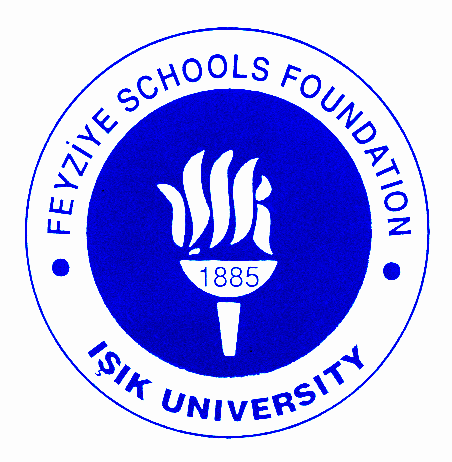
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**IŞIK UNIVERSITY**

**Faculty of Engineering**

**Department of Industrial Engineering**

**An Adaptive Production Planning Model for Heavy Equipment Manufacturing Industry**

**Project Report**

**by**

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**May 2016**

**An Adaptive Production Planning Model for Heavy Equipment Manufacturing Industry**

A Project Presented  
by

**Cem Derin**

**202IE0513**

**Ahmet Durak**

**202IE0126**

to

Işık University  
Department of Industrial Engineering

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## Abstract

Your brief abstract should be here

## Acknowledgments

Any special wishes, thanks and gratitutes should be mentioned here. Don't forget your family and professor!!!

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### 

### Overview

##### Introduction

The first line should be indented right. Regular style for all your body writings is "**Normal**". Please use the correct section heading style from the "Change Styles" menu. If you don't use the right style, your table of contents will not be created properly.

##### Motivation

##### 

##### Contributions

### Problem Description

##### Process under Investigation

You should write your equations in the following format by using the "Equation Editor".



subject to

* (Assignment) Assigning each plate to exactly one slab.

 for all 

* (Weight Range) If we assign plate i to slab j, the plate’s weight lies between its minimum and maximum weight. Otherwise, the weight of plate i assigned to slab j must be zero.

 for all



* (Slab Capacity) Total weight of plates assigned to a given slab must not exceed that slab’s weight. This constraint also prevents assigning plates to slabs that are not chosen.

 for all 

##### Limitations and Restrictions

Your figures should be labeled with the "Caption" style such as this.

Figure ‑ Network Diagram of Steel Manufacturing



### Methodology and Literature Review

##### A Linear Programming Model for Integrated Steel Production Planning

##### ERP Structure

Your tables should be labeled with the "Caption" style such as this.

Table ‑ Raw Material Proportions

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **PRODUCTS** | | | |
| **Mines** | **Bleaching Earth *Proportions*** | **Drilling Earth *Proportions*** | **Cat Litter *Proportions*** | **Desiccant Clay *Proportions*** |
|
| **Alt Yazır** | 70% | 55% | 75% | - |
| **Orta Yazır** | - | 25% | - | - |
| **Üst Yazır** | - | 20% | - | - |
| **Malkara** | 15% | - | - | - |
| **Camcı** | 15% | - | 25% | 25% |
| **Balıkesir** | - | - | - | 75% |

### Design and Solution Approach

##### Applied Solution

##### Data Structure

Table ‑ Sales Data for Bleaching Earth

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Bleaching Earth** | | | | | |
| ***Month*** | ***2002*** | ***2003*** | ***2004*** | ***2005*** | ***2006*** |
| ***1*** | 536 | 699 | 649 | 615 | 633 |
| ***2*** | 531 | 642 | 734 | 596 | 797 |
| ***3*** | 644 | 765 | 815 | 924 | 1.021 |
| ***4*** | 513 | 828 | 387 | 620 | 723 |
| ***5*** | 525 | 777 | 653 | 738 | 1.217 |
| ***6*** | 466 | 414 | 862 | 654 | 845 |
| ***7*** | 577 | 538 | 374 | 652 | 671 |
| ***8*** | 910 | 824 | 896 | 860 | 957 |
| ***9*** | 866 | 746 | 800 | 1.341 | 1.110 |
| ***10*** | 716 | 942 | 1.027 | 933 | 856 |
| ***11*** | 942 | 475 | 544 | 806 | 1.181 |
| ***12*** | 556 | 700 | 463 | 725 | 808 |
| ***TOTAL*** | **7.782** | **8.350** | **8.204** | **9.464** | **10.819** |

Table ‑ Sales Data for Drilling Earth

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Drilling Earth** | | | | | |
| ***Month*** | ***2002*** | ***2003*** | ***2004*** | ***2005*** | ***2006*** |
| ***1*** | 19 | 197 | 38 | 2 | 717 |
| ***2*** | 945 | 65 | 188 | 52 | 0 |
| ***3*** | 57 | 58 | 19 | 51 | 1.002 |
| ***4*** | 102 | 264 | 18 | 653 | 198 |
| ***5*** | 32 | 2.735 | 105 | 986 | 808 |
| ***6*** | 62 | 41 | 600 | 255 | 620 |
| ***7*** | 1.445 | 3.665 | 1.523 | 2 | 135 |
| ***8*** | 267 | 320 | 197 | 464 | 464 |
| ***9*** | 933 | 3.549 | 156 | 171 | 1.578 |
| ***10*** | 82 | 3.900 | 1.229 | 17 | 683 |
| ***11*** | 212 | 128 | 1.731 | 78 | 363 |
| ***12*** | 3 | 437 | 46 | 360 | 1.000 |
| ***TOTAL*** | **4.157** | **15.359** | **5.850** | **3.091** | **7.568** |

Table ‑ Sales Data for Cat Litter

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Cat Litter** | | | | | |
| ***Month*** | ***2002*** | ***2003*** | ***2004*** | ***2005*** | ***2006*** |
| ***1*** | 0 | 0 | 0 | 22 | 66 |
| ***2*** | 0 | 0 | 20 | 42 | 44 |
| ***3*** | 0 | 55 | 0 | 147 | 66 |
| ***4*** | 0 | 50 | 0 | 120 | 66 |
| ***5*** | 0 | 200 | 0 | 77 | 110 |
| ***6*** | 0 | 0 | 0 | 182 | 44 |
| ***7*** | 0 | 0 | 22 | 90 | 131 |
| ***8*** | 0 | 0 | 0 | 20 | 119 |
| ***9*** | 0 | 0 | 0 | 22 | 63 |
| ***10*** | 0 | 0 | 5.808 | 5750 | 5.043 |
| ***11*** | 0 | 0 | 0 | 30 | 110 |
| ***12*** | 0 | 45 | 22 | 44 | 44 |
| ***TOTAL*** | **0** | **350** | **5.872** | **6.546** | **5.906** |

Figure ‑ ARIMA Plot for Bleaching Earth



### Analysis of Results

##### Implementation and Continuous Feedback

##### Sensitivity Analysis

##### Limitations

### Conclusions and Discussions

##### Design of DSS

##### Economical, Social, Ethical and Environmental Impacts

##### Possible Future Work

## Bibliography

[1] Article : A linear programming model for integrated steel production and distribution planning / Mingyuan Chen University of Regina, Regina, Saskatchewan, Canada, and Weimin Wang Federated Co-Op, Saskatoon, Saskatchewan, Canada.

[2] Article : Production Plannin with flexible Product Specifications / *McCombs School of Business, The University of Texas at Austin, Austin, Texas.* Operations Research © 2003 INFORMS Vol. 51, No. 1, January–February 2003, pp. 94–112

[3] Article : A Linear programming decision tool for selecting the optimum excavator / Structural Survey Volume 19 . Number 2 . 2001 . pp. 113±120

[4] Book : Model Building in Mathematical Programming by Williams (4th Edition, Wiley),

[5] Book : Optimization Modeling with LINGO

[6] [www.lindo.com](http://www.lindo.com) website

[7] [www.solver.com](http://www.solver.com) website

## Appendix