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| **Definition** |  | **Units** |
|  | **Monomer production reactor, characterised by:** |  |
|  | Minimum production rate of reactor | Kte/d |
|  | Maximum production rate of reactor | Kte/d |
|  | Mass coefficient for production/consumption of material when reactor processes | - |
|  | Operation cost of reactor | K$/kte |
|  |  |  |
|  | **Polymer lines, characterised by :** |  |
|  | The rate of production of grade in polymer line | Kte/d |
|  | Minimum runtime producing grade in polymer line | d |
|  | Operation cost coefficient of producing grade in line | K$/kte |
|  |  |  |
|  | **Polymer grades, characterised by: , ,** |  |
|  | Conversion ratio between monomers and the grade polymer | - |
|  | Sale price of grade to customer | K$/kte |
|  | Demand of for customer during time period | kte |
|  |  |  |
|  | **Different types of materials including monomers, characterised by: ,** |  |
|  | Sale price of monomers | K$/kte |
|  | Purchase price of monomers | K$/kte |
|  |  |  |
|  | **Time periods, characterised by:** |  |
|  | Length of the period in days | d |
|  | fraction of the time available for production in polymer line for period | - |
|  |  |  |
|  | **Customers, characterised by: and** |  |
|  |  |  |
|  | **IHP points, characterised by:** |  |
|  | Lead time to the UAE gateway (); or from UAE gateway to IHP | d |
|  | Amount of grade that arrives at IHP over because of preceding shipment | kte |
|  |  |  |
| **Subsets** |  |  |
|  | Customer set that receives shipment from IHP |  |
|  | Set of raw material that can be processed in i |  |
|  | Set of polymer grades that can be produced from polymer plant |  |

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| **Variables** |  | **Units** |
|  | Amount of material consumed in unit over period | Kte |
|  | Production amount of monomer plant over period | Kte |
|  | Production amount of grade in polymer line over period | Kte |
|  | Plant inventory level of material over period | Kte |
|  | Amount of material purchased over period | Kte |
|  | Amount of material sold by export over period | Kte |
|  | Shipment of grade to IHP over period | Kte |
|  | inventory level of grade at over period | Kte |
|  | Supply of grade from IHP to customer at period | Kte |
|  | Amount of material flared over period | Kte |
|  | Slack variable for demand | kte |

**What we can show:**

Objective function (Maximisation):

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Production rate constraint for each monomer plant

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Where is the raw material that can be processed in

Minimal constraint for producing grade in

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Where is the set of grade that can be produced in polymer line

Maximal constraint for producing grade in

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| --- | --- |
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Sum of all grades production in a particular unit must be less than the overall time available at duration

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| --- | --- |
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Material inventory balance at the plant

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| --- | --- |
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Bounds on, and :

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For the grade inventory balance at the UAE gateway ():

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| --- | --- |
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| --- | --- |
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| --- | --- |
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For the grade inventory balance at other locations ()

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| --- | --- |
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| --- | --- |
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Demand constraints (modified):

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| --- | --- |
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