Safer Coal Sampling System in NTPC, Korba

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Introductions: As per CERC guidelines third party sampling of coal by CIMFR has been started pan NTPC basis from September 2016. As per tripartite agreement sampling has to be done both at loading end in the mines area and at unloading end in power plant area. As per directives of CERC the sampling has to be done from wagon top in both loading and unloading end.

Hazards identification: There are some inherent safety issues involved in wagon top sampling. After a rake is loaded, then the rake is made stable in one location. For collection of samples, persons climb up to the wagons and collect sample and then climb down. During unloading end sampling, when a rake reaches station, just before entering track hopper or wagon tippler area, the rake is made stable then sample collection is done from wagon top by manual method. At the very beginning detailed brain storming done by NTPC, Korba team to identify the hazards involved in the process. Major safety issues in this process are as follows:

a) During climb up and climb down from wagon top, chance of falling
b) During movement from one wagon to another wagon, chances of falling from wagon gaps
c) During wagon top sampling, sudden opening of Bottom gate of BOBR wagon when the rake is on Track hopper, this may lead to falling of person along with coal.
d) Movement of stable rake during sampling due to communication failure.
e) In electrified track, there is possibilities of electrocution

Safety initiatives: Various safety initiatives has been incorporated by NTPC, Korba to minimize risk involved during wagon top sampling at both loading and unloading end. All the sampling staffs has been issued PPEs and reflector fitted dress. CCTV have been installed to monitor safety practices.

Fig 1

a) During climb up and climb down from wagon top, chance of falling: To make the climbing process safe suitable platforms has been made in both loading and unloading end.

b) During movement from one wagon to another wagon, chances of falling from wagon gaps : Instruction has been given to resist movement through wagon top. Persons has to climb up in particular wagon, then collect sample, after that climb down. Then they have to repeat the procedure for next randomly selected wagon, and repeat the process.

c) During wagon top sampling, sudden opening of Bottom gate of BOBR wagon when the rake is on Track hopper, this may lead to falling of person along with coal – To prevent this clear standard operating procedure has been issued for not doing any sampling when the rake is inside the track hopper.

d) Movement of stable rake during sampling due to communication failure: New innovative procedure has been implemented to prevent such hazard, which is described later.

e) In electrified track, there is possibility of electrocution: In NTPC, Korba tracks are not electrified so this hazard is not applicable in Korba. But in other station where it is electrified, there detailed safety precaution is taken by isolation of the section, before starting of wagon top sampling process.

Movement of stable rake during sampling due to communication failure: During the initial phase of wagon top sampling at mines end, it was reported by the sampling persons of CIMFR that there were a instance of rake movement while sampling was under process and the rakes moved almost 5 km before it could be stopped and then the sampling persons climbed down from the loaded rake. The exiting operating procedure was as follows:

1. After completion of rake loading at silo, engine driver moves the rake and stables it in a location which is just outside silo area. The loco driver informs ASM (Asst Station Master) Silo control room, by walkie talkie that loading has completed. Then ASM informs CIMFR sampling supervisor that sampling could be started. After completion of sampling, CIMFR sampling supervisor informs ASM that sampling has been completed. Then ASM inform loco driver that movement can be started for onward journey. The process is graphically shown below:

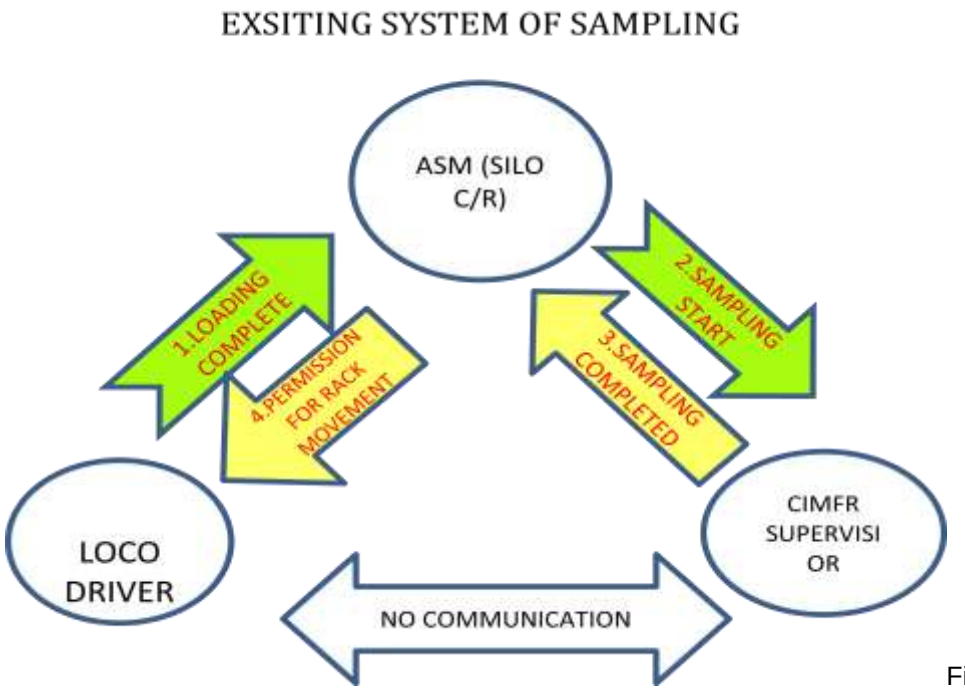

Fig-2

2. The drawback of the existing system are the followings:
    a. Loco driver is physically 0.6 km away from ASM and CIMFR supervisor is 0.3 km away from the ASM
    b. All the activities are based on verbal communication
    c. Sometimes sample team just jump start sampling job with out informing the ASM
    d. Unauthorized person can communicate with the ASM, causing unsafe movement of rakes.
    e. There is no communication between the loco driver and the sampling team.

Innovative solution by means of VISUAL INDICATION SYSTEM: To make coal sampling operation more reliable & safe, visual indication system incorporated with existing verbal communication. The system is explained below:

a. Sampling permission given by ASM. In his console he put the selector switch to “Permission for sampling”. A green light glows in his panel and simultaneously to CIMFR Supervisor panel (which is located in the field, in the sampling area).
b. Without permission of ASM, Sampling shall not start.
c. Then CIMFR supervisor, set the selector switch to “Sampling On”. With that a Red light glows on in ASM panel, CIMFR supervisor panel and the Railway Red Signal turned ON. ASM will not RESET the RED SIGNAL without permission of Coal sampling SUPERVISIOR. CIMFR panel is kept under lock and key, and key is only available with CIMFR supervisor.
d. After completion of sampling, CIMFR supervisor RESET the signal at his panel. Simultaneously it resets in ASM panel & Sampling ON signal. Then ASM reset the Red signal in Railway point.
e. As a second line of protection, ASM speaks with Loco driver in VFS set. Now the rake is ready for departure.
f. Private No. is exchange by ASM & CIMFR Supervisor during START and COMPLETION of coal sampling with time at their register respectively.

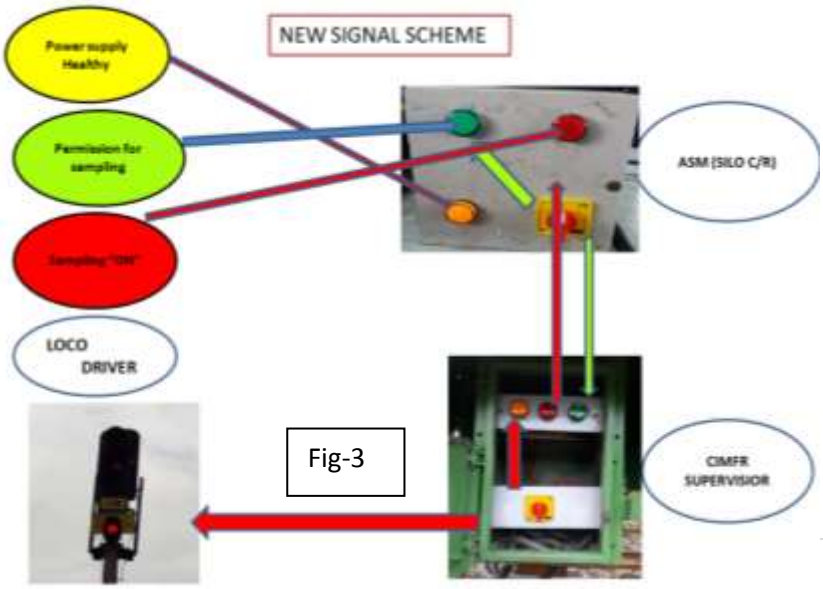

Fig-3

Console at CIMFR Supervisor end


Console at ASM end

Railway Sampling signal at TH end

Railway Sampling signal at TH end

g. This Visual Indication System has been provided in both loading at Gevra and at unloading end in Track Hopper 1 & 2 in NTPC, Korba.
h. This system can be repeated in all the NTPC stations and in other power station to make sampling system safer.
i. To institutionalize the system following Code of safe practices for sampling has been issued.(Annexure I)

New Project in Drawing Board

In MGR during BOBR rake unloading, laborers clean the coal from railway track for preventing derailment during rake movement. One hazard associated with the job is that if there is miscommunication between MGR unloading supervisor and loco driver, then rake can be moved while cleaning is under progress. To prevent such scenario existing practice is MGR supervisor speaks to loco driver after completion of each box cleaning. Special hooters also installed in both the Track hopper top, to caution the cleaning laborers. But as this is only verbal communication, there are always possibilities of miscommunication.

So it was emerged after brain storming that a wireless communication with visual signal system may be installed to make the communication between MGR unloading supervisor and Loco driver safer. Minimum requirement of the system should be such that it should have a range of more than 500 meter, and signal between loco in Track Hopper I & II should not interfere, as generally simultaneous unloading of rakes goes in both the track hoppers. So we had send our requirement to various wireless vendors.

Hand set of the wireless device

After multiple visit at site, two parties come with innovative solution. The system is that for each loco (there are 09 locos in Korba) there will be a dedicated wireless device. For each loco there will be paired devices, which will be in the hand of the Loco driver and MGR Unloading Supervisor. The set of Loco driver and the MGR unloading supervisor for a particular rake is paired by means of dedicated signal. This pair will not interfere with other sets with other loco driver. Based on requirement the MGR unloading supervisor will put on RED signal for stoppage of loco. When cleaning of track below the BOBR is completed, he will put on GREEN signal, which will be flashed in driver's unit with RED light and a sound initiation. Loco driver will acknowledge the same. In this way a safer unloading can be done. The system has been trialed in two locos, stationed at Track Hopper 1 & 2. It worked satisfactorily up to a range of 500 meter. The cost implication for all the 9 locos will be around Rs 15 Lakhs.

Conclusions: With implementation of all the above system the Wagon top sampling has become safer. Our future project of wireless system will make MGR unloading much safer. All these can be implemented in all the NTPC stations and in other power stations.

Annexure –I

Code of safe practices for collecting of coal samples from NTPC KORBA (MGR) Rakes at SECL, Gevra Loading point.

To improve the operational activity during coal sampling and ensure safety of persons involved in collection of coal sample, a new "VISUAL INDICATION INTERLOCKING SYSTEM" has been commissioned at SECL SILO Loading point.

Following things are provided at SILO .

a. Additional Red LED Signal is provided for Loco-driver on Signal No. 10 of SILO out point
b. "STOP SAMPLING ON".
c. Control & Indication panel for ASM at NTPC SILO control room.
d. Control & Indication panel for CIMFR SUPERVISIOR at sampling point with Lock & key arrangement

Operational Practices and Interlocking.

Step(1)- After completion of loading, Rake is halted at predefined location for Sampling by Loco driver.
Step(2)- Sampling Request shall be given by CIMFR Supervisor .

Step(3)-

a. Sampling "permission" will be given by ASM by making control switch (S1)"ON".
b. "GREEN" indication will appear in Control panel of CIMFR SUPERVISIOR & ASM.
c. "Without permission of ASM, sampling shall not start".

Step(4)-

a. Sampling "START" signal will be given by CIMFR supervisor by Unlock the panel & making control switch (S2)"ON".
b. Additional "RED" signal will "ON" at signal No. 10 "AS SAMPLING ON" FOR LOCODRIVER.
c. "RED" indication at control panel of ASM & CIMFR SUPERVISIOR's during coal sampling.
This is done in view of making them aware that coal sampling is being carried out and they should not go for moving the train until the work is completed.

Step(5)- Once sampling has started (RED indication appear), ASM will switch "OFF" (S1). *" No signal will be RESET".*

Step(6)-

a. Completion of sampling and withdrawal of manpower shall be informed by CIMFR supervisor by making control switch (S2) "OFF".
b. It will RESET (TURN OFF) all RED & GREEN Indication & "STOP SAMPLING ON" signal. *" Clearance of sampling completion by CIMFR Supervisor".*

Step(7)- After dual confirmation through VHF set , ASM will permit RAKE movement as per MGR operational practices.

Step(8)- Private No. is exchange by ASM & CIMFR Supervisor during START and COMPLETION of coal sampling with time at their register respectively.