Rolled in scale seminar course

1. Basic knowledge on features of scale in HSM operation
   a. Three kinds of Oxide
   b. Hardness of oxide and steel
   c. Generating speed of scale
   d. Effect of Si, Ni and Cu at reheating furnace
   e. Removability of rolled in scale depending on content and temperature

2. Descaling
   a. Evaluation of descaling capability: pressure, water volume, nozzle type, distance, nozzle arrangement, number of headers
   b. HSB and rougher descaler
   c. FSB
   d. Interstand descaling
   e. Ultra high pressure descaling

3. Work roll
   a. Roll surface black scale or black oxide layer
   b. Heat transfer to WR from rolled material and effective way to cool WR
   c. Mechanism of WR deterioration and generation of roll banding and rolled in scale
   d. Introduction of HSS roll

4. Roll cooling, strip cooling, roll gap cooling and lubrication rolling
   a. Roll cooling Necessary amount and distribution among stands and between entry and delivery
   b. Strip cooling
   c. Roll gap cooling
   d. Lubrication rolling

5. Approach to find the causes of rolled in scale
   a. Find the size, type and their distribution in longitudinal and transverse directions as well as top or bottom surface.
   b. Deformation behavior and temperature distribution and transient from reheating furnace to finisher
   c. Precise inspection at pickling line: You can surely find all types of rolled in scale here.
   d. Use of Parsytec system
   e. The timing of ON-OFF of descalers, strip coolant and roll gap cooling
   f. Evaluation of the effectiveness of lubrication rolling: Loads were really reduced?
      Bottom surface was really lubricated?
   g. Find rolled position in finisher rolling campaigns as well as rougher rolling campaign.
   h. Study contents and rolling temperature.
   i. Ask research laboratory to use equipment for analysis, such as light microscope, SEM, EPMA and so on.
   j. Measure the actual descaling pressure during rolling.

6. All types of rolled in scale, their causes and countermeasures
   6-1. Real rolled in scale
   a. Scattered sands scale or salt and pepper scale
   b. Comet scale
   c. Spindle scale
   d. Line scale
   e. Dragged mark scale
   f. Band scale
   g. Big wave scale
   h. Fish scale type scale
i. HSS roll type scale
j. Red scale
k. Roll component scale
l. Edge scattered sands scale
m. Rougher roll scale
n. Cu scale or Cu scab
o. Wood grain shallow scale

6.2. Non-real rolled in scale found at cold rolling
a. Scale pressed into steel surface at subsequent lines such as pickling line
b. Attached scale particle after finisher stands
c. ROT table roller scratch
d. Rust hole by water

7. Actual training in rolled in scale problem at your HSM and pickling line
a. Training in specific rolled in scale that you suffer at your HSM