1. SUBJECT:

Providing Real Time Equipment Performance Monitoring System for Open Cast Mine III, RG2 Area as below.

a) Performance monitoring of HEMM and other open cast equipment.
b) Monitoring of VHMS and PLM modules’ parameters of all equipment to increase availability of Equipment and to reduce idle time.
c) Real time and Dynamic Allotment of Dumpers to shovels to reduce idle time of shovels and queuing of dumpers.
d) Trip counting of coal and over burden dumpers.
e) Generation of coal and over burden production.
f) Fuel Management.

2. HEMM AND OTHER OPEN CAST EQUIPMENT AVAILABLE:

<table>
<thead>
<tr>
<th>Equipment Type</th>
<th>Capacity</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hyd. Shovel</td>
<td>1.0 Cu.m (Tata Hitachi)</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>2.8 Cu.m (D-3(L&amp;T))</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>5.0 Cu.m (L&amp;T)</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>6.5 Cu.m (Tata Hitachi)</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>12.0 Cu.m</td>
<td>1</td>
</tr>
<tr>
<td>Rope Shovel</td>
<td>10.0 Cu.m (BEML&amp;HEC)</td>
<td>5</td>
</tr>
<tr>
<td>Dumpers</td>
<td>35 T (HM)</td>
<td>34</td>
</tr>
<tr>
<td></td>
<td>60 T (BEML)</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>85 T (CAT)</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>100 T (CAT)</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>100 T (Komatsu)</td>
<td>17</td>
</tr>
<tr>
<td>Dozers</td>
<td>155 (BEML)</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>355 (BEML)</td>
<td>10</td>
</tr>
<tr>
<td>Drills</td>
<td>IEM 70E 250 mm</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Recp-250 mm</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Recp-150 mm</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>IDM-30/Atlascapco</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>150mm/Sandvik</td>
<td></td>
</tr>
<tr>
<td>Loaders</td>
<td>(HM)</td>
<td>4</td>
</tr>
<tr>
<td>Motor Grader</td>
<td>BG-825</td>
<td>4</td>
</tr>
<tr>
<td>Water Tanker</td>
<td>28000 KL</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>(BEML-2/HM-4)</td>
<td></td>
</tr>
<tr>
<td>Dragline</td>
<td>30.6 (BEML)</td>
<td>1</td>
</tr>
</tbody>
</table>

3. PERFORMANCE MONITORING OF HEMM AND OTHER OPEN CAST EQUIPMENT:

The system should monitor the current and historical data of various indications of VHMS, PLM modules, etc, available in the system of HEMM. The indications monitored are hour meter, coolant temperature, engine oil level, battery voltage, etc. These indications should be monitored from any of the user terminals. System shall also generate warning for indications that cross the allowable levels. Timely intervention by maintenance crew shall save an HEMM from serious break downs.

Total engine hours of an HEMM shall be arrived by tapping signal from on-board hour meter. Preventive maintenance schedule report is to be generated using this.
Any break down or repair should be recorded and it is immediately to be intimated to concerned persons by displaying the message and by sending sms to help in prompt action by maintenance crew for saving valuable time and thereby improving availability of HEMM. Also, provision is to be given for operators of HEMM to record break down by pressing a key provided on on-board unit.

4. **MONITORING OF VHMS AND PLM MODULES’ PARAMETERS OF ALL EQUIPMENT TO INCREASE AVAILABILITY OF EQUIPMENT AND TO REDUCE IDLE TIME:**

The following audio-visuals indications should be provided for monitoring VHMS & PLM parameters of different equipment.

**Dumpers:**

To capture maximum speed, average speed, distance travelled, waiting time, loading time, unloading time, load carried by dumper for each trip.

Alert audio messages in Telugu & English to be given to Dumper Operators and control room person for the following events.

a) In the case of Operator exceeds pre-defined maximum speed for different dumpers.
b) In the event of dumpers travelling in opposite direction falls in line.
c) To maintain safe distance between dumpers travelling in the same direction.
d) Fire warning to Operator and to control room in case of catching fire.
e) Bucket hoist indication to be given in the event of dumper travelling in bucket hoist position.

The system should capture the parameters of VHMS module and other parameters not covered by VHMS of the equipment to monitor the following items:

Engine oil pressure, transmission oil pressure & temperature, boost pressure, coolant temperature, exhaust gases temperature, coolant flow, coolant level, RPM, Intake air pressure & temperature, fuel level, torque convertor and transmission, oil temperature & pressure, hydraulic break oil temperature, alternator out put, battery voltage, fault codes along with details, tyre inflation pressure & temperature.

**Hydraulic Shovels:**

Engine oil pressure, engine oil level, coolant temperature, air filter chocking, fuel level, PTO oil level & temperature, hydraulic oil level & temperature, hydraulic pump pressure, alternator out put, fault indicator & battery voltage.

**Rope Shovels:**

a) Data shall be tapped for currents(DC) of hoist system, crowd system, swing system and propel system.
b) Main motor AC current.
c) Temperatures of machine room, hoist system, crowd system and swing system.
d) For the above necessary sensors are to be installed arranged.

**Dragline:**
5. **REAL TIME AND DYNAMIC ALLOTMENT OF DUMPERS TO SHOVELS TO REDUCE IDLE TIME OF SHOVELS AND QUEUING OF DUMPERS:***

   The system should display vehicle position on real time basis on a mine map in all the clients. Mine map on which vehicle position is to be displayed will be provided by SCCL from time to time. The facilities like zooming, tracing and tracking the trucks shall be provided. The system shall show position, speed and time duration for HEMM to complete an event.

   The system should display instantaneous and periodic alert messages regarding break down, idle time, in a control panel and to the connected clients of all the equipment.

   The system shall support different icons for different vehicles. The system shall log vehicle movement. This should provide instant warning on inadvertent entry of vehicles in blasting zone during specified time.

   The system should capture online locations of moving and non-moving HEMM. It should capture status of equipment like break down, loading, empty travel, loaded travel, dumping, other alarms, speed etc. The system should capture electrical signals from dash board of equipment.

   The system should display configurable maps of haul roads and other survey features in the mine superimposed with a dynamic representation of equipment location and status. The real time movement of HEMM could be seen on the computer screen. Equipment with different status is to be represented with different coloured icons. Relevant information regarding the equipment’s performance is to be provided like when was an operator allotted to the equipment, when did it take the first load, how many trips has it made in current shift, working/idle/maintenance hours in the current shift, current operation status, allocation, graphical analysis of performance etc.

   The system should display exceptions, warning messages and land marks crossed etc. through pop-up windows and scrolling text. For example, any break down or availability of HEMM should immediately be flashed on all the display modules open on any of the user terminals. It is required to speed up the necessary action to be taken up by the concerned people.

   The system should provide facility for voice connectivity between control room and any of the on board unit installed on HEMM. Mine Supervisors should able to talk to operators of HEMM to save valuable time.

   Dynamic allocation of various dumpers to different shovels and monitoring their progress up to different dump sites and back should be done based on suitable algorithm. Allocation of equipment to operators should be done depending on various factors like operators skill for various HEMM, supervisor’s priority for operators, operator’s preference for different HEMM etc.

   After the attendance is over, at the beginning of the shift, the system shall capture the availability of operators and HEMM and instantly, the system shall allot the equipment to operator. At the same point of time, the dumpers should also be allocated to their first destinations (shovel or dump) to reduce time loss at the shift start. Apart from initial allocation, during shift, whenever an equipment or operator becomes available for allocation, the system should allocate it automatically.

   The system should try to optimize the mine situation by reducing shovel idling, dumper queuing etc. to lead to higher machinery utilization and more productivity.

6. **TRIP COUNTING OF COAL AND OVER BURDEN DUMPERS**
The system shall provide provision for trip counting of coal and over burden dumper trips from loading points to unloading points.

The system shall provide to ensure that the dumper reached allotted shovel for taking load of coal or over burden.

The system shall provide to ensure that all the dumpers are taken load at loading points and also to ensure that the dumpers are unloaded at unloading points / yards.

At loading points of coal and over burden, the system shall capture the details of both shovels and dumpers with date and time. The system shall capture the shovel hand shaking with the dumper for the purpose of shovel wise dumper wise trips counting. The system shall ensure the dumpers loading with coal or over burden at loading points.

7. GENERATION OF COAL AND OVER BURDEN PRODUCTION:

After the operator attendance and allocation is over, the system should display production data on real time basis.

The system should be able to monitor and provide production figures for over burden and coal without intervention of operators. Shovels and dumpers working in OB can get diverted to coal or vise-versa in between the shifts.

The production figures are to be based upon the actual coal/OB loaded on to the dumpers and number of trips made by the dumpers.

8. FUEL MANAGEMENT:

In opencast mine, bowsers are used for fueling HEMM equipment like shovels, drills etc. stationed in quarry. Bowsers will be taking fuel from fuel bunk on the surface and travel to the quarry and pump fuel to stationed HEMM equipment in the quarry.

The system should facilitate fueling from both stationery (diesel bunk) and mobile (diesel bowser/mobile tanker) stations. The system shall automatically identify the vehicle that needs to be filled at fueling area. The system shall capture and transmit, in real time, the diesel filling details to be central server from both mobile and stationary fueling stations.

The system shall ensure that while filling the diesel, automatically stop when tank is filled or about to be filled up to neck. The system shall provide accurate and comprehensive information on fuel usage to reduce fuel theft and unauthorized usage of vehicles.

The fuel available in the HEMM equipment should be displayed and the required fuel is to be pumped. Both the readings are to be captured.

The total cycle of fuel taking and pumping shall be automated. Authorized equipment including bowser should be identified before taking or pumping fuel. The system shall prevent/alert unauthorized vehicles from being filled at the fuel station. During pumping fuel from bowser to authorized equipment, the nozzle should not be allowed to pull out to arrest pilferage of fuel.

Equipment-wise, shift-wise fuel consumption should be captured. The total fuel supplied and fuel consumed should be tallied to ensure no pilferage of fuel is done.
9. NETWORK FOR DATA AND VOICE COMMUNICATION:

The firm shall present with suitable cost effective networking technology to establish connectivity for transfer of data and voice communication in the open cast quarry area to control room.

The network should fulfill the total requirement of the project for transferring data from HEMM to control room and other features mentioned above. Also, it should support required voice communication.

10. SYSTEM SOFTWARE:

The firm should develop web based software to fulfill the objective of the project and for generation of required reports.

The software should facilitate displaying of maps superimposed with a dynamic representation of equipment location and status for authorized remote clients.

The database shall be ORACLE. Necessary ORACLE user licenses will be provided by SCCL.

The software should be integrated with MMS Application which is in operation at OC Mine. The software should also be integrated with SAP.

The data is to be hosted in central server located at Singareni Bhawan, Hyderabad. The servers, clients will be on SCCL account. LAN connectivity in the control room and connectivity from control room to remote locations will be taken care by SCCL.

11. REPORTS:

Production:

a) Cause wise equipment idleness report
b) Equipment production report
c) Dumper production report (shovel-wise)
d) Shift production report
e) Dump yard wise production report
f) Dump cubic meter-kilometer
g) Target-Achievement report
h) Equipment status report
i) Exceptions reported against Dynamic allocation by the system by on board instrument
j) Shift wise trip sheet report
k) Trip progress report
l) Shift-wise, equipment-wise analysis report giving performance details
m) First loading at shift-start/last loading at shift end
n) Any other customized report with user friendly interface

HEMM Performance Reports

a) HEMM availability/utilization report
b) Operator performance report, with number of trips, kilometers run
c) Report showing variation of production with variation in availability of HEMM
d) Breakdown analysis report
e) Equipment availability/utilization report
f) Exceptions report
g) Fuel consumption – Equipment wise
h) Equipment wise tyre pressure and temperature
12. **SCOPE OF WORK**:

The firm shall provide Comprehensive Integrated System for Open Cast Mining Operations for the following Areas for OC III, RG2 Area: under BOO concept (Build, Own & Operate), for a period of 5 years.

- **g)** Performance monitoring of HEMM and other open cast equipment.
- **h)** Monitoring of VHMS and PLM modules’ parameters of all equipment to increase availability of Equipment and to reduce idle time.
- **i)** Real time and Dynamic Allotment of Dumpers to shovels to reduce idle time of shovels and queuing of dumpers.
- **j)** Trip counting of coal and over burden dumpers.
- **k)** Generation of coal and over burden production.
- **l)** Fuel Management.

The firm shall suggest suitable cost effective technologies to fulfill the above objectives. The technologies may include suitable on-board equipments, Access Control units, on-board systems, sensors, logics, Network components, etc. for fulfilling the complete scope of work.

13. **STATUTORY RULES**

The firm should follow -

- **a)** All statutory rules, regulations, applicable laws etc., and statutory requirement related to government licenses, workmen compensation, insurance etc., including minimum wage act, for their personnel/works.
- **b)** Should follow rules, if any, imposed by local/state/central authorities should also be complied with by the contractor(s).
- **c)** Should indemnify the company (SCCL) from any liability befalling on SCCL due to any commission/omission by himself or by his representative or by his employee or by any third party in execution of contract. if the company (SCCL) is made liable for such claims by the court or authority, the same should be reimbursed to the company (SCCL) by the contractor(s), as if the company (SCCL) has paid on their behalf.
- **d)** During the course of execution of the work, if any accident occurs whether major or minor, the successful tenderer(s) or his supervisory staff should inform the same immediately without any delay to the colliery manager/project officer/agent/general manager concerned to take steps in accordance with the mines act and other relevant laws, otherwise, the successful tenderer(s) or his supervisory staff will be prosecuted for violation of the mines act and other relevant laws.

14. **FORCE MAJEURE CONDITIONS**

The following shall be treated as force majeure conditions.

- **a)** Natural calamities,
- **b)** War
- **c)** Public commotion
- **d)** Fire
- **e)** Regulations of the Government authorities

15. **Acceptance Test:**
The firm should formulate acceptance procedures.
The acceptance test will be carried by SCCL nominated personnel.
Acceptance test will be carried out at SCCL site on signing the acceptance test plan by both SCCL & firm, the project is deemed accepted and the contract will be in force from that day subject to terms and condition.

16. TERMS AND CONDITIONS:
A) TECHNICAL
a) The equipment / gadgets using various technologies shall be state of the technology available in the world.
b) Getting and renewal of licenses for all the related systems like GPS/ RFID etc is the responsibility of the firm.
c) The equipment / gadgets used shall not disturb / hamper any system or functionality of the transport vehicles.
d) Only provision will be given to tap the power from the auto electrical circuit of the HEMM equipment.
e) Power tapping circuit should be in proper layout & should have separate fuse.
f) The on board equipment should be able to work with the available voltage in the vehicle.
g) Transfer of on board equipment from one vehicle to other should be on free of cost.
h) The problem in any of the equipment / gadgets should be solved within two hours from time of the report. Otherwise, delay will attract the penalty clause.
i) Firm should maintain sufficient stocks of all the equipment / gadgets.
j) The data transmitted shall fit in to SCCL’s database structure wherever required.
k) The cost of all On board equipment, sensors, system logics, Access Control units, on-board systems, sensors, logics, Network components, etc. is on firm’s account.
l) The replacements for these equipment during contract period is on firm’s account.
m) Maintenance of all the above equipment is to be done by the firm with their manpower.

B) GENERAL
a) All the persons deployed by the firm shall be trained at SCCL training centers. The persons shall carry the identity card issued by the contractor.
b) VTC, Medical Examination Certificates shall be produced to the Office of the Mine Manager.
c) The safety of the persons deployed in the project site is the responsibility of the firm and shall produce indemnified bond.
d) The firm shall identify one senior person as project manager till the completion of project, who is well versant with all the related technologies and shall take spot decisions and authorized to draw minutes of the meeting from time to time.
e) SCCL provides all the civil structures if any with power supply at free of cost.
f) Training is to be given to all the truck drivers, control centre staff & all the related persons at free of cost.
g) The entire work of implementation should be completed within 4 months from date of release of firm order.
h) The stay of the employees from firm side at project shall be the sole responsibility of the firm including their transportation for entire period of the project.