



## Cable Theft – an international perspective

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on behalf of the IRSE International Technical Committee

### INTRODUCTION

With the exception of the oldest mechanical and the newest radio-based systems, railway signalling relies very heavily on the use of electrical cables running along the track to signals, points, train detection and train protection equipment. The high price of copper makes these cables a tempting target for thieves, who steal the cables and strip the insulation to sell the copper content as scrap metal.

The cost to a railway infrastructure manager is enormously greater than the value of the cable itself, through the man hours worked in replacing the stolen cable and compensation paid to railway undertakings for the train delays that result from the signalling system failure. There may also be an impact on safety - while most cable thefts result in a "fail safe" consequence, there have been examples of wrong side track circuit failures due to stolen rail bonding and electrical hazards due to stolen earth connections – not to mention additional hours worked trackside to make the repairs.

A number of railways in Europe have experienced increasing levels of disruption from cable theft in the last five years, and this has prompted the IRSE International Technical Committee to collate information from different countries around the world about the operational impact and the initiatives that are being taken to combat the problem. The detailed results are listed in a table – the rest of this article analyses some of the headline issues.

### A serious problem for many railways

Cable theft is a concern for many European railway networks, with typical annual train delays of between five to twenty delay minutes per km of route. This may not sound all that much, but the compensation bill to railway undertakings for train delays adds up to tens of millions of Euros for some infrastructure managers.

### Burial is the best defence

Railways that routinely bury their cables instead of running them in surface troughing experience much less impact from theft of operational signalling cables (e.g. Finland and Switzerland). This does not make them entirely immune – they have experienced theft of cables not yet installed from worksites, and of overhead electrical supply return conductor cables.

### Reduce the amount of copper on the ground

Replacing communications cables with optical fibre and power cables with aluminium makes a much less tempting target – assuming the thieves are smart enough to realise the cables are not copper before they cut into them.



### *The greatest train robbery yet.*

*Over the past three years cable theft cost the taxpayer more than £43 million, and the problem is growing. But it also costs passengers thousands of hours of their time through signal failure caused by stolen and damaged cables. We're working with British Transport Police and train operators to stop cable thieves stealing even more of your time and money.*



Report cable theft by calling  
British Transport Police on  
0800 40 50 40

Helping Britain run better



### Railways need to work with law enforcement agencies

Railways are not the only victim, there is also theft from buildings and electrical supply networks. The impact of cable theft is now being recognised in some countries with changes in the law requiring evidence of identity to be recorded when scrap metal is traded, and punishment for convicted thieves taking into account the cost of disruption as well as the value of the cable stolen. In the UK this is proving to be a significant deterrent for casual small scale criminals. It may be less effective in continental Europe where organised gangs can more easily transport large quantities of cables across borders – there are even stories of container loads being exported to recycling plants in China.



## Plan to manage the consequences

The operational impact can be minimised if processes are in place to detect and repair the damage as rapidly as possible, and backup procedures are in place to allow trains to continue to move in a degraded mode of operation. These responses range from simple initiatives, e.g. making sure repair staff have ample stocks of the right types of cable, to more radical approaches using diverse sources of information such as GPS location reports from trains and conditioning monitoring data from points to manage train movements when the primary signalling system is unavailable.

## There is some success to report

In the UK at least, the range of measures that have been put in place seems to be turning the tide against the cable thieves. Network Rail reported a 50% reduction in train delay minutes in 2012/13 compared with the previous year. ProRail in the Netherlands have reported a 40% drop in incidents in 2013 compared with 2012. Internationally, there are initiatives by the UIC and CER to share best practice amongst the railways and raise the political profile of the issue at a European level.

*See spreadsheet opposite for table of measures*

1 Network Rail Cable Theft Poster

2 British Transport Police raid a Scrap metal dealer

3 Cable Theft Repair work

4 Belgian Cable Theft poster

5 Police are taking a hard line on cable theft

6 British Transport Police officer checking cable during a scrap-yard visit

7 SmartWater forensic spray can be detected using UV lights to link them back to a particular crime scene, long after the offence has taken place



## IMPACT OF CABLE THEFT AND MITIGATION MEASURES

	UK	Netherlands	France	Belgium	Germany	South Africa	Australia
<b>Severity of the problem</b>							
Train delays (hours per year)	5300	170	5800	543	4000		
Year of report	2008-2011	2010	2010	2010	2012		
Network size (km)	16321	2896	29640	3513	41981		
Normalised delays (minutes per route km)	19	4	12	9	6		
<b>Measures to make cable more difficult to locate and remove</b>							
Sealing cable troughs with locked or glued lids	X		X				X
Tie together cables	X		X			X	
Buried cable routes instead of surface troughs or open wire pole routes			X			X	X
Routing tail cables below, not above the ballast						X	
Fewer access points, e.g. disconnection boxes for track circuits, axle counters						X	
Avoid temporary cables on the surface during re-signalling work							X
Don't use bright colours that draw attention to the cable						X	
Don't mark location of buried cable routes						X	
Use apparatus cases that resist unauthorised entry and fire						X	
Painting bare copper wire so it looks like another metal				X			
Coating tail cables with black grease							X
<b>Using cables that are less valuable to thieves</b>							
Replace copper with fibre (communications)	X					X	X
Replace copper with aluminium (power)	X		X		X		X
Replace copper with steel (earth bonding)						X	
Fouling technology that contaminates copper if it is melted						X	
<b>Marking cables so they can be identified after they are stolen</b>							
Cables with distinctive marking	X				X		X
DNA tagging/Smartwater	X	X	X	X	X		
<b>Means of detecting theft as it occurs</b>							
Intruder alarms on buildings	X						X
Cable condition monitoring			X				
Tremblers, detecting disturbance	X						
CCTV (overt and covert)	X		X				
Security teams at high risk sites (e.g. cables not yet installed)	X	X		X			
<b>Making it harder to sell stolen cable</b>							
Law to prevent scrap being sold for cash anonymously	X			X			X
Railway staff visits to scrap metal dealers	X				X		
<b>Increasing the likelihood and severity of punishment</b>							
Sharing intelligence between railway, police, tax authorities	X	X			X		
Use of railway and police helicopters	X		X				
Police visits to scrap dealers and known criminals	X	X	X				
Raising public awareness of consequences of cable theft	X						
Sentencing taking account of cost of disruption, not just cost of cable	X						
<b>Minimising impact on railway operations</b>							
Duplicate/diverse/reconfigurable communications	X					X	X
Duplicate/diverse/reconfigurable power supplies	X						X
Equipment to detect where cable has been cut	X						
Vehicle on stand-by loaded with main cable types	X						
GPS train location							
as backup to conventional train detection	X						
Condition monitoring via radio							
as backup to conventional points detection	X						

Note: this table lists those mitigation measures specifically reported for each country - there will undoubtedly be others.