

Reduction of Cost and Time by Clubbing Recovery Shooting of Data Gaps with Normal Shooting – A Case Study

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Summary

The villages, industrial campus, oil companies' installations, dry river beds, ravines etc. do not allow the regular drilling of shot holes in onland seismic data acquisition work. In 3D seismic surveys a gap of 30-40 continuous regular shot holes creates a hole in the subsurface coverage. Now days these gaps are present more or less in every swath of 3D survey. Conventionally, the subsurface data gaps are recovered by putting the receivers and shot points at available locations. This results in more number of shot points than the skipped shot points. The objective is to design a recovery plan whereby the regular swath can be utilized for recovering sub-surface data loss. The recovery plan has to be simple and at the same time it should fulfill the following criterions 1) placing the shot points at a place where shot holes were drilled to remove the chances of non availability of shot holes at desired locations 2) To place as many shots as skipped to optimize cost 3) To recover all offsets and non redundant fold 4) To avoid redundant offsets and foldage.

Introduction

With the passage of time the human settlement s are increasing in the operational area of 3D seismic data acquisition work. This creates hurdles in the continuous subsurface coverage. The data gaps generated can be handled in many ways. Efforts has been made in this paper to show that cost and time can be optimized by using same or less number of shot points by using the same spread as laid out for normal shooting.

Methodology

The methodology adopted is I) study of 3D swath geometry II) identification of missed CMP points and missed offsets and evaluation III) Calculation of ray paths and corresponding position of shot pint and receivers on paper IV) Putting the shot point on Field Processing System (FPU) at the drilled location preferably on the back of the swath on each shot line and utilizing the spread which is used for regular production. V) Generation of non -redundant fold and non- redundant offsets on FPU to show the recovery of data gap.

I) Study Of 3D Swath Geometry

I.1. Purpose

The disposition of shot and receivers in building the non-redundant foldage is understood.

I.3. Procedures

The following steps are involved in the understanding the

generation of non-redundant foldage.

1. To collect the co-ordinates, bearing, SLI, RLI, GI, line rollover, swath rollover of geometry.
2. To feed all the information in FPU in layout window and generate geometry layout.
3. To generate non-redundant foldage and see placement of shots and receivers superimposed on the foldage map.

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II) Identification of Missed CMP Points and Missed Offsets and Evaluation

The actual field data in SPS format is loaded in FPU. The data gaps generated due to logistics (skipped shot points) are noted on a paper. The corresponding CMP points and offsets are calculated.

The missing offsets are to be seen from Non redundant offset map. It is better to divide offsets in three classes i) Near offsets ii) Middle offsets iii) Far offsets.

III) Calculation of Ray Paths and Corresponding Position of Shot Points and Receivers

The ray paths from all possible locations are to be conceived and the ray paths generated by placing shot points half the spread length from the current shot points are to be studied. The shot points are to be placed on all the shot lines where drilling could be done previously to minimize the gap between planning and execution of the recovery programme.



IV) Putting the Shot Point on Field Processing Unit (FPU) at the Drilled Location Preferably on the Back of the Swath on each Shot Line.

The shot points should be placed at back of the skipped shot points on each line nearly half the spread length and spread assigned to this set should be in front with no near offset gap. Generally it is seen that shot points can be drilled at the back and the statistics of such shot points are available with the party.

This technique was successfully used in west of Patan and Kalol – Valod area to recover the sub-surface data gaps.

V) Generation of Non-Redundant Fold and Non-Redundant Offsets on FPU to Show the Recovery of Data Gap.

The geometry non-redundant fold and non-redundant offsets before and after the recovery for the above two examples were generated on FPU and are shown in figs 1 to 7.

Area: West of Patan

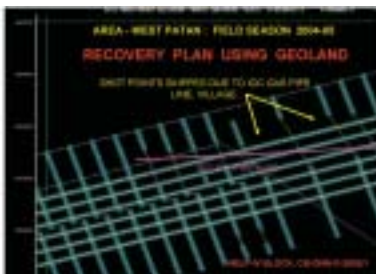


Fig. 1: Skipped shot points

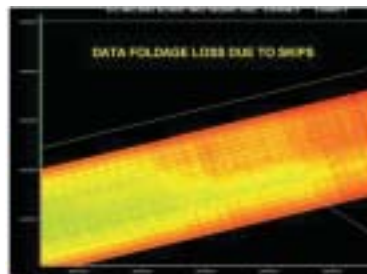


Fig. 2: Foldage loss due to skips

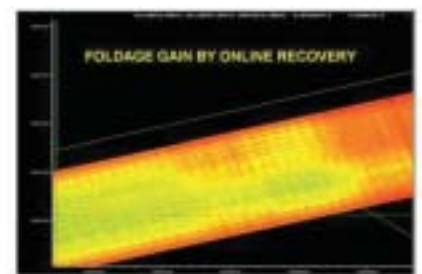


Fig. 3: Foldage gain by online recovery

Area: Kalol Valod

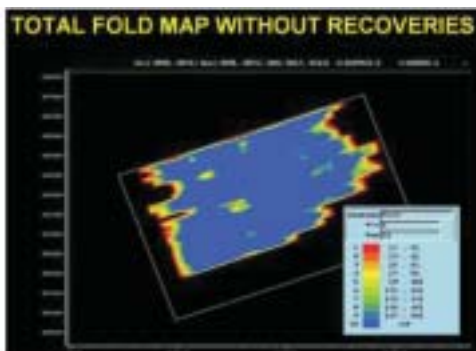


Fig. 4: Total fold without recoveries

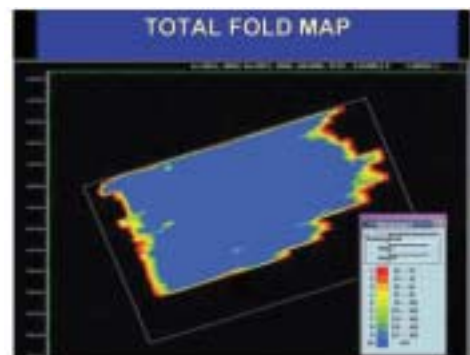


Fig. 5: Total fold after recoveries

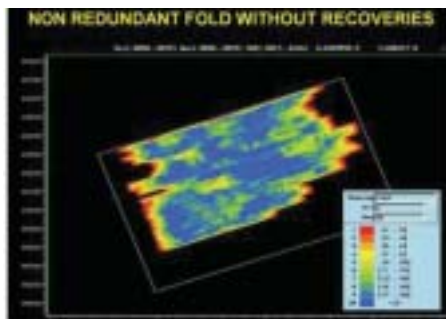


Fig. 6: Non redundant fold without recoveries



Fig. 7: Non redundant fold after recoveries

Conclusion

The above examples show it clearly that data gaps can be filled along with the normal shooting at no extra cost as the swath laid for normal shooting is used. It also facilitates in submitting data to computer center after the completion of every swath instead of waiting till the entire area is covered and then recovery plans are executed. The savings on cost and time and simplicity of the method are the three important factors which weigh heavily in the favour of this recovery method.

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