	$6624
INDIRECT	$6800	$6800
SHIPPING	$1400	$1400
DUTY	$300	$300
INVENTORY	$751 + 151L	$751 + 151L
TOTAL (EQUATION)	$32511 + 6214L	$33155 + 6214L

TOTAL

	REGULAR TIME	OVERTIME
(L = $1.0)	$38725	$39369
(L = $1.6)	$42453	$43097
(L = $1.9)	$44317	$44961
(L = $2.2)	$46182	$46825

III) Cost calculations (per unit) for product
manufactured in Europe and sold in USA market.

TYPE OF COST

	REGULAR TIME	OVERTIME
MATERIAL	$11635 + 9094L	$11635 + 9094L
LABOR	3389L	3728L
INDIRECT	$6800	$6800
SHIPPING	$1400	$1400
INVENTORY	$460 + 312L	$460 + 312L
TOTAL (EQUATION)	$20295 + 12795L	$20295 + 13134L

TOTAL

(L = $1.0)	$33090	$33431
(L = $1.6)	$40767	$41309
(L = $1.9)	$44605	$45250
(L = $2.2)	$48444	$49190

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IV) Cost calculations (per unit) for product
manufactured in Europe and sold in European market.

TYPE OF COST

	REGULAR TIME	OVERTIME
MATERIAL	$11635 + 9094L	$11635 + 9094L
LABOR	3389L	3728L
INDIRECT	$6800	$6800
TOTAL (EQUATION)	$18435 + 12484L	$18435 + 12823L

TOTAL

(L = $1.0)	$30919	$31258
(L = $1.6)	$38409	$38952
(L = $1.9)	$42154	$42798
(L = $2.2)	$45900	$46646

CALCULATION OF PROFITS

(L = $1.0)

VARIABLE	PRICE	COST	PROFIT
X1	$52102	$33092	$19010
X2	$47650	$30919	$16731
X3	$52102	$33092	$19010
X4	$47650	$30919	$16731
X5	$52102	$33092	$19010
X6	$47650	$30919	$16731
X7	$52102	$33092	$19010
X8	$47650	$30919	$16731
X9	$52102	$36093	$16009
X10	$47650	$38725	$ 8925
X11	$52102	$36093	$16009
X12	$47650	$38725	$ 8925
X13	$52102	$36093	$16009
X14	$47650	$38725	$ 8925
X15	$52102	$36093	$16009
X16	$47650	$38725	$ 8925
X17	$52102	$33431	$18671
X18	$47650	$31258	$16392

VARIABLE	PRICE	COST	PROFIT
X19	$52102	$33431	$18671
X20	$47650	$31321	$16392
X21	$52102	$33431	$18671
X22	$47650	$31321	$16392
X23	$52102	$33431	$18671
X24	$47650	$31321	$16392
X25	$52102	$36733	$15369
X26	$47650	$39369	$ 8281
X27	$52102	$36733	$15369
X28	$47650	$39369	$ 8281
X29	$52102	$36733	$15369
X30	$47650	$39369	$ 8281
X31	$52102	$36733	$15369
X32	$47650	$39369	$ 8281

CALCULATION OF PROFITS

(L = $1.6)

VARIABLE	PRICE	COST	PROFIT
X1	$52102	$40767	$11335
X2	$47650	$38409	$ 9241
X3	$52102	$40767	$11335
X4	$47650	$38409	$ 9241
X5	$52102	$40767	$11335
X6	$47650	$38409	$ 9241
X7	$52102	$40767	$11335
X8	$47650	$38409	$ 9241
X9	$52102	$39713	$12389
X10	$47650	$42453	$ 5197
X11	$52102	$39713	$12389
X12	$47650	$42453	$ 5197
X13	$52102	$39713	$12389
X14	$47650	$42453	$ 5197
X15	$52102	$39713	$12389
X16	$47650	$42453	$ 5197
X17	$52102	$41309	$10793
X18	$47650	$38952	$ 8698

PROFITS (CONT.) (L = $1.6)

VARIABLE	PRICE	COST	PROFIT
X19	$52102	$41309	$10793
X20	$47650	$38952	$ 8698
X21	$52102	$41309	$10793
X22	$47650	$38952	$ 8698
X23	$52102	$41309	$10793
X24	$47650	$38952	$ 8698
X25	$52102	$40357	$11745
X26	$47650	$43097	$ 4553
X27	$52102	$40357	$11745
X28	$47650	$43097	$ 4553
X29	$52102	$40357	$11745
X30	$47650	$43097	$ 4553
X31	$52102	$40357	$11745
X32	$47650	$43097	$ 4553

CALCULATION OF PROFITS

(L = $1.9)

VARIABLE	PRICE	COST	PROFIT
X1	$52102	$44608	$ 7494
X2	$47650	$42154	$ 5496
X3	$52102	$44608	$ 7494
X4	$47650	$42154	$ 5496
X5	$52102	$44608	$ 7494
X6	$47650	$42154	$ 5496
X7	$52102	$44608	$ 7494
X8	$47650	$42154	$ 5496
X9	$52102	$41522	$10580
X10	$47650	$44317	$ 3333
X11	$52102	$41522	$10580
X12	$47650	$44137	$ 3333
X13	$52102	$41522	$10580
X14	$47650	$44317	$ 3333
X15	$52102	$41522	$10580
X16	$47650	$44317	$ 3333
X17	$52102	$45250	$ 6852
X18	$47650	$42799	$ 4851

PROFITS (CONT.) (L = $1.9)

VARIABLE	PRICE	COST	PROFIT
X19	$52102	$45250	$ 6852
X20	$47650	$42799	$ 4851
X21	$52102	$45250	$ 6852
X22	$47650	$42799	$ 4851
X23	$52102	$45250	$ 6852
X24	$47650	$42799	$ 4851
X25	$52102	$42166	$ 9936
X26	$47650	$44961	$ 2689
X27	$52102	$42166	$ 9936
X28	$47650	$44961	$ 2689
X29	$52102	$42166	$ 9936
X30	$47650	$44961	$ 2689
X31	$52102	$42166	$ 9936
X32	$47650	$44961	$ 2689

CALCULATION OF PROFITS

$(L = \$2.2)$

VARIABLE	PRICE	COST	PROFIT
X1	$52102	$48444	$3658
X2	$47650	$45900	$1750
X3	$52102	$48444	$3658
X4	$47650	$45900	$1750
X5	$52102	$48444	$3658
X6	$47650	$45900	$1750
X7	$52102	$48444	$3658
X8	$47650	$45900	$1750
X9	$52102	$43333	$8769
X10	$47650	$46182	$1468
X11	$52102	$43333	$8769
X12	$47650	$46182	$1468
X13	$52102	$43333	$8769
X14	$47650	$46182	$1468
X15	$52102	$43333	$8769
X16	$47650	$46182	$1468
X17	$52102	$49190	$2912
X18	$47650	$46646	$1004

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PROFITS (CONT.) (L = $2.2)

VARIABLE	PRICE	COST	PROFIT
X19	$52102	$49190	$2912
X20	$47650	$46646	$1004
X21	$52102	$49190	$2912
X22	$47650	$46646	$1004
X23	$52102	$49190	$2912
X24	$47650	$46646	$1004
X25	$52102	$43977	$8125
X26	$47650	$46826	$ 824
X27	$52102	$43977	$8125
X28	$47650	$46826	$ 824
X29	$52102	$43977	$8125
X30	$47650	$46826	$ 824
X31	$52102	$43977	$8125
X32	$47650	$46826	$ 824

DECISION VARIABLES - DEFINITION OF TERMS

VARI-ABLE	PLANT LOCATION				MARKET LOCATION							
	USA		EUROPE		EUROPE				USA			
	REG. TIME	OVER TIME	REG. TIME	OVER TIME	CALENDAR QUARTER				CALENDAR QUARTER			
					I	II	III	IV	I	II	III	IV
X1			▓						▓			
X2			▓		▓							
X3			▓							▓		
X4			▓			▓						
X5			▓								▓	
X6			▓				▓					
X7			▓									▓
X8			▓					▓				
X9	▓								▓			
X10	▓				▓							
X11	▓									▓		
X12	▓					▓						
X13	▓										▓	
X14	▓						▓					
X15	▓											▓
X16	▓							▓				
X17				▓					▓			
X18				▓	▓							
X19				▓						▓		
X20				▓		▓						
X21				▓							▓	
X22				▓			▓					
X23				▓								▓
X24				▓				▓				
X25		▓							▓			
X26		▓			▓							
X27		▓								▓		
X28		▓				▓						
X29		▓									▓	
X30		▓					▓					
X31		▓										▓
X32		▓						▓				

Example: X1 represents the quantity of units produced in Europe in the first quarter on regular time for the USA market in the first quarter.

MODEL FORMULATION

I) Objective Function

Maximize profits,

L = 1 (exchange rate)

Max Z = 19010 X1 + 16731 X2 + 19010 X3 + 16731 X4 +
        19010 X5 + 16731 X6 + 19010 X7 + 16731 X8 +
        16009 X9 + 8925 X10 + 16009 X11 + 8925 X12 +
        16009 X13 + 8925 X14 + 16009 X15 + 8925 X16 +
        18671 X17 + 16392 X18 + 18671 X19 + 16392 X20 +
        18671 X21 + 16392 X22 + 18671 X23 + 16392 X24 +
        15369 X25 + 8281 X26 + 15369 X27 + 8281 X28 +
        15369 X29 + 8281 X30 + 15369 X31 + 8281 X32

L = 1.6

Max Z = 11335 X1 + 9241 X2 + 11335 X3 + 9241 X4 +
        11335 X5 + 9241 X6 + 11335 X7 + 9241 X8 +
        12389 X9 + 5197 X10 + 12389 X11 + 5197 X12 +
        12389 X13 + 5197 X14 + 12389 X15 + 5197 X16 +
        10793 X17 + 8698 X18 + 10793 X19 + 8698 X20 +
        10793 X21 + 8698 X22 + 10793 X23 + 8698 X24 +
        11745 X25 + 4553 X26 + 11745 X27 + 4553 X28 +
        11745 X29 + 4553 X30 + 11745 X31 + 4553 X32

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Objective Function (Cont.)

L = 1.9

Max Z = 7494 X1 + 5496 X2 + 7494 X3 + 5496 X4 +

7494 X5 + 5496 X6 + 7494 X7 + 5496 X8 +

10580 X9 + 3333 X10 + 10580 X11 + 3333 X12 +

10580 X13 + 3333 X14 + 10580 X15 + 3333 X16 +

6852 X17 + 4851 X18 + 6852 X19 + 4851 X20 +

6852 X21 + 4851 X22 + 6852 X23 + 4851 X24 +

9936 X25 + 2689 X26 + 9936 X27 + 2689 X28 +

9936 X29 + 2689 X30 + 9936 X31 + 2689 X32

L = 2.2

Max Z = 3658 X1 + 1750 X2 + 3658 X3 + 1750 X4 +

3658 X5 + 1750 X6 + 3658 X7 + 1750 X8 +

8769 X9 + 1468 X10 + 8769 X11 + 1468 X12 +

8769 X13 + 1468 X14 + 8769 X15 + 1468 X16 +

2912 X17 + 1004 X18 + 2912 X19 + 1004 X20 +

2912 X21 + 1004 X22 + 2912 X23 + 1004 X24 +

8125 X25 + 824 X26 + 8125 X27 + 824 X28 +

8125 X29 + 824 X30 + 8125 X31 + 824 X32

II) Subject to

Demand Restrictions

- First Quarter in European market

$X2 + X10 + X18 + X26 = 50$

- First Quarter in USA market

$X1 + X9 + X17 + X25 = 55$

- Second Quarter in European market

$X4 + X12 + X20 + X28 = 30$

- Second Quarter in USA market

$X3 + X11 + X19 + X27 = 25$

- Third Quarter in European market

$X5 + X13 + X21 + X29 = 30$

- Third Quarter in USA market

$X6 + X14 + X22 + X30 = 35$

- Fourth Quarter in European market

$X8 + X16 + X24 + X32 = 45$

-Fourth Quarter in USA market

$X7 + X15 + X23 + X31 = 50$

Capacity Restrictions (Regular Time)

- First Quarter in European plant

92 X1 + 92 X2 <= 4140

- First Quarter in USA plant

92 X9 + 92 X10 <= 4600

- Second Quarter in European plant

92 X3 + 92 X4 <= 4140

- Second Quarter in USA plant

92 X11 + 92 X12 <= 4600

- Third Quarter in European plant

92 X5 + 92 X6 <= 1840

- Third Quarter in USA plant

92 X13 + 92 X14 <= 4600

- Fourth Quarter in European plant

92 X7 + 92 X8 <= 5330

- Fourth Quarter in USA plant

92 X15 + 92 X16 <= 2760

Capacity Restrictions (Overtime)

- First Quarter in European plant
92 X17 + 92 X18 <= 600

- First Quarter in USA plant
92 X25 + 92 X26 <= 700

- Second Quarter in European plant
92 X19 + 92 X20 <= 600

- Second Quarter in USA plant
92 X27 + 92 X28 <= 700

- Third Quarter in European plant
92 X21 + 92 X22 <= 200

- Third Quarter in USA plant
92 X29 + 92 X30 <= 500

- Fourth Quarter in European plant
92 X23 + 92 X24 <= 500

- Fourth Quarter in USA plant
92 X31 + 92 X32 <= 250

Nonnegativity Restrictions

Xi >= 0

DISCUSSION OF RESULTS

I) For the case of exchange rate L = $1.90, the maximum profit attainable would be $2,478,694 which would be the result of the following production program for the entire year.

Units Produced Using Regular Time

Plant Location	Variable	Value (Units)	Profit ($/Unit)	Total Profit
Europe	X2	45	5496	247,320
	X4	30	5496	164,880
	X6	20	5496	109,920
	X7	12.93	7494	96,897
	X8	45	5496	247,320
USA	X9	50	10580	529,000
	X11	25	10580	264,500
	X13	30	10580	317,400
	X14	12.82	3333	42,729
	X15	30	10580	317,400

Units Produced Using Overtime

Plant Location	Variable	Value (Units)	Profit ($/Unit)	Total Profit
Europe	X18	5	4851	24,755
	X22	2.17	4851	10,527
	X23	4.35	6852	29,806
USA	X25	5	9936	49,680
	X31	2.71	9936	26,922
	Total Profit			$2,478,694

The Variable column lists the basic variables that were in the last tableaux, where the optimum objective function was established.

The Value column represents the number of units of each basic variable that should be produced in order to generate the maximum feasible profit.

For example, X2 = 45 means that 45 units should be manufactured during regular time in the European plant to satisfy the European market during the first quarter of the year.

PRODUCTION PLAN RESULTS

FOR THE BASE CASE EXCHANGE RATE OF $1.90=£1.00
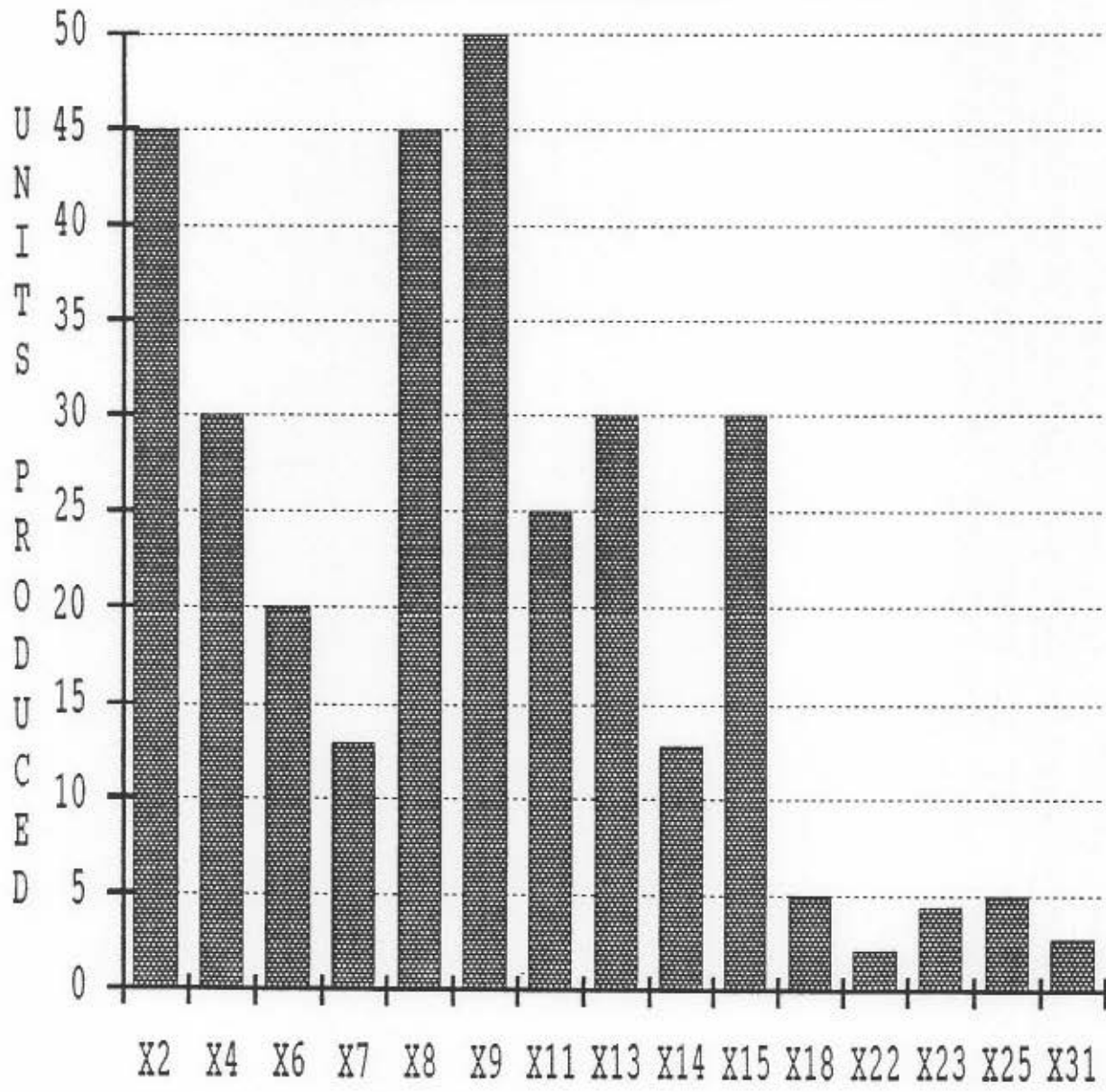
LINEAR PROGRAM VARIABLE

(ALL OTHER VARIABLES EQUAL ZERO)

II) Percentages of the production program distribution.

Percentage	Units to be Produced	Plant Location	Regular Time/ Overtime
47.81	153	Europe	Regular Time
46.25	148	USA	Regular Time
3.75	12	Europe	Overtime
2.19	7	USA	Overtime
100.00	320		

From the above table we conclude that about 94% of the units would be produced during regular time and about 6% would be produced during overtime. It is also evident that both plants would share the overall production program equally through the whole year.

Optimal Production Plan

Plant	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Total
Europe					
Regular Time	45	30	20	58	153
Overtime	5	0	2	4	11
USA					
Regular Time	50	25	43	30	148
Overtime	5	0	0	3	8
Total	105	55	65	95	320
	32.8%	17.2%	20.3%	29.7%	

PRODUCTION PLANNING CAPACITY DISTRIBUTION
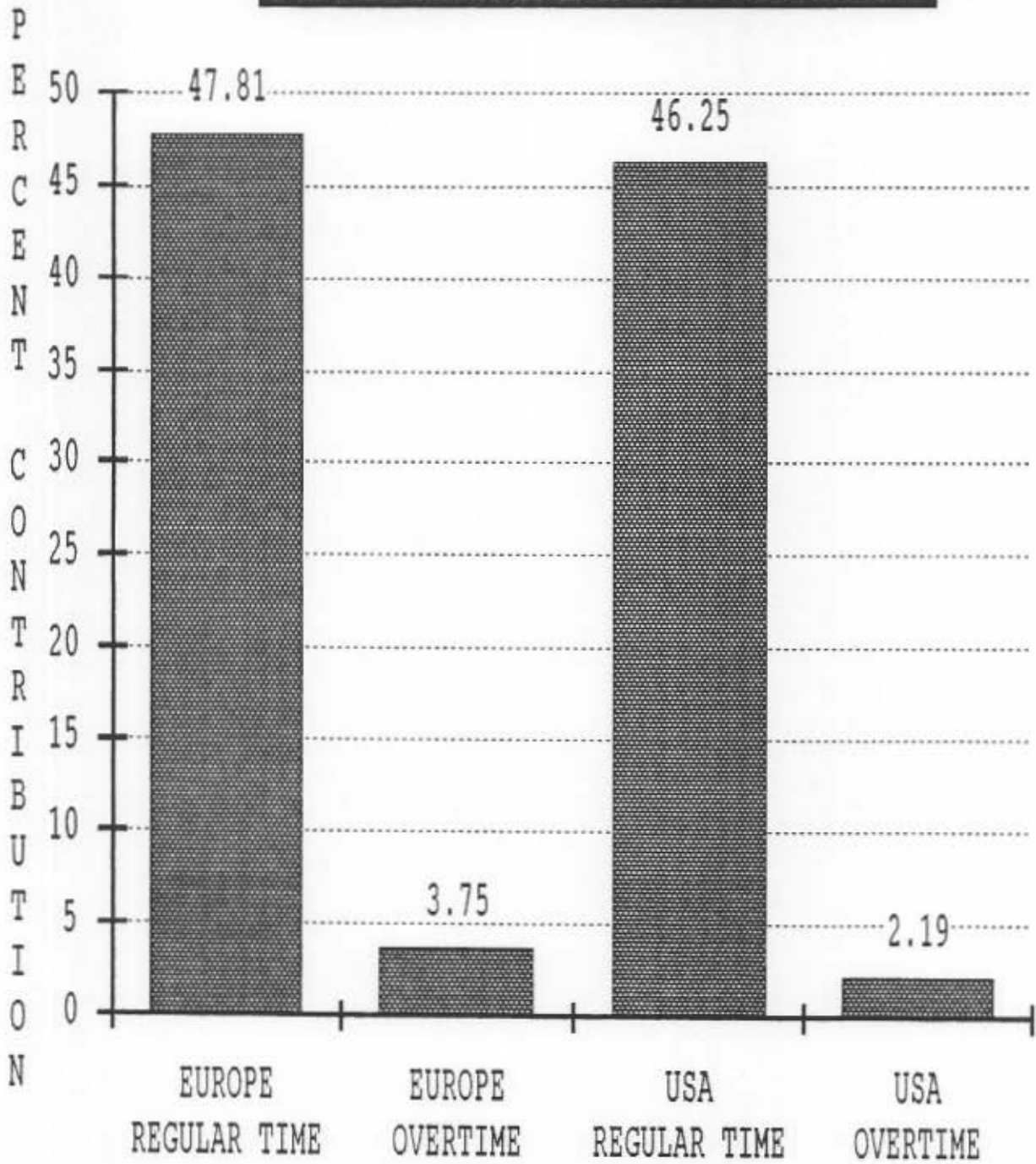
Optimal Distribution Plan

Market Location	First Quarter		Second Quarter		Third Quarter		Fourth Quarter	
	USA	EUR	USA	EUR	USA	EUR	USA	EUR
Production Plant								
EUR	0	50	0	30	0	22	17	45
USA	55	0	25	0	30	13	33	0

III) Dual Price

The dual price represents the profit generated per
constraint so that multiplying this number by the
right hand side value of each constraint and
adding up all these values will give the total
profit.

Row	Constraint Identity	Right Hand Side Value	Dual Price	Profit per unit change in the Constraint
2	EUR Demand First Quarter	50	4851	242,550
3	EUR Demand Second Quarter	30	5496	164,880
4	USA Demand First Quarter	55	9936	546,480
5	USA Demand Second Quarter	25	10580	264,500
6	EUR Demand Third Quarter	35	3333	116,655
7	USA Demand Third Quarter	30	10580	317,400
8	EUR Demand Fourth Quarter	45	4854	218,430
9	USA Demand Fourth Quarter	50	6852	342,600

Row	Constraint Identity	Right Hand Side Value	Dual Price	Profit per Constraint
		Regular Time Capacities		
10	EUR First Quarter	4140	7.01	29,021
11	USA First Quarter	4600	7	32,000
14	EUR Third Quarter	1840	23.51	43,258
16	EUR Fourth Quarter	5330	6.98	37,203
17	USA Fourth Quarter	2760	40.52	111,835
		Overtime Capacities		
22	EUR Third Quarter	200	16.50	3,300
25	USA Fourth Quarter	250	33.52	8,380
		Total Profit		2,478,694

For example, the satisfying of the demand in Europe during the first quarter would result in a profit of $242,550.

SENSITIVITY ANALYSIS

A. Study of Postoptimal Parameters

I) Objective Function Coefficient Ranges

In order for each basic variable to remain in the optimal solution, its objective function coefficient would be allowed to fluctuate between two limits which are called; allowable increase and allowable decrease. (Please refer to the table on page 46.)

For example, if management defines a program that generates an increase above $3087 in profit per unit produced in the European plant using regular time, during the first quarter for the European market, then a new optimal production plan has to drop the above variable in order to keep feasibility.

RANGES IN WHICH THE BASIS IS UNCHANGED:

OBJ COEFFICIENT RANGES

VARIABLE	CURRENT COEF	ALLOWABLE INCREASE	ALLOWABLE DECREASE
X1	7494.000000	3086.999760	INFINITY
X2	5496.000000	INFINITY	645.000000
X3	7494.000000	3086.000000	INFINITY
X4	5496.000000	INFINITY	645.000000
X5	7494.000000	5248.996090	INFINITY
X6	5496.000000	INFINITY	2163.000000
X7	7494.000000	3.000000	642.000000
X8	5496.000000	INFINITY	3.000000
X9	10580.000000	INFINITY	644.000000
X10	3333.000000	2162.000000	INFINITY
X11	10580.000000	INFINITY	644.000000
X12	3333.000000	2163.000000	INFINITY
X13	10580.000000	INFINITY	644.000000
X14	3333.000000	1518.000240	644.000000
X15	10580.000000	INFINITY	3727.999760
X16	3333.000000	5248.996090	INFINITY
X17	6852.000000	3084.000000	INFINITY
X18	4851.000000	645.000000	2162.000000
X19	6852.000000	3728.000000	INFINITY
X20	4851.000000	645.000000	INFINITY
X21	6852.000000	5246.000000	INFINITY
X22	4851.000000	INFINITY	1518.000240
X23	6852.000000	642.000000	3.000000
X24	4851.000000	3.000000	INFINITY
X25	9936.000000	644.000000	3084.000000
X26	2689.000000	2162.000000	INFINITY
X27	9936.000000	644.000000	INFINITY
X28	2689.000000	2807.000000	INFINITY
X29	9936.000000	644.000000	INFINITY
X30	2689.000000	644.000000	INFINITY
X31	9936.000000	INFINITY	3083.999760
X32	2689.000000	5248.996090	INFINITY

OBJ COEFFICIENT RANGES

VARIABLE	CURRENT COEF	ALLOWABLE INCREASE	ALLOWABLE DECREASE

II) Right-hand side ranges

This means that the right-hand side of each constraint can fluctuate between the allowable increase and decrease and still generate the same set of basic variables in the optimal feasible solution. (Please refer to the table on page 48.)

Taking the first constraint (row 2). If the demand in Europe is increased by more than 1.52 units, the optimal feasible solution would change. We cannot predict what the new production plan that will be generated by this change would be like.

ROW	CURRENT RHS	ALLOWABLE INCREASE	ALLOWABLE DECREASE	
2	50.000000	1.521739	5.000000	
3	30.000000	15.000000	30.000000	
4	55.000000	2.608695	5.000000	
5	25.000000	25.000000	25.000000	
6	35.000000	7.173913	12.826086	
7	30.000000	7.173913	30.000000	
8	45.000000	0.000000	4.347826	
9	50.000000	0.000000	4.347826	
10	4140.000000	460.000000	140.000000	
11	4600.000000	460.000000	240.000000	
12	4140.000000	INFINITY	1380.000000	
13	4600.000000	INFINITY	2300.000000	
14	1840.000000	1180.000000	660.000000	
15	4600.000000	INFINITY	660.000000	
16	5330.000000	400.000000	0.000000	
17	2760.000000	400.000000	0.000000	
18	600.000000	INFINITY	140.000000	
19	700.000000	INFINITY	240.000000	
20	600.000000	INFINITY	600.000000	
21	700.000000	INFINITY	700.000000	
22	200.000000	1180.000000	200.000031	
23	500.000000	INFINITY	500.000000	
24	400.000000	INFINITY	0.000000	
25	250.000000	400.000000	0.000000	

B. Exchange Rate Sensitivity

I) Objective Function Values

The basic exchange rate used up to this point has
been $1.90 equals 1 Pound Sterling. At that rate the
value of the objective function is $2,478,694. To
test the sensitvity of the model costs were
recalculated with exchange rates set at L = $1.0,
L = $1.6 and L = $2.2. Further investigation
revealed that the exchange rate of L = $1.0 had
ocurred only once in the past and has been dropped
from this discussion.

At L = 1.6 the value of the objective function is
$3,379,493 which is an increase of $900,799. At L =
2.2 the value is $1,578,535 a decrease of $900,159.

Because of the magnitude of the changes in the value
of the objective function$ do to small changes in
the exchange rate, it is recommended that further
analysis be done regarding anticipated return of
investment which includes exchange rate
considerations.

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II) Decision Variables

Two decision variables changed when going from L =
$1.9 to L = $2.2. X14 (units built in the USA for
the European market during the third quarter)
changed from 12.82 to 15.0 and X22 (units built in
Europe using overtime for the European market
during the third quarter) changed from 2.18 to 0.0.
Since no other variables changed it is assumed that
the cost of shipping to Europe and paying duties
was less than the incresed cost of materials and
labor in the European plant.

CONCLUSIONS

*)   The profit objective should be on the order or
      $2.5 million.

*)   The production plan is based on production for
      local markets in both Europe and the USA, except
      in the third and fourth quarters. In the third
      quarter, 13 units produced in the USA should be
      exported to Europe and in the fourth quarter, 17
      units produced in Europe should be exported to the
      USA.

*)   The demand of both markets is expected to be
      satisfied completely and plant capacity is being
      utilized fully.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
2				PRICE,	VOLUME	AND	PROFITABILITY	ANALYSIS							
4	GIVEN	DATA		EUROPE	PROFITABILITY			USA	PROFITABILITY			COMBINED	ANNUAL	PROFITABILITY	
5	EUROPE														
6	VOLUME	PRICE		VOL	PROFIT-$	5% PENALTY		VOL	PROFIT-$	5% PENALTY		VOL	TOTAL	EUROPE	USA
7	0	77378		0	0	0		0	0	0		0	0	0	0
8	148	54000		10	937580	329180		10	204270	189870		10	513050	329180	189870
9	197	46260		20	643560	614760		20	389400	360600		20	975360	614760	360600
10	250	37888		30	917940	874740		30	555390	512190		30	1386930	874740	512190
11				40	1160728	1103120		40	702240	644640		40	1747760	1103120	644640
12	USA			50	1371900	1299900		50	829950	757950		50	2057850	1299900	757950
13	VOLUME	PRICE		60	1551480	1465080		60	938520	852120		60	2317200	1465080	852120
14	0	62964		70	1699460	1598660		70	1027950	927150		70	2525810	1598660	927150
15	125	51000		80	1815840	1700640		80	1098240	983040		80	2683680	1700640	983040
16	195	44300		90	1900620	1771020		90	1149390	1019790		90	2790810	1771020	1019790
17	250	39037		100	1953800	1809800		100	1181400	1037400		100	2847200	1809800	1037400
18				110	1975380	1816980		110	1194270	1035870		110	2852850	1816980	1035870
19				120	1965360	1792560		120	1188000	1015200		120	2807760	1792560	1015200
20				130	1923740	1736540		130	1162590	975390		130	2711930	1736540	975390
21				140	1850520	1648920		140	1118040	916440		140	2565360	1648920	916440
22				150	1745700	1529700		150	1054350	838350		150	2368050	1529700	838350
23				160	1609280	1609280		160	971520	971520		160	2580800	1609280	971520
24				170	1441260	1441260		170	869550	869550		170	2310810	1441260	869550
25				180	1241640	1241640		180	748440	748440		180	1990080	1241640	748440
26				190	1010420	1010420		190	608190	608190		190	1618610	1010420	608190
27				200	747600	747600		200	448800	448800		200	1196400	747600	448800
28				210	453180	453180		210	270270	270270		210	723450	453180	270270
29				220	127160	127160		220	72600	72600		220	199760	127160	72600
30				230	-230460	-230460		230	-144210	-144210		230	-374670	-230460	-144210
31				240				240				240			

	DETAIL		DETAIL	
	VOL	EUROPE	VOL	USA
35	100	1953800	100	1181400
36	101	1957380	101	1183548
37	102	1960644	102	1185505
38	103	1963592	103	1187271
39	104	1966224	104	1188845
40	105	1968540	105	1190228
41	106	1970540	106	1191419
42	107	1972224	107	1192419
43	108	1973592	108	1193227
44	109	1974644	109	1193844
45	110	1975380	110	1194270
46	111	1975800	111	1194504
47	112	1975904	112	1194547
48	113	1975692	113	1194399
49	114	1975164	114	1194059
50	115	1974320	115	1193528
51	116	1973160	116	1192805
52	117	1971684	117	1191891
53	118	1969892	118	1190785
54	119	1967784	119	1189488
55	120	1965360	120	1188000
56	121	1962620	121	1186320
57	122	1959564	122	1184449
58	123	1956192	123	1182387
59	124	1952504	124	1180133
60	125	1948500	125	1177688
61	126	1944180	126	1175051
62	127	1939544	127	1172223
63	128	1934592	128	1169203
64	129	1929324	129	1165992
65	130	1923740	130	1162590

```
MAX       19010 X1 + 16731 X2 + 19010 X3 + 16731 X4 + 19010 X5
      + 16731 X6 + 19010 X7 + 16731 X8 + 16009 X9 + 9925 X10
      + 16009 X11 + 8925 X12 + 16009 X13 + 8925 X14 + 16009 X15
      + 8925 X16 + 13571 X17 + 15372 X18 + 18671 X19 + 16329 X20
      + 13571 X21 + 16392 X22 + 18671 X23 + 16392 X24 + 15369 X25
      + 8291 X26 + 15369 X27 + 8281 X28 + 15369 X29 + 8281 X30
      + 15369 X31 + 9291 X32
SUBJECT TO
          2)    X2 + X10 + X18 + X26 =      50
          3)    X4 + X12 + X20 + X28 =      30
          4)    X1 + X9 + X17 + X25 =       55
          5)    X3 + X11 + X19 + X27 =      25
          6)    X3 + X11 + X19 + X27 =      25
          7)    X6 + X14 + X22 + X30 =      35
          8)    X5 + X13 + X21 + X29 =      30
          9)    X8 + X16 + X24 + X32 =      45
         10)    X7 + X15 + X23 + X31 =      50
         11)    92 X1 + 92 X2 <=      4140
         12)    92 X9 + 92 X10 <=      4600
         13)    92 X3 + 92 X4 <=      4140
         14)    92 X11 + 92 X12 <=      4600
         15)    92 X5 + 92 X6 <=      1840
         16)    92 X13 + 92 X14 <=      4600
         17)    92 X7 + 92 X8 <=      5330
         18)    92 X15 + 92 X16 <=      2760
         19)    92 X17 + 92 X18 <=      600
         20)    92 X25 + 92 X26 <=      700
         21)    92 X19 + 92 X20 <=      600
         22)    92 X27 + 92 X28 <=      700
         23)    92 X21 + 92 X22 <=      200
         24)    92 X29 + 92 X30 <=      500
         25)    92 X23 + 92 X24 <=      400
         26)    92 X31 + 92 X32 <=      250
END
```

LP OPTIMUM FOUND AT STEP   25

OBJECTIVE FUNCTION VALUE

1)   5248700.00

VARIABLE	VALUE	REDUCED COST
X1	0.000000	-0.000732
X2	45.000000	0.000000
X3	15.000000	0.000000
X4	30.000000	0.000000
X5	0.000000	4804.996090
X6	20.000000	0.000000
X7	17.282608	0.000000
X8	40.652161	0.000000
X9	50.000000	0.000000
X10	0.000000	4804.996090
X11	3.478260	0.000000
X12	0.000000	4805.000000
X13	30.000000	0.000000
X14	12.826086	0.000000
X15	30.000000	0.000000
X16	0.000000	4804.996090
X17	1.521739	0.000000
X18	5.000000	0.000000
X19	6.521739	0.000000
X20	0.000000	62.998535
X21	0.000000	4804.996090
X22	2.173913	0.000000
X23	0.000000	-0.000732
X24	4.347826	0.000000
X25	3.478260	0.000000
X26	0.000000	4809.000000
X27	0.000000	640.000000
X28	0.000000	5449.000000
X29	0.000000	640.000000
X30	0.000000	644.000000
X31	2.717391	0.000000
X32	0.000000	4809.000000

ROW	SLACK OR SURPLUS	DUAL PRICES
2)	0.000000	13090.000000
3)	0.000000	13730.000000
4)	0.000000	15369.000000
5)	0.000000	16009.000000
6)	0.000000	0.000000
7)	0.000000	8925.000000
8)	0.000000	16009.000000
9)	0.000000	13090.000000
10)	0.000000	15369.000000
11)	0.000000	39.576080
12)	0.000000	6.956521
13)	0.000000	32.619553
14)	4230.000000	0.000000
15)	0.000000	84.847824
16)	650.000000	0.000000
17)	0.000000	39.576080
18)	0.000000	6.956521
19)	0.000000	35.891296
20)	380.000000	0.000000
21)	0.000000	28.934769
22)	700.000000	0.000000
23)	0.000000	81.163040
24)	500.000000	0.000000
25)	0.000000	35.891296
26)	0.000000	0.000000

NO. ITERATIONS=   25

RANGES IN WHICH THE BASIS IS UNCHANGED:

		OBJ COEFFICIENT RANGES	
VARIABLE	CURRENT	ALLOWABLE	ALLOWABLE
	COEF	INCREASE	DECREASE
X1	19010.000000	-0.000732	INFINITY
X2	16731.000000	INFINITY	-0.000732
X3	19010.000000	62.998535	3000.999510
X4	16731.000000	INFINITY	62.998535
X5	19010.000000	4804.996090	INFINITY
X6	16731.000000	INFINITY	4804.996090
X7	19010.000000	4804.996090	-0.000732
X8	16731.000000	-0.000732	4804.996090
X9	16009.000000	INFINITY	640.000000
X10	8925.000000	4804.996090	INFINITY
X11	16009.000000	2661.999270	640.000000
X12	8925.000000	4805.000000	INFINITY
X13	16009.000000	INFINITY	640.000000
X14	8925.000000	4804.996090	644.000000
X15	16009.000000	INFINITY	640.000000
X16	8925.000000	4804.996090	INFINITY
X17	18671.000000	4804.996090	-0.000732
X18	16392.000000	-0.000732	4804.996090
X19	18671.000000	INFINITY	62.998535
X20	16329.000000	62.998535	INFINITY
X21	18671.000000	4804.996090	INFINITY
X22	16392.000000	INFINITY	4804.996090
X23	18671.000000	-0.000732	INFINITY
X24	16392.000000	INFINITY	-0.000732
X25	15369.000000	640.000000	4809.000000
X26	8281.000000	4809.000000	INFINITY
X27	15369.000000	640.000000	INFINITY
X28	8281.000000	5449.000000	INFINITY
X29	15369.000000	640.000000	INFINITY
X30	8281.000000	644.000000	INFINITY
X31	15369.000000	640.000000	4809.000000
X32	8281.000000	4809.000000	INFINITY

| | | RIGHTHAND SIDE RANGES | |
ROW	CURRENT RHS	ALLOWABLE INCREASE	ALLOWABLE DECREASE
2	50.000000	1.521739	3.478260
3	30.000000	15.000000	3.478260
4	55.000000	4.130434	3.478260
5	25.000000	0.000000	0.000000
6	25.000000	0.000000	0.000000
7	35.000000	7.173913	12.826086
8	30.000000	7.173913	30.000000
9	45.000000	0.000000	2.717391
10	50.000000	0.000000	2.717391
11	4140.000000	320.000000	140.000015
12	4600.000000	320.000000	380.000000
13	4140.000000	320.000000	1380.000240
14	4600.000000	INFINITY	4280.000000
15	1840.000000	1180.000000	660.000000
16	4600.000000	INFINITY	660.000000
17	5330.000000	250.000031	0.000000
18	2760.000000	250.000031	0.000000
19	600.000000	320.000000	140.000015
20	700.000000	INFINITY	380.000000
21	600.000000	320.000000	600.000000
22	700.000000	INFINITY	700.000000
23	200.000000	1180.000000	200.000031
24	500.000000	INFINITY	500.000000
25	400.000000	250.000031	0.000000
26	250.000000	INFINITY	0.000000

```
MAX      7494 X1 + 5496 X2 + 7494 X3 + 5496 X4 + 7494 X5
       + 5496 X6 + 7494 X7 + 5496 X8 + 10580 X9 + 3333 X10
       + 10580 X11 + 3333 X12 + 10580 X13 + 3333 X14 + 10580 X15
       + 3333 X16 + 6852 X17 + 4851 X18 + 6852 X19 + 4851 X20
       + 6852 X21 + 4851 X22 + 6852 X23 + 4851 X24 + 9936 X25
       + 2689 X26 + 9936 X27 + 2689 X28 + 9936 X29 + 2689 X30
       + 9936 X31 + 2689 X32
SUBJECT TO
      2)      X2 + X10 + X18 + X26 =        50
      3)      X4 + X12 + X20 + X28 =        30
      4)      X1 + X9 + X17 + X25 =         55
      5)      X3 + X11 + X19 + X27 =        25
      6)      X6 + X14 + X22 + X30 =        35
      7)      X5 + X13 + X21 + X29 =        30
      8)      X8 + X16 + X24 + X32 =        45
      9)      X7 + X15 + X23 + X31 =        50
     10)      92 X1 + 92 X2 <=      4140
     11)      92 X9 + 92 X10 <=     4600
     12)      92 X3 + 92 X4 <=      4140
     13)      92 X11 + 92 X12 <=     4600
     14)      92 X5 + 92 X6 <=      1840
     15)      92 X13 + 92 X14 <=     4600
     16)      92 X7 + 92 X8 <=      5330
     17)      92 X15 + 92 X16 <=     2760
     18)      92 X17 + 92 X18 <=      600
     19)      92 X25 + 92 X26 <=      700
     20)      92 X19 + 92 X20 <=      600
     21)      92 X27 + 92 X28 <=      700
     22)      92 X21 + 92 X22 <=      200
     23)      92 X29 + 92 X30 <=      500
     24)      92 X23 + 92 X24 <=      400
     25)      92 X31 + 92 X32 <=      250
END
```

LP OPTIMUM FOUND AT STEP   22

       OBJECTIVE FUNCTION VALUE

       1)   2478694.00

VARIABLE	VALUE	REDUCED COST
X1	0.000000	3086.999760
X2	45.000000	0.000000
X3	0.000000	3086.000000
X4	30.000000	0.000000
X5	0.000000	5248.996090
X6	20.000000	0.000000
X7	12.934782	0.000000
X8	45.000000	0.000000
X9	50.000000	0.000000
X10	0.000000	2162.000000
X11	25.000000	0.000000
X12	0.000000	2163.000000
X13	30.000000	0.000000

X14	12.826086	0.000000
X15	30.000000	0.000000
X16	0.000000	5248.996090
X17	0.000000	3084.000000
X18	5.000000	0.000000
X19	0.000000	3728.000000
X20	0.000000	645.000000
X21	0.000000	5246.000000
X22	2.173913	0.000000
X23	4.347826	0.000000
X24	0.000000	3.000000
X25	5.000000	0.000000
X26	0.000000	2162.000000
X27	0.000000	644.000000
X28	0.000000	2807.000000
X29	0.000000	644.000000
X30	0.000000	644.000000
X31	2.717391	0.000000
X32	0.000000	5248.996090

ROW	SLACK OR SURPLUS	DUAL PRICES
2)	0.000000	4851.000000
3)	0.000000	5496.000000
4)	0.000000	9936.000000
5)	0.000000	10580.000000
6)	0.000000	3333.000000
7)	0.000000	10580.000000
8)	0.000000	4854.000000
9)	0.000000	6852.000000
10)	0.000000	7.010869
11)	0.000000	7.000000
12)	1380.000000	0.000000
13)	2300.000000	0.000000
14)	0.000000	23.510864
15)	660.000000	0.000000
16)	0.000000	6.978260
17)	0.000000	40.521729
18)	140.000000	0.000000
19)	240.000000	0.000000
20)	600.000000	0.000000
21)	700.000000	0.000000
22)	0.000000	16.500000
23)	500.000000	0.000000
24)	0.000000	0.000000
25)	0.000000	33.521729

NO. ITERATIONS=   22

RANGES IN WHICH THE BASIS IS UNCHANGED:

	OBJ COEFFICIENT RANGES		
VARIABLE	CURRENT	ALLOWABLE	ALLOWABLE
	COEF	INCREASE	DECREASE
X1	7494.000000	3086.999760	INFINITY

X2	5496.000000	INFINITY	645.000000
X3	7494.000000	3086.000000	INFINITY
X4	5496.000000	INFINITY	645.000000
X5	7494.000000	5248.996090	INFINITY
X6	5496.000000	INFINITY	2163.000000
X7	7494.000000	3.000000	642.000000
X8	5496.000000	INFINITY	3.000000
X9	10580.000000	INFINITY	644.000000
X10	3333.000000	2162.000000	INFINITY
X11	10580.000000	INFINITY	644.000000
X12	3333.000000	2163.000000	INFINITY
X13	10580.000000	INFINITY	644.000000
X14	3333.000000	1518.000240	644.000000
X15	10580.000000	INFINITY	3727.999760
X16	3333.000000	5248.996090	INFINITY
X17	6852.000000	3084.000000	INFINITY
X18	4851.000000	645.000000	2162.000000
X19	6852.000000	3728.000000	INFINITY
X20	4851.000000	645.000000	INFINITY
X21	6852.000000	5246.000000	INFINITY
X22	4851.000000	INFINITY	1518.000240
X23	6852.000000	642.000000	3.000000
X24	4851.000000	3.000000	INFINITY
X25	9936.000000	644.000000	3084.000000
X26	2689.000000	2162.000000	INFINITY
X27	9936.000000	644.000000	INFINITY
X28	2689.000000	2807.000000	INFINITY
X29	9936.000000	644.000000	INFINITY
X30	2689.000000	644.000000	INFINITY
X31	9936.000000	INFINITY	3083.999760
X32	2689.000000	5248.996090	INFINITY

RIGHTHAND SIDE RANGES

ROW	CURRENT RHS	ALLOWABLE INCREASE	ALLOWABLE DECREASE
2	50.000000	1.521739	5.000000
3	30.000000	15.000000	30.000000
4	55.000000	2.608695	5.000000
5	25.000000	25.000000	25.000000
6	35.000000	7.173913	12.826086
7	30.000000	7.173913	30.000000
8	45.000000	0.000000	4.347826
9	50.000000	0.000000	4.347826
10	4140.000000	460.000000	140.000000
11	4600.000000	460.000000	240.000000
12	4140.000000	INFINITY	1380.000000
13	4600.000000	INFINITY	2300.000000
14	1840.000000	1180.000000	660.000000
15	4600.000000	INFINITY	660.000000
16	5330.000000	400.000000	0.000000
17	2760.000000	400.000000	0.000000
18	600.000000	INFINITY	140.000000
19	700.000000	INFINITY	240.000000
20	600.000000	INFINITY	600.000000
21	700.000000	INFINITY	700.000000

22	200.000000	1180.000000	200.000031	
23	500.000000	INFINITY	500.000000	
24	400.000000	INFINITY	0.000000	
25	250.000000	400.000000	0.000000	

THE TABLEAU

ROW	(BASIS)		X1	X2	X3	X4
1	ART		3087.000	0.000	3086.000	0.000
2		X18	-1.000	0.000	0.000	0.000
3		X4	0.000	0.000	0.000	1.000
4		X25	1.000	0.000	0.000	0.000
5		X11	0.000	0.000	1.000	0.000
6		X14	0.000	0.000	0.000	0.000
7		X13	0.000	0.000	0.000	0.000
8		X8	0.000	0.000	0.000	0.000
9		X23	0.000	0.000	0.000	0.000
10		X2	1.000	1.000	0.000	0.000
11		X9	0.000	0.000	0.000	0.000
12	SLK	12	0.000	0.000	92.000	0.000
13	SLK	13	0.000	0.000	-92.000	0.000
14		X6	0.000	0.000	0.000	0.000
15	SLK	15	0.000	0.000	0.000	0.000
16		X7	0.000	0.000	0.000	0.000
17		X15	0.000	0.000	0.000	0.000
18	SLK	18	92.000	0.000	0.000	0.000
19	SLK	19	-92.000	0.000	0.000	0.000
20	SLK	20	0.000	0.000	0.000	0.000
21	SLK	21	0.000	0.000	0.000	0.000
22		X22	0.000	0.000	0.000	0.000
23	SLK	23	0.000	0.000	0.000	0.000
24	SLK	24	0.000	0.000	0.000	0.000
25		X31	0.000	0.000	0.000	0.000

ROW	X5	X6	X7	X8	X9
1	5248.996	0.000	0.000	0.000	0.000
2	0.000	0.000	0.000	0.000	0.000
3	0.000	0.000	0.000	0.000	0.000
4	0.000	0.000	0.000	0.000	0.000
5	0.000	0.000	0.000	0.000	0.000
6	-1.000	0.000	0.000	0.000	0.000
7	1.000	0.000	0.000	0.000	0.000
8	0.000	0.000	0.000	1.000	0.000
9	0.000	0.000	0.000	0.000	0.000
10	0.000	0.000	0.000	0.000	0.000
11	0.000	0.000	0.000	0.000	1.000
12	0.000	0.000	0.000	0.000	0.000
13	0.000	0.000	0.000	0.000	0.000
14	1.000	1.000	0.000	0.000	0.000
15	0.000	0.000	0.000	0.000	0.000
16	0.000	0.000	1.000	0.000	0.000
17	0.000	0.000	0.000	0.000	0.000
18	0.000	0.000	0.000	0.000	0.000
19	0.000	0.000	0.000	0.000	0.000

20	0.000	0.000	0.000	0.000	0.000
21	0.000	0.000	0.000	0.000	0.000
22	0.000	0.000	0.000	0.000	0.000
23	0.000	0.000	0.000	0.000	0.000
24	0.000	0.000	0.000	0.000	0.000
25	0.000	0.000	0.000	0.000	0.000

ROW	X10	X11	X12	X13	X14
1	2162.000	0.000	2163.000	0.000	0.000
2	1.000	0.000	0.000	0.000	0.000
3	0.000	0.000	1.000	0.000	0.000
4	-1.000	0.000	0.000	0.000	0.000
5	0.000	1.000	0.000	0.000	0.000
6	0.000	0.000	0.000	0.000	1.000
7	0.000	0.000	0.000	1.000	0.000
8	0.000	0.000	0.000	0.000	0.000
9	0.000	0.000	0.000	0.000	0.000
10	0.000	0.000	0.000	0.000	0.000
11	1.000	0.000	0.000	0.000	0.000
12	0.000	0.000	-92.000	0.000	0.000
13	0.000	0.000	92.000	0.000	0.000
14	0.000	0.000	0.000	0.000	0.000
15	0.000	0.000	0.000	0.000	0.000
16	0.000	0.000	0.000	0.000	0.000
17	0.000	0.000	0.000	0.000	0.000
18	-92.000	0.000	0.000	0.000	0.000
19	92.000	0.000	0.000	0.000	0.000
20	0.000	0.000	0.000	0.000	0.000
21	0.000	0.000	0.000	0.000	0.000
22	0.000	0.000	0.000	0.000	0.000
23	0.000	0.000	0.000	0.000	0.000
24	0.000	0.000	0.000	0.000	0.000
25	0.000	0.000	0.000	0.000	0.000

ROW	X15	X16	X17	X18	X19
1	-0.001	5248.996	3084.000	0.000	3728.000
2	0.000	0.000	0.000	1.000	0.000
3	0.000	0.000	0.000	0.000	0.000
4	0.000	0.000	1.000	0.000	0.000
5	0.000	0.000	0.000	0.000	1.000
6	0.000	0.000	0.000	0.000	0.000
7	0.000	0.000	0.000	0.000	0.000
8	0.000	1.000	0.000	0.000	0.000
9	0.000	0.000	0.000	0.000	0.000
10	0.000	0.000	0.000	0.000	0.000
11	0.000	0.000	0.000	0.000	0.000
12	0.000	0.000	0.000	0.000	0.000
13	0.000	0.000	0.000	0.000	-92.000
14	0.000	0.000	0.000	0.000	0.000
15	0.000	0.000	0.000	0.000	0.000
16	0.000	-1.000	0.000	0.000	0.000
17	1.000	1.000	0.000	0.000	0.000
18	0.000	0.000	92.000	0.000	0.000

19	0.000	0.000	-92.000	0.000	0.000
20	0.000	0.000	0.000	0.000	92.000
21	0.000	0.000	0.000	0.000	0.000
22	0.000	0.000	0.000	0.000	0.000
23	0.000	0.000	0.000	0.000	0.000
24	0.000	0.000	0.000	0.000	0.000
25	0.000	0.000	0.000	0.000	0.000

ROW	X20	X21	X22	X23	X24
1	645.000	5246.000	0.000	0.000	3.000
2	0.000	0.000	0.000	0.000	0.000
3	1.000	0.000	0.000	0.000	0.000
4	0.000	0.000	0.000	0.000	0.000
5	0.000	0.000	0.000	0.000	0.000
6	0.000	-1.000	0.000	0.000	0.000
7	0.000	1.000	0.000	0.000	0.000
8	0.000	0.000	0.000	0.000	1.000
9	0.000	0.000	0.000	1.000	1.000
10	0.000	0.000	0.000	0.000	0.000
11	0.000	0.000	0.000	0.000	0.000
12	-92.000	0.000	0.000	0.000	0.000
13	0.000	0.000	0.000	0.000	0.000
14	0.000	0.000	0.000	0.000	0.000
15	0.000	0.000	0.000	0.000	0.000
16	0.000	0.000	0.000	0.000	-1.000
17	0.000	0.000	0.000	0.000	0.000
18	0.000	0.000	0.000	0.000	0.000
19	0.000	0.000	0.000	0.000	0.000
20	92.000	0.000	0.000	0.000	0.000
21	0.000	0.000	0.000	0.000	0.000
22	0.000	1.000	1.000	0.000	0.000
23	0.000	0.000	0.000	0.000	0.000
24	0.000	0.000	0.000	0.000	0.000
25	0.000	0.000	0.000	0.000	0.000

ROW	X25	X26	X27	X28	X29
1	0.000	2162.000	644.000	2807.000	644.000
2	0.000	1.000	0.000	0.000	0.000
3	0.000	0.000	0.000	1.000	0.000
4	1.000	0.000	0.000	0.000	0.000
5	0.000	0.000	1.000	0.000	0.000
6	0.000	0.000	0.000	0.000	0.000
7	0.000	0.000	0.000	0.000	1.000
8	0.000	0.000	0.000	0.000	0.000
9	0.000	0.000	0.000	0.000	0.000
10	0.000	0.000	0.000	0.000	0.000
11	0.000	0.000	0.000	0.000	0.000
12	0.000	0.000	0.000	-92.000	0.000
13	0.000	0.000	-92.000	0.000	0.000
14	0.000	0.000	0.000	0.000	0.000
15	0.000	0.000	0.000	0.000	-92.000
16	0.000	0.000	0.000	0.000	0.000
17	0.000	0.000	0.000	0.000	0.000

18	0.000	-92.000	0.000	0.000	0.000
19	0.000	92.000	0.000	0.000	0.000
20	0.000	0.000	0.000	0.000	0.000
21	0.000	0.000	92.000	92.000	0.000
22	0.000	0.000	0.000	0.000	0.000
23	0.000	0.000	0.000	0.000	92.000
24	0.000	0.000	0.000	0.000	0.000
25	0.000	0.000	0.000	0.000	0.000

ROW	X30	X31	X32	SLK 10	SLK 11
1	644.000	-0.001	5248.996	7.011	7.000
2	0.000	0.000	0.000	-0.011	0.000
3	0.000	0.000	0.000	0.000	0.000
4	0.000	0.000	0.000	0.000	-0.011
5	0.000	0.000	0.000	0.000	0.000
6	1.000	0.000	0.000	0.000	0.000
7	0.000	0.000	0.000	0.000	0.000
8	0.000	0.000	1.000	0.000	0.000
9	0.000	0.000	0.000	0.000	0.000
10	0.000	0.000	0.000	0.011	0.000
11	0.000	0.000	0.000	0.000	0.011
12	0.000	0.000	0.000	0.000	0.000
13	0.000	0.000	0.000	0.000	0.000
14	0.000	0.000	0.000	0.000	0.000
15	-92.000	0.000	0.000	0.000	0.000
16	0.000	0.000	-1.000	0.000	0.000
17	0.000	0.000	0.000	0.000	0.000
18	0.000	0.000	0.000	1.000	0.000
19	0.000	0.000	0.000	0.000	1.000
20	0.000	0.000	0.000	0.000	0.000
21	0.000	0.000	0.000	0.000	0.000
22	0.000	0.000	0.000	0.000	0.000
23	92.000	0.000	0.000	0.000	0.000
24	0.000	0.000	0.000	0.000	0.000
25	0.000	1.000	1.000	0.000	0.000

ROW	SLK 12	SLK 13	SLK 14	SLK 15	SLK 16
1	0.000	0.000	23.511	0.000	6.978
2	0.000	0.000	0.000	0.000	0.000
3	0.000	0.000	0.000	0.000	0.000
4	0.000	0.000	0.000	0.000	0.000
5	0.000	0.000	0.000	0.000	0.000
6	0.000	0.000	-0.011	0.000	0.000
7	0.000	0.000	0.000	0.000	0.000
8	0.000	0.000	0.000	0.000	0.000
9	0.000	0.000	0.000	0.000	-0.011
10	0.000	0.000	0.000	0.000	0.000
11	0.000	0.000	0.000	0.000	0.000
12	1.000	0.000	0.000	0.000	0.000
13	0.000	1.000	0.000	0.000	0.000
14	0.000	0.000	0.011	0.000	0.000
15	0.000	0.000	1.000	1.000	0.000
16	0.000	0.000	0.000	0.000	0.011

17	0.000	0.000	0.000	0.000	0.000
18	0.000	0.000	0.000	0.000	0.000
19	0.000	0.000	0.000	0.000	0.000
20	0.000	0.000	0.000	0.000	0.000
21	0.000	0.000	0.000	0.000	0.000
22	0.000	0.000	0.000	0.000	0.000
23	0.000	0.000	0.000	0.000	0.000
24	0.000	0.000	0.000	0.000	1.000
25	0.000	0.000	0.000	0.000	0.000

ROW	SLK 17	SLK 18	SLK 19	SLK 20	SLK 21
1	40.522	0.000	0.000	0.000	0.000
2	0.000	0.000	0.000	0.000	0.000
3	0.000	0.000	0.000	0.000	0.000
4	0.000	0.000	0.000	0.000	0.000
5	0.000	0.000	0.000	0.000	0.000
6	0.000	0.000	0.000	0.000	0.000
7	0.000	0.000	0.000	0.000	0.000
8	0.000	0.000	0.000	0.000	0.000
9	-0.011	0.000	0.000	0.000	0.000
10	0.000	0.000	0.000	0.000	0.000
11	0.000	0.000	0.000	0.000	0.000
12	0.000	0.000	0.000	0.000	0.000
13	0.000	0.000	0.000	0.000	0.000
14	0.000	0.000	0.000	0.000	0.000
15	0.000	0.000	0.000	0.000	0.000
16	0.000	0.000	0.000	0.000	0.000
17	0.011	0.000	0.000	0.000	0.000
18	0.000	1.000	0.000	0.000	0.000
19	0.000	0.000	1.000	0.000	0.000
20	0.000	0.000	0.000	1.000	0.000
21	0.000	0.000	0.000	0.000	1.000
22	0.000	0.000	0.000	0.000	0.000
23	0.000	0.000	0.000	0.000	0.000
24	1.000	0.000	0.000	0.000	0.000
25	0.000	0.000	0.000	0.000	0.000

ROW	SLK 22	SLK 23	SLK 24	SLK 25	
1	17.	0.00E+00	0.00E+00	34.	0.25E+07
2	0.000	0.000	0.000	0.000	5.000
3	0.000	0.000	0.000	0.000	30.000
4	0.000	0.000	0.000	0.000	5.000
5	0.000	0.000	0.000	0.000	25.000
6	-0.011	0.000	0.000	0.000	12.826
7	0.000	0.000	0.000	0.000	30.000
8	0.000	0.000	0.000	0.000	45.000
9	0.000	0.000	0.000	-0.011	4.348
10	0.000	0.000	0.000	0.000	45.000
11	0.000	0.000	0.000	0.000	50.000
12	0.000	0.000	0.000	0.000	1380.000
13	0.000	0.000	0.000	0.000	2300.000
14	0.000	0.000	0.000	0.000	20.000
15	1.000	0.000	0.000	0.000	660.000

16	0.000	0.000	0.000	0.000	12.935
17	0.000	0.000	0.000	0.000	30.000
18	0.000	0.000	0.000	0.000	140.000
19	0.000	0.000	0.000	0.000	240.000
20	0.000	0.000	0.000	0.000	600.000
21	0.000	0.000	0.000	0.000	700.000
22	0.011	0.000	0.000	0.000	2.174
23	0.000	1.000	0.000	0.000	500.000
24	0.000	0.000	1.000	1.000	0.000
25	0.000	0.000	0.000	0.011	2.717

```
MAX      11335 X1 + 9241 X2 + 11335 X3 + 9241 X4 + 11335 X5
       + 9241 X6 + 11335 X7 + 9241 X8 + 12389 X9 + 5197 X10
       + 12389 X11 + 5197 X12 + 12389 X13 + 5197 X14 + 12389 X15
       + 5197 X16 + 10793 X17 + 8698 X18 + 10793 X19 + 8698 X20
       + 10793 X21 + 8698 X22 + 10793 X23 + 8698 X24 + 11745 X25
       + 4553 X26 + 11745 X27 + 4553 X28 + 11745 X29 + 4553 X30
       + 11745 X31 + 4553 X32
SUBJECT TO
        2)    X2 + X10 + X18 + X26 =      50
        3)    X4 + X12 + X20 + X28 =      30
        4)    X1 + X9 + X17 + X25 =       55
        5)    X3 + X11 + X19 + X27 =      25
        6)    X6 + X14 + X22 + X30 =      35
        7)    X5 + X13 + X21 + X29 =      30
        8)    X8 + X16 + X24 + X32 =      45
        9)    X7 + X15 + X23 + X31 =      50
       10)    92 X1 + 92 X2 <=    4140
       11)    92 X9 + 92 X10 <=   4600
       12)    92 X3 + 92 X4 <=    4140
       13)    92 X11 + 92 X12 <=   4600
       14)    92 X5 + 92 X6 <=    1840
       15)    92 X13 + 92 X14 <=   4600
       16)    92 X7 + 92 X8 <=    5330
       17)    92 X15 + 92 X16 <=   2760
       18)    92 X17 + 92 X18 <=   600
       19)    92 X25 + 92 X26 <=   700
       20)    92 X19 + 92 X20 <=   600
       21)    92 X27 + 92 X28 <=   700
       22)    92 X21 + 92 X22 <=   200
       23)    92 X29 + 92 X30 <=   500
       24)    92 X23 + 92 X24 <=   400
       25)    92 X31 + 92 X32 <=   250
END

LP OPTIMUM FOUND AT STEP      22

       OBJECTIVE FUNCTION VALUE

        1)     3379493.00
```

VARIABLE	VALUE	REDUCED COST
X1	0.000000	952.999756
X2	45.000000	0.000000
X3	0.000000	1054.000000
X4	30.000000	0.000000
X5	0.000000	5097.996090
X6	20.000000	0.000000
X7	12.934782	0.000000
X8	45.000000	0.000000
X9	50.000000	0.000000
X10	0.000000	4145.000000
X11	25.000000	0.000000
X12	0.000000	4044.000000
X13	30.000000	0.000000

X14	12.826086	0.000000
X15	30.000000	0.000000
X16	0.000000	5097.996090
X17	0.000000	952.000000
X18	5.000000	0.000000
X19	0.000000	1596.000000
X20	0.000000	543.000000
X21	0.000000	5096.996090
X22	2.173913	0.000000
X23	4.347826	0.000000
X24	0.000000	1.000000
X25	5.000000	0.000000
X26	0.000000	4145.000000
X27	0.000000	644.000000
X28	0.000000	4688.000000
X29	0.000000	644.000000
X30	0.000000	644.000000
X31	2.717391	0.000000
X32	0.000000	5097.996090

ROW	SLACK OR SURPLUS	DUAL PRICES
2)	0.000000	8698.000000
3)	0.000000	9241.000000
4)	0.000000	11745.000000
5)	0.000000	12389.000000
6)	0.000000	5197.000000
7)	0.000000	12389.000000
8)	0.000000	8699.000000
9)	0.000000	10793.000000
10)	0.000000	5.502173
11)	0.000000	7.000000
12)	1380.000000	0.000000
13)	2300.000000	0.000000
14)	0.000000	43.956512
15)	660.000000	0.000000
16)	0.000000	5.891304
17)	0.000000	17.347824
18)	140.000000	0.000000
19)	240.000000	0.000000
20)	600.000000	0.000000
21)	700.000000	0.000000
22)	0.000000	38.054337
23)	500.000000	0.000000
24)	0.000000	0.000000
25)	0.000000	10.347326

NO. ITERATIONS=   22

RANGES IN WHICH THE BASIS IS UNCHANGED:

OBJ COEFFICIENT RANGES

VARIABLE	CURRENT COEF	ALLOWABLE INCREASE	ALLOWABLE DECREASE
X1	11335.000000	952.999756	INFINITY

X2	9241.000000	INFINITY	543.000000
X3	11335.000000	1054.000000	INFINITY
X4	9241.000000	INFINITY	543.000000
X5	11335.000000	5097.996090	INFINITY
X6	9241.000000	INFINITY	4044.000000
X7	11335.000000	1.000000	542.000000
X8	9241.000000	INFINITY	1.000000
X9	12389.000000	INFINITY	644.000000
X10	5197.000000	4145.000000	INFINITY
X11	12389.000000	INFINITY	644.000000
X12	5197.000000	4044.000000	INFINITY
X13	12389.000000	INFINITY	644.000000
X14	5197.000000	3500.999760	644.000000
X15	12389.000000	INFINITY	1596.000000
X16	5197.000000	5097.996090	INFINITY
X17	10793.000000	952.000000	INFINITY
X18	8698.000000	543.000000	4145.000000
X19	10793.000000	1596.000000	INFINITY
X20	8698.000000	543.000000	INFINITY
X21	10793.000000	5096.996090	INFINITY
X22	8698.000000	INFINITY	3500.999760
X23	10793.000000	542.000000	1.000000
X24	8698.000000	1.000000	INFINITY
X25	11745.000000	644.000000	952.000000
X26	4553.000000	4145.000000	INFINITY
X27	11745.000000	644.000000	INFINITY
X28	4553.000000	4688.000000	INFINITY
X29	11745.000000	644.000000	INFINITY
X30	4553.000000	644.000000	INFINITY
X31	11745.000000	INFINITY	952.000000
X32	4553.000000	5037.996090	INFINITY

RIGHTHAND SIDE RANGES

ROW	CURRENT RHS	ALLOWABLE INCREASE	ALLOWABLE DECREASE
2	50.000000	1.521739	5.000000
3	30.000000	15.000000	30.000000
4	55.000000	2.608695	5.000000
5	25.000000	25.000000	25.000000
6	35.000000	7.173913	12.826086
7	30.000000	7.173913	30.000000
8	45.000000	0.000000	4.347826
9	50.000000	0.000000	4.347826
10	4140.000000	460.000000	140.000000
11	4600.000000	460.000000	240.000000
12	4140.000000	INFINITY	1380.000000
13	4600.000000	INFINITY	2300.000000
14	1840.000000	1180.000000	660.000000
15	4600.000000	INFINITY	660.000000
16	5330.000000	400.000000	0.000000
17	2760.000000	400.000000	0.000000
18	600.000000	INFINITY	140.000000
19	700.000000	INFINITY	240.000000
20	600.000000	INFINITY	600.000000
21	700.000000	INFINITY	700.000000

22	200.000000	1180.000000	200.000031	
23	500.000000	INFINITY	500.000000	
24	400.000000	INFINITY	0.000000	
25	250.000000	400.000000	0.000000	

THE TABLEAU

ROW	(BASIS)	X1	X2	X3	X4
1	ART	953.000	0.000	1054.000	0.000
2	X18	-1.000	0.000	0.000	0.000
3	X4	0.000	0.000	0.000	1.000
4	X25	1.000	0.000	0.000	0.000
5	X11	0.000	0.000	1.000	0.000
6	X14	0.000	0.000	0.000	0.000
7	X13	0.000	0.000	0.000	0.000
8	X8	0.000	0.000	0.000	0.000
9	X23	0.000	0.000	0.000	0.000
10	X2	1.000	1.000	0.000	0.000
11	X9	0.000	0.000	0.000	0.000
12 SLK	12	0.000	0.000	92.000	0.000
13 SLK	13	0.000	0.000	-92.000	0.000
14	X6	0.000	0.000	0.000	0.000
15 SLK	15	0.000	0.000	0.000	0.000
16	X7	0.000	0.000	0.000	0.000
17	X15	0.000	0.000	0.000	0.000
18 SLK	18	92.000	0.000	0.000	0.000
19 SLK	19	-92.000	0.000	0.000	0.000
20 SLK	20	0.000	0.000	0.000	0.000
21 SLK	21	0.000	0.000	0.000	0.000
22	X22	0.000	0.000	0.000	0.000
23 SLK	23	0.000	0.000	0.000	0.000
24 SLK	24	0.000	0.000	0.000	0.000
25	X31	0.000	0.000	0.000	0.000

ROW	X5	X6	X7	X8	X9
1	5097.996	-0.001	0.000	0.000	0.000
2	0.000	0.000	0.000	0.000	0.000
3	0.000	0.000	0.000	0.000	0.000
4	0.000	0.000	0.000	0.000	0.000
5	0.000	0.000	0.000	0.000	0.000
6	-1.000	0.000	0.000	0.000	0.000
7	1.000	0.000	0.000	0.000	0.000
8	0.000	0.000	0.000	1.000	0.000
9	0.000	0.000	0.000	0.000	0.000
10	0.000	0.000	0.000	0.000	0.000
11	0.000	0.000	0.000	0.000	1.000
12	0.000	0.000	0.000	0.000	0.000
13	0.000	0.000	0.000	0.000	0.000
14	1.000	1.000	0.000	0.000	0.000
15	0.000	0.000	0.000	0.000	0.000
16	0.000	0.000	1.000	0.000	0.000
17	0.000	0.000	0.000	0.000	0.000
18	0.000	0.000	0.000	0.000	0.000
19	0.000	0.000	0.000	0.000	0.000

ROW					
20	0.000	0.000	0.000	0.000	0.000
21	0.000	0.000	0.000	0.000	0.000
22	0.000	0.000	0.000	0.000	0.000
23	0.000	0.000	0.000	0.000	0.000
24	0.000	0.000	0.000	0.000	0.000
25	0.000	0.000	0.000	0.000	0.000

ROW	X10	X11	X12	X13	X14
1	4145.000	0.000	4044.000	0.000	0.000
2	1.000	0.000	0.000	0.000	0.000
3	0.000	0.000	1.000	0.000	0.000
4	-1.000	0.000	0.000	0.000	0.000
5	0.000	1.000	0.000	0.000	0.000
6	0.000	0.000	0.000	0.000	1.000
7	0.000	0.000	0.000	1.000	0.000
8	0.000	0.000	0.000	0.000	0.000
9	0.000	0.000	0.000	0.000	0.000
10	0.000	0.000	0.000	0.000	0.000
11	1.000	0.000	0.000	0.000	0.000
12	0.000	0.000	-92.000	0.000	0.000
13	0.000	0.000	92.000	0.000	0.000
14	0.000	0.000	0.000	0.000	0.000
15	0.000	0.000	0.000	0.000	0.000
16	0.000	0.000	0.000	0.000	0.000
17	0.000	0.000	0.000	0.000	0.000
18	-92.000	0.000	0.000	0.000	0.000
19	92.000	0.000	0.000	0.000	0.000
20	0.000	0.000	0.000	0.000	0.000
21	0.000	0.000	0.000	0.000	0.000
22	0.000	0.000	0.000	0.000	0.000
23	0.000	0.000	0.000	0.000	0.000
24	0.000	0.000	0.000	0.000	0.000
25	0.000	0.000	0.000	0.000	0.000

ROW	X15	X16	X17	X18	X19
1	0.000	5097.996	952.000	0.000	1596.000
2	0.000	0.000	0.000	1.000	0.000
3	0.000	0.000	0.000	0.000	0.000
4	0.000	0.000	1.000	0.000	0.000
5	0.000	0.000	0.000	0.000	1.000
6	0.000	0.000	0.000	0.000	0.000
7	0.000	0.000	0.000	0.000	0.000
8	0.000	1.000	0.000	0.000	0.000
9	0.000	0.000	0.000	0.000	0.000
10	0.000	0.000	0.000	0.000	0.000
11	0.000	0.000	0.000	0.000	0.000
12	0.000	0.000	0.000	0.000	0.000
13	0.000	0.000	0.000	0.000	-92.000
14	0.000	0.000	0.000	0.000	0.000
15	0.000	0.000	0.000	0.000	0.000
16	0.000	-1.000	0.000	0.000	0.000
17	1.000	1.000	0.000	0.000	0.000
18	0.000	0.000	92.000	0.000	0.000

19	0.000	0.000	-92.000	0.000	0.000
20	0.000	0.000	0.000	0.000	92.000
21	0.000	0.000	0.000	0.000	0.000
22	0.000	0.000	0.000	0.000	0.000
23	0.000	0.000	0.000	0.000	0.000
24	0.000	0.000	0.000	0.000	0.000
25	0.000	0.000	0.000	0.000	0.000

ROW	X20	X21	X22	X23	X24
1	543.000	5096.996	-0.001	0.000	1.000
2	0.000	0.000	0.000	0.000	0.000
3	1.000	0.000	0.000	0.000	0.000
4	0.000	0.000	0.000	0.000	0.000
5	0.000	0.000	0.000	0.000	0.000
6	0.000	-1.000	0.000	0.000	0.000
7	0.000	1.000	0.000	0.000	0.000
8	0.000	0.000	0.000	0.000	1.000
9	0.000	0.000	0.000	1.000	1.000
10	0.000	0.000	0.000	0.000	0.000
11	0.000	0.000	0.000	0.000	0.000
12	-92.000	0.000	0.000	0.000	0.000
13	0.000	0.000	0.000	0.000	0.000
14	0.000	0.000	0.000	0.000	0.000
15	0.000	0.000	0.000	0.000	0.000
16	0.000	0.000	0.000	0.000	-1.000
17	0.000	0.000	0.000	0.000	0.000
18	0.000	0.000	0.000	0.000	0.000
19	0.000	0.000	0.000	0.000	0.000
20	92.000	0.000	0.000	0.000	0.000
21	0.000	0.000	0.000	0.000	0.000
22	0.000	1.000	1.000	0.000	0.000
23	0.000	0.000	0.000	0.000	0.000
24	0.000	0.000	0.000	0.000	0.000
25	0.000	0.000	0.000	0.000	0.000

ROW	X25	X26	X27	X28	X29
1	0.000	4145.000	644.000	4688.000	644.000
2	0.000	1.000	0.000	0.000	0.000
3	0.000	0.000	0.000	1.000	0.000
4	1.000	0.000	0.000	0.000	0.000
5	0.000	0.000	1.000	0.000	0.000
6	0.000	0.000	0.000	0.000	0.000
7	0.000	0.000	0.000	0.000	1.000
8	0.000	0.000	0.000	0.000	0.000
9	0.000	0.000	0.000	0.000	0.000
10	0.000	0.000	0.000	0.000	0.000
11	0.000	0.000	0.000	0.000	0.000
12	0.000	0.000	0.000	-92.000	0.000
13	0.000	0.000	-92.000	0.000	0.000
14	0.000	0.000	0.000	0.000	0.000
15	0.000	0.000	0.000	0.000	-92.000
16	0.000	0.000	0.000	0.000	0.000
17	0.000	0.000	0.000	0.000	0.000

18	0.000	-92.000	0.000	0.000	0.000
19	0.000	92.000	0.000	0.000	0.000
20	0.000	0.000	0.000	0.000	0.000
21	0.000	0.000	92.000	92.000	0.000
22	0.000	0.000	0.000	0.000	0.000
23	0.000	0.000	0.000	0.000	92.000
24	0.000	0.000	0.000	0.000	0.000
25	0.000	0.000	0.000	0.000	0.000

ROW	X30	X31	X32	SLK 10	SLK 11
1	644.000	0.000	5097.996	5.902	7.000
2	0.000	0.000	0.000	-0.011	0.000
3	0.000	0.000	0.000	0.000	0.000
4	0.000	0.000	0.000	0.000	-0.011
5	0.000	0.000	0.000	0.000	0.000
6	1.000	0.000	0.000	0.000	0.000
7	0.000	0.000	0.000	0.000	0.000
8	0.000	0.000	1.000	0.000	0.000
9	0.000	0.000	0.000	0.000	0.000
10	0.000	0.000	0.000	0.011	0.000
11	0.000	0.000	0.000	0.000	0.011
12	0.000	0.000	0.000	0.000	0.000
13	0.000	0.000	0.000	0.000	0.000
14	0.000	0.000	0.000	0.000	0.000
15	-92.000	0.000	0.000	0.000	0.000
16	0.000	0.000	-1.000	0.000	0.000
17	0.000	0.000	0.000	0.000	0.000
18	0.000	0.000	0.000	1.000	0.000
19	0.000	0.000	0.000	0.000	1.000
20	0.000	0.000	0.000	0.000	0.000
21	0.000	0.000	0.000	0.000	0.000
22	0.000	0.000	0.000	0.000	0.000
23	92.000	0.000	0.000	0.000	0.000
24	0.000	0.000	0.000	0.000	0.000
25	0.000	1.000	1.000	0.000	0.000

ROW	SLK 12	SLK 13	SLK 14	SLK 15	SLK 16
1	0.000	0.000	43.957	0.000	5.891
2	0.000	0.000	0.000	0.000	0.000
3	0.000	0.000	0.000	0.000	0.000
4	0.000	0.000	0.000	0.000	0.000
5	0.000	0.000	0.000	0.000	0.000
6	0.000	0.000	-0.011	0.000	0.000
7	0.000	0.000	0.000	0.000	0.000
8	0.000	0.000	0.000	0.000	0.000
9	0.000	0.000	0.000	0.000	-0.011
10	0.000	0.000	0.000	0.000	0.000
11	0.000	0.000	0.000	0.000	0.000
12	1.000	0.000	0.000	0.000	0.000
13	0.000	1.000	0.000	0.000	0.000
14	0.000	0.000	0.011	0.000	0.000
15	0.000	0.000	1.000	1.000	0.000
16	0.000	0.000	0.000	0.000	0.011

17	0.000	0.000	0.000	0.000	0.000
18	0.000	0.000	0.000	0.000	0.000
19	0.000	0.000	0.000	0.000	0.000
20	0.000	0.000	0.000	0.000	0.000
21	0.000	0.000	0.000	0.000	0.000
22	0.000	0.000	0.000	0.000	0.000
23	0.000	0.000	0.000	0.000	0.000
24	0.000	0.000	0.000	0.000	1.000
25	0.000	0.000	0.000	0.000	0.000

ROW	SLK 17	SLK 18	SLK 19	SLK 20	SLK 21
1	17.348	0.000	0.000	0.000	0.000
2	0.000	0.000	0.000	0.000	0.000
3	0.000	0.000	0.000	0.000	0.000
4	0.000	0.000	0.000	0.000	0.000
5	0.000	0.000	0.000	0.000	0.000
6	0.000	0.000	0.000	0.000	0.000
7	0.000	0.000	0.000	0.000	0.000
8	0.000	0.000	0.000	0.000	0.000
9	-0.011	0.000	0.000	0.000	0.000
10	0.000	0.000	0.000	0.000	0.000
11	0.000	0.000	0.000	0.000	0.000
12	0.000	0.000	0.000	0.000	0.000
13	0.000	0.000	0.000	0.000	0.000
14	0.000	0.000	0.000	0.000	0.000
15	0.000	0.000	0.000	0.000	0.000
16	0.000	0.000	0.000	0.000	0.000
17	0.011	0.000	0.000	0.000	0.000
18	0.000	1.000	0.000	0.000	0.000
19	0.000	0.000	1.000	0.000	0.000
20	0.000	0.000	0.000	1.000	0.000
21	0.000	0.000	0.000	0.000	1.000
22	0.000	0.000	0.000	0.000	0.000
23	0.000	0.000	0.000	0.000	0.000
24	1.000	0.000	0.000	0.000	0.000
25	0.000	0.000	0.000	0.000	0.000

ROW	SLK 22	SLK 23	SLK 24	SLK 25	
1	38.	0.00E+00	0.00E+00	10.	0.34E+07
2	0.000	0.000	0.000	0.000	5.000
3	0.000	0.000	0.000	0.000	30.000
4	0.000	0.000	0.000	0.000	5.000
5	0.000	0.000	0.000	0.000	25.000
6	-0.011	0.000	0.000	0.000	12.826
7	0.000	0.000	0.000	0.000	30.000
8	0.000	0.000	0.000	0.000	45.000
9	0.000	0.000	0.000	-0.011	4.348
10	0.000	0.000	0.000	0.000	45.000
11	0.000	0.000	0.000	0.000	50.000
12	0.000	0.000	0.000	0.000	1380.000
13	0.000	0.000	0.000	0.000	2300.000
14	0.000	0.000	0.000	0.000	20.000
15	1.000	0.000	0.000	0.000	660.000

16	0.000	0.000	0.000	0.000	12.935
17	0.000	0.000	0.000	0.000	30.000
18	0.000	0.000	0.000	0.000	140.000
19	0.000	0.000	0.000	0.000	240.000
20	0.000	0.000	0.000	0.000	600.000
21	0.000	0.000	0.000	0.000	700.000
22	0.011	0.000	0.000	0.000	2.174
23	0.000	1.000	0.000	0.000	500.000
24	0.000	0.000	1.000	1.000	0.000
25	0.000	0.000	0.000	0.011	2.717

```
MAX        3658 X1 + 1750 X2 + 3658 X3 + 1750 X4 + 3658 X5
         + 1750 X6 + 3658 X7 + 1750 X8 + 8769 X9 + 1468 X10
         + 8769 X11 + 1468 X12 + 8769 X13 + 1468 X14 + 8769 X15
         + 1468 X16 + 2912 X17 + 1004 X18 + 2912 X19 + 1004 X20
         + 2912 X21 + 1004 X22 + 2912 X23 + 1004 X24 + 8125 X25
         + 824 X26 + 8125 X27 + 824 X28 + 8125 X29 + 824 X30
         + 8125 X31 + 824 X32
SUBJECT TO
    2)     X2 + X10 + X18 + X26 =      50
    3)     X4 + X12 + X20 + X28 =      30
    4)     X1 + X9 + X17 + X25 =     55
    5)     X3 + X11 + X19 + X27 =     25
    6)     X6 + X14 + X22 + X30 =     35
    7)     X5 + X13 + X21 + X29 =     30
    8)     X8 + X16 + X24 + X32 =     45
    9)     X7 + X15 + X23 + X31 =     50
   10)     92 X1 + 92 X2 <=     4140
   11)     92 X9 + 92 X10 <=     4600
   12)     92 X3 + 92 X4 <=     4140
   13)     92 X11 + 92 X12 <=     4600
   14)     92 X5 + 92 X6 <=     1840
   15)     92 X13 + 92 X14 <=     4600
   16)     92 X7 + 92 X8 <=     5330
   17)     92 X15 + 92 X16 <=     2760
   18)     92 X17 + 92 X18 <=     600
   19)     92 X25 + 92 X26 <=     700
   20)     92 X19 + 92 X20 <=     600
   21)     92 X27 + 92 X28 <=     700
   22)     92 X21 + 92 X22 <=     200
   23)     92 X29 + 92 X30 <=     500
   24)     92 X23 + 92 X24 <=     400
   25)     92 X31 + 92 X32 <=     250
END

LP OPTIMUM FOUND AT STEP        22

        OBJECTIVE FUNCTION VALUE

    1)      1578535.00

   VARIABLE           VALUE          REDUCED COST
        X1          0.000000          5212.996090
        X2         45.000000             0.000000
        X3          0.000000          5111.000000
        X4         30.000000             0.000000
        X5          0.000000          5392.996090
        X6         20.000000             0.000000
        X7         12.934782             0.000000
        X8         45.000000             0.000000
        X9         50.000000             0.000000
        X10         0.000000           180.000000
        X11        25.000000             0.000000
        X12         0.000000           282.000000
        X13        30.000000             0.000000
```

X14	15.000000	0.000000
X15	30.000000	0.000000
X16	0.000000	5392.996090
X17	0.000000	5213.000000
X18	5.000000	0.000000
X19	0.000000	5857.000000
X20	0.000000	746.000000
X21	0.000000	5857.000000
X22	0.000000	464.000000
X23	4.347826	0.000000
X24	0.000000	0.000244
X25	5.000000	0.000000
X26	0.000000	180.000000
X27	0.000000	644.000000
X28	0.000000	926.000000
X29	0.000000	644.000000
X30	0.000000	644.000000
X31	2.717391	0.000000
X32	0.000000	5392.996090

ROW	SLACK OR SURPLUS	DUAL PRICES
2)	0.000000	1004.000000
3)	0.000000	1750.000000
4)	0.000000	8125.000000
5)	0.000000	8769.000000
6)	0.000000	1468.000000
7)	0.000000	8769.000000
8)	0.000000	1004.000240
9)	0.000000	2912.000000
10)	0.000000	8.108695
11)	0.000000	7.000000
12)	1380.000000	0.000000
13)	2300.000000	0.000000
14)	0.000000	3.065217
15)	460.000000	0.000000
16)	0.000000	8.108695
17)	0.000000	63.663040
18)	140.000000	0.000000
19)	240.000000	0.000000
20)	600.000000	0.000000
21)	700.000000	0.000000
22)	200.000000	0.000000
23)	500.000000	0.000000
24)	0.000000	0.000000
25)	0.000000	56.663040

NO. ITERATIONS=   22

RANGES IN WHICH THE BASIS IS UNCHANGED:

OBJ COEFFICIENT RANGES		
VARIABLE	CURRENT COEF	ALLOWABLE INCREASE	ALLOWABLE DECREASE
X1	3658.000000	5212.996090	INFINITY

X2	1750.000000	INFINITY	746.000000
X3	3658.000000	5111.000000	INFINITY
X4	1750.000000	INFINITY	282.000000
X5	3658.000000	5392.996090	INFINITY
X6	1750.000000	INFINITY	282.000000
X7	3658.000000	0.000244	746.000000
X8	1750.000000	INFINITY	0.000244
X9	8769.000000	INFINITY	180.000031
X10	1468.000000	180.000000	INFINITY
X11	8769.000000	INFINITY	644.000000
X12	1468.000000	282.000000	INFINITY
X13	8769.000000	INFINITY	644.000000
X14	1468.000000	282.000000	464.000000
X15	8769.000000	INFINITY	5392.996090
X16	1468.000000	5392.996090	INFINITY
X17	2912.000000	5213.000000	INFINITY
X18	1004.000000	746.000000	180.000000
X19	2912.000000	5857.000000	INFINITY
X20	1004.000000	746.000000	INFINITY
X21	2912.000000	5857.000000	INFINITY
X22	1004.000000	464.000000	INFINITY
X23	2912.000000	746.000000	0.000244
X24	1004.000000	0.000244	INFINITY
X25	8125.000000	180.000031	5212.996090
X26	824.000000	180.000000	INFINITY
X27	8125.000000	644.000000	INFINITY
X28	824.000000	926.000000	INFINITY
X29	8125.000000	644.000000	INFINITY
X30	824.000000	644.000000	INFINITY
X31	8125.000000	INFINITY	5213.000000
X32	824.000000	5392.996090	INFINITY

RIGHTHAND SIDE RANGES

ROW	CURRENT RHS	ALLOWABLE INCREASE	ALLOWABLE DECREASE
2	50.000000	1.521739	5.000000
3	30.000000	15.000000	30.000000
4	55.000000	2.608695	5.000000
5	25.000000	25.000000	25.000000
6	35.000000	5.000000	15.000000
7	30.000000	5.000000	30.000000
8	45.000000	0.000000	4.347826
9	50.000000	0.000000	4.347826
10	4140.000000	460.000000	140.000000
11	4600.000000	460.000000	240.000000
12	4140.000000	INFINITY	1380.000000
13	4600.000000	INFINITY	2300.000000
14	1840.000000	1380.000240	460.000000
15	4600.000000	INFINITY	460.000000
16	5330.000000	400.000000	0.000000
17	2760.000000	400.000000	0.000000
18	600.000000	INFINITY	140.000000
19	700.000000	INFINITY	240.000000
20	600.000000	INFINITY	600.000000
21	700.000000	INFINITY	700.000000

22	200.000000	INFINITY	200.000000
23	500.000000	INFINITY	500.000000
24	400.000000	INFINITY	0.000000
25	250.000000	400.000000	0.000000

THE TABLEAU

ROW	(BASIS)	X1	X2	X3	X4
1	ART	5212.996	0.000	5111.000	0.000
2	X18	-1.000	0.000	0.000	0.000
3	X4	0.000	0.000	0.000	1.000
4	X25	1.000	0.000	0.000	0.000
5	X11	0.000	0.000	1.000	0.000
6	X14	0.000	0.000	0.000	0.000
7	X13	0.000	0.000	0.000	0.000
8	X8	0.000	0.000	0.000	0.000
9	X23	0.000	0.000	0.000	0.000
10	X2	1.000	1.000	0.000	0.000
11	X9	0.000	0.000	0.000	0.000
12 SLK	12	0.000	0.000	92.000	0.000
13 SLK	13	0.000	0.000	-92.000	0.000
14	X6	0.000	0.000	0.000	0.000
15 SLK	15	0.000	0.000	0.000	0.000
16	X7	0.000	0.000	0.000	0.000
17	X15	0.000	0.000	0.000	0.000
18 SLK	18	92.000	0.000	0.000	0.000
19 SLK	19	-92.000	0.000	0.000	0.000
20 SLK	20	0.000	0.000	0.000	0.000
21 SLK	21	0.000	0.000	0.000	0.000
22 SLK	22	0.000	0.000	0.000	0.000
23 SLK	23	0.000	0.000	0.000	0.000
24 SLK	24	0.000	0.000	0.000	0.000
25	X31	0.000	0.000	0.000	0.000

ROW	X5	X6	X7	X8	X9
1	5392.996	0.000	0.000	0.000	0.000
2	0.000	0.000	0.000	0.000	0.000
3	0.000	0.000	0.000	0.000	0.000
4	0.000	0.000	0.000	0.000	0.000
5	0.000	0.000	0.000	0.000	0.000
6	-1.000	0.000	0.000	0.000	0.000
7	1.000	0.000	0.000	0.000	0.000
8	0.000	0.000	0.000	1.000	0.000
9	0.000	0.000	0.000	0.000	0.000
10	0.000	0.000	0.000	0.000	0.000
11	0.000	0.000	0.000	0.000	1.000
12	0.000	0.000	0.000	0.000	0.000
13	0.000	0.000	0.000	0.000	0.000
14	1.000	1.000	0.000	0.000	0.000
15	0.000	0.000	0.000	0.000	0.000
16	0.000	0.000	1.000	0.000	0.000
17	0.000	0.000	0.000	0.000	0.000
18	0.000	0.000	0.000	0.000	0.000
19	0.000	0.000	0.000	0.000	0.000

ROW					
20	0.000	0.000	0.000	0.000	0.000
21	0.000	0.000	0.000	0.000	0.000
22	0.000	0.000	0.000	0.000	0.000
23	0.000	0.000	0.000	0.000	0.000
24	0.000	0.000	0.000	0.000	0.000
25	0.000	0.000	0.000	0.000	0.000

ROW	X10	X11	X12	X13	X14
1	180.000	0.000	282.000	0.000	0.000
2	1.000	0.000	0.000	0.000	0.000
3	0.000	0.000	1.000	0.000	0.000
4	-1.000	0.000	0.000	0.000	0.000
5	0.000	1.000	0.000	0.000	0.000
6	0.000	0.000	0.000	0.000	1.000
7	0.000	0.000	0.000	1.000	0.000
8	0.000	0.000	0.000	0.000	0.000
9	0.000	0.000	0.000	0.000	0.000
10	0.000	0.000	0.000	0.000	0.000
11	1.000	0.000	0.000	0.000	0.000
12	0.000	0.000	-92.000	0.000	0.000
13	0.000	0.000	92.000	0.000	0.000
14	0.000	0.000	0.000	0.000	0.000
15	0.000	0.000	0.000	0.000	0.000
16	0.000	0.000	0.000	0.000	0.000
17	0.000	0.000	0.000	0.000	0.000
18	-92.000	0.000	0.000	0.000	0.000
19	92.000	0.000	0.000	0.000	0.000
20	0.000	0.000	0.000	0.000	0.000
21	0.000	0.000	0.000	0.000	0.000
22	0.000	0.000	0.000	0.000	0.000
23	0.000	0.000	0.000	0.000	0.000
24	0.000	0.000	0.000	0.000	0.000
25	0.000	0.000	0.000	0.000	0.000

ROW	X15	X16	X17	X18	X19
1	-0.004	5392.996	5213.000	0.000	5857.000
2	0.000	0.000	0.000	1.000	0.000
3	0.000	0.000	0.000	0.000	0.000
4	0.000	0.000	1.000	0.000	0.000
5	0.000	0.000	0.000	0.000	1.000
6	0.000	0.000	0.000	0.000	0.000
7	0.000	0.000	0.000	0.000	0.000
8	0.000	1.000	0.000	0.000	0.000
9	0.000	0.000	0.000	0.000	0.000
10	0.000	0.000	0.000	0.000	0.000
11	0.000	0.000	0.000	0.000	0.000
12	0.000	0.000	0.000	0.000	0.000
13	0.000	0.000	0.000	0.000	-92.000
14	0.000	0.000	0.000	0.000	0.000
15	0.000	0.000	0.000	0.000	0.000
16	0.000	-1.000	0.000	0.000	0.000
17	1.000	1.000	0.000	0.000	0.000
18	0.000	0.000	92.000	0.000	0.000

19	0.000	0.000	-92.000	0.000	0.000
20	0.000	0.000	0.000	0.000	92.000
21	0.000	0.000	0.000	0.000	0.000
22	0.000	0.000	0.000	0.000	0.000
23	0.000	0.000	0.000	0.000	0.000
24	0.000	0.000	0.000	0.000	0.000
25	0.000	0.000	0.000	0.000	0.000

ROW	X20	X21	X22	X23	X24
1	746.000	5857.000	464.000	0.000	0.000
2	0.000	0.000	0.000	0.000	0.000
3	1.000	0.000	0.000	0.000	0.000
4	0.000	0.000	0.000	0.000	0.000
5	0.000	0.000	0.000	0.000	0.000
6	0.000	0.000	1.000	0.000	0.000
7	0.000	1.000	0.000	0.000	0.000
8	0.000	0.000	0.000	0.000	1.000
9	0.000	0.000	0.000	1.000	1.000
10	0.000	0.000	0.000	0.000	0.000
11	0.000	0.000	0.000	0.000	0.000
12	-92.000	0.000	0.000	0.000	0.000
13	0.000	0.000	0.000	0.000	0.000
14	0.000	0.000	0.000	0.000	0.000
15	0.000	-92.000	-92.000	0.000	0.000
16	0.000	0.000	0.000	0.000	-1.000
17	0.000	0.000	0.000	0.000	0.000
18	0.000	0.000	0.000	0.000	0.000
19	0.000	0.000	0.000	0.000	0.000
20	92.000	0.000	0.000	0.000	0.000
21	0.000	0.000	0.000	0.000	0.000
22	0.000	92.000	92.000	0.000	0.000
23	0.000	0.000	0.000	0.000	0.000
24	0.000	0.000	0.000	0.000	0.000
25	0.000	0.000	0.000	0.000	0.000

ROW	X25	X26	X27	X28	X29
1	0.000	180.000	644.000	926.000	644.000
2	0.000	1.000	0.000	0.000	0.000
3	0.000	0.000	0.000	1.000	0.000
4	1.000	0.000	0.000	0.000	0.000
5	0.000	0.000	1.000	0.000	0.000
6	0.000	0.000	0.000	0.000	0.000
7	0.000	0.000	0.000	0.000	1.000
8	0.000	0.000	0.000	0.000	0.000
9	0.000	0.000	0.000	0.000	0.000
10	0.000	0.000	0.000	0.000	0.000
11	0.000	0.000	0.000	0.000	0.000
12	0.000	0.000	0.000	-92.000	0.000
13	0.000	0.000	-92.000	0.000	0.000
14	0.000	0.000	0.000	0.000	0.000
15	0.000	0.000	0.000	0.000	-92.000
16	0.000	0.000	0.000	0.000	0.000
17	0.000	0.000	0.000	0.000	0.000

18	0.000	-92.000	0.000	0.000	0.000
19	0.000	92.000	0.000	0.000	0.000
20	0.000	0.000	0.000	0.000	0.000
21	0.000	0.000	92.000	92.000	0.000
22	0.000	0.000	0.000	0.000	0.000
23	0.000	0.000	0.000	0.000	92.000
24	0.000	0.000	0.000	0.000	0.000
25	0.000	0.000	0.000	0.000	0.000

ROW	X30	X31	X32	SLK 10	SLK 11
1	644.000	-0.004	5392.996	8.109	7.000
2	0.000	0.000	0.000	-0.011	0.000
3	0.000	0.000	0.000	0.000	0.000
4	0.000	0.000	0.000	0.000	-0.011
5	0.000	0.000	0.000	0.000	0.000
6	1.000	0.000	0.000	0.000	0.000
7	0.000	0.000	0.000	0.000	0.000
8	0.000	0.000	1.000	0.000	0.000
9	0.000	0.000	0.000	0.000	0.000
10	0.000	0.000	0.000	0.011	0.000
11	0.000	0.000	0.000	0.000	0.011
12	0.000	0.000	0.000	0.000	0.000
13	0.000	0.000	0.000	0.000	0.000
14	0.000	0.000	0.000	0.000	0.000
15	-92.000	0.000	0.000	0.000	0.000
16	0.000	0.000	-1.000	0.000	0.000
17	0.000	0.000	0.000	0.000	0.000
18	0.000	0.000	0.000	1.000	0.000
19	0.000	0.000	0.000	0.000	1.000
20	0.000	0.000	0.000	0.000	0.000
21	0.000	0.000	0.000	0.000	0.000
22	0.000	0.000	0.000	0.000	0.000
23	92.000	0.000	0.000	0.000	0.000
24	0.000	0.000	0.000	0.000	0.000
25	0.000	1.000	1.000	0.000	0.000

ROW	SLK 12	SLK 13	SLK 14	SLK 15	SLK 16
1	0.000	0.000	3.065	0.000	8.109
2	0.000	0.000	0.000	0.000	0.000
3	0.000	0.000	0.000	0.000	0.000
4	0.000	0.000	0.000	0.000	0.000
5	0.000	0.000	0.000	0.000	0.000
6	0.000	0.000	-0.011	0.000	0.000
7	0.000	0.000	0.000	0.000	0.000
8	0.000	0.000	0.000	0.000	0.000
9	0.000	0.000	0.000	0.000	-0.011
10	0.000	0.000	0.000	0.000	0.000
11	0.000	0.000	0.000	0.000	0.000
12	1.000	0.000	0.000	0.000	0.000
13	0.000	1.000	0.000	0.000	0.000
14	0.000	0.000	0.011	0.000	0.000
15	0.000	0.000	1.000	1.000	0.000
16	0.000	0.000	0.000	0.000	0.011

17	0.000	0.000	0.000	0.000	0.000
18	0.000	0.000	0.000	0.000	0.000
19	0.000	0.000	0.000	0.000	0.000
20	0.000	0.000	0.000	0.000	0.000
21	0.000	0.000	0.000	0.000	0.000
22	0.000	0.000	0.000	0.000	0.000
23	0.000	0.000	0.000	0.000	0.000
24	0.000	0.000	0.000	0.000	1.000
25	0.000	0.000	0.000	0.000	0.000

ROW	SLK 17	SLK 18	SLK 19	SLK 20	SLK 21
1	63.663	0.000	0.000	0.000	0.000
2	0.000	0.000	0.000	0.000	0.000
3	0.000	0.000	0.000	0.000	0.000
4	0.000	0.000	0.000	0.000	0.000
5	0.000	0.000	0.000	0.000	0.000
6	0.000	0.000	0.000	0.000	0.000
7	0.000	0.000	0.000	0.000	0.000
8	0.000	0.000	0.000	0.000	0.000
9	-0.011	0.000	0.000	0.000	0.000
10	0.000	0.000	0.000	0.000	0.000
11	0.000	0.000	0.000	0.000	0.000
12	0.000	0.000	0.000	0.000	0.000
13	0.000	0.000	0.000	0.000	0.000
14	0.000	0.000	0.000	0.000	0.000
15	0.000	0.000	0.000	0.000	0.000
16	0.000	0.000	0.000	0.000	0.000
17	0.011	0.000	0.000	0.000	0.000
18	0.000	1.000	0.000	0.000	0.000
19	0.000	0.000	1.000	0.000	0.000
20	0.000	0.000	0.000	1.000	0.000
21	0.000	0.000	0.000	0.000	1.000
22	0.000	0.000	0.000	0.000	0.000
23	0.000	0.000	0.000	0.000	0.000
24	1.000	0.000	0.000	0.000	0.000
25	0.000	0.000	0.000	0.000	0.000

ROW	SLK 22	SLK 23	SLK 24	SLK 25	
1	0.00E+00	0.00E+00	0.00E+00	57.	0.16E+07
2	0.000	0.000	0.000	0.000	5.000
3	0.000	0.000	0.000	0.000	30.000
4	0.000	0.000	0.000	0.000	5.000
5	0.000	0.000	0.000	0.000	25.000
6	0.000	0.000	0.000	0.000	15.000
7	0.000	0.000	0.000	0.000	30.000
8	0.000	0.000	0.000	0.000	45.000
9	0.000	0.000	0.000	-0.011	4.348
10	0.000	0.000	0.000	0.000	45.000
11	0.000	0.000	0.000	0.000	50.000
12	0.000	0.000	0.000	0.000	1380.000
13	0.000	0.000	0.000	0.000	2300.000
14	0.000	0.000	0.000	0.000	20.000
15	0.000	0.000	0.000	0.000	460.000

16	0.000	0.000	0.000	0.000	12.935
17	0.000	0.000	0.000	0.000	30.000
18	0.000	0.000	0.000	0.000	140.000
19	0.000	0.000	0.000	0.000	240.000
20	0.000	0.000	0.000	0.000	600.000
21	0.000	0.000	0.000	0.000	700.000
22	1.000	0.000	0.000	0.000	200.000
23	0.000	1.000	0.000	0.000	500.000
24	0.000	0.000	1.000	1.000	0.000
25	0.000	0.000	0.000	0.011	2.717