Instances

Table 1 presents data on mining equipment in operation collected from dispatch and telemetry systems. The equipment set includes loaders, shovels, drills, motor graders, heavy haulers, and bulldozers. Column 1 lists the characteristic, while Column 2 shows the range of values this characteristic can take for the mining equipment included in the instances used. The first line shows the amount of mining equipment. Line 2 presents the fuel consumption of the mining equipment in liters per hour. Lines 3 and 4 report the equipment's tank capacity and the fuel amount at the beginning of the work shift, both in liters. Line 5 shows the critical fuel level as a percentage. Finally, lines 6 and 7 display the start and end of the time window in minutes. When the mining equipment reaches the critical fuel level, it may run dry. Therefore, the critical level is used to calculate the end of the time window, representing the maximum time the equipment can continue operating with the existing fuel supply in its tank without refueling.

Table 1.: Mining equipment characteristics

Characteristics	**Range values**
#Mining equipment	10 - 92
Fuel consumption (L/h)	10 - 246
Tank capacity (L)	300 - 4940
Fuel at the beginning of the work shift (L)	162 - 3897
Critical level (%)	20 - 35
Start of time window (min)	0
End of time window (min)	25 - 1927

Table 2 presents data on the available fuel convoys for operation in the next work shift. Column 1 lists the characteristic, while Column 2 shows the range of values this characteristic can take in the convoys included in the instances used. Line 1 indicates the amount of convoys. Line 2 shows the fuel loading capacity of the convoys in liters. Line 3 reports the fuel fill rate of the convoy pump in liters per minute. Finally, Line 4 presents the average speed of the convoys in kilometers per hour.

Table 2.: Convoys characteristics.

Characteristics	**Range values**
# Convoy	3 - 13
Fuel loading capacity (L)	20000 - 30000
Fuel fill rate (L/min)	250
Average speed (km/h)	20 - 40

Table 3 summarizes the evaluated instances. According to the table, in instance 1, ten mining equipment need to be filled, and three convoys are available. Similarly, in instance 2, there are 12 mining equipment to be filled, and three convoys can be used. This pattern is repeated for the other instances. The instances are divided into two groups: small instances, which include instances 1 to 3, and large instances, which include instances 4 to 12.

Table 3.: Instances.

	#Instance	**#Convoys**	**#Mining Equipment**
Small Instances	1	3	10
	2	3	12
	3	5	31
Large Instances	4	8	40
	5	10	40
	6	12	40
	7	8	50
	8	10	50
	9	12	50
	10	8	60
	11	10	60
	12	12	60