INTRODUCTION

As the velocity analysis is applied on a common-mid-point (CMP) gather, the operator of CMP method cannot estimate the reflector event properly and does not use the data redundancy in multi-coverage data set. Hence, the common-reflection-surface (CRS) stack method has been introduced [1-4].

The CRS method in depth domain instead of a point on the reflector considers a part of the circle. The seismic response of this part of the circle, in time domain, in addition to one CMP considers the neighboring CMPs [5]. Consequently, the CRS method uses the data redundancy in multi coverage data set and simulate a zero offset (ZO) stack section with high signal to noise ratio. Moreover, the attribute which control the shape of operator so called wave field attributes [6]. The Normal-Incidence-Point (NIP) wave, which is one of these attributes, has been used to calculate the stacking velocity [7]. But this attribute in CRS obtains in data driven manner. As results, the NIP ware is influenced by Normal wave. In this research, $R_{NIP}$ has been applied by us. Moreover, $R_{NIP}$ is obtained by model based Common-Diffraction-Surface (CDS) stack. In addition, it is so important that the NIP wave in model-base CDS stack method not be influenced by N waves [8].

THEORY

Based on the second order approximation of travel time, it is possible to obtain the travel time, which is read as:

$$t^2(x_m, h) = \left[ t_0 + \frac{2 \sin \alpha}{V_0} (x_m - x_0) \right]^2 + \frac{2t_{anis} \alpha}{V_0} \left( \frac{(x_m - x_0)^2}{R_x} - \frac{h^2}{R_{NIP}} \right)$$

(1)
Here, \( x_0 \) is the location of the point which is considered for the stacking, \( x_m \) is the distance to the \( x_0 \), \( t_0 \) is the time which considered for the stacking, \( v_0 \) velocity at the surface, \( \alpha \) is the emergence angle, \( h \) is offset, \( R_{\text{NIP}} \) is the radius of NIP wave front, and \( R_{\text{N}} \) is the radius of N wave. For an underground diffractor, the wavefront when reaches to the surface the \( R_{\text{N}} = R_{\text{NIP}} = R_{\text{CDS}} \), so the Equation 1 is simplified to CDS equation (as seen in Equation 2):

\[
t^2(x_m, h) = t_0^2 + \frac{2 v_0\sin \alpha}{v_0^2}(x_m - x_0)^2 + \frac{2v_0\cos \alpha}{R_{\text{CDS}}v_0^2}[(x_m - x_0) - h^2]
\]

(2)

As for a CMP, \( x_m \) and \( x_0 \) is equal; therefore, it is possible to obtain stacking velocity from Equations 1 and 2. By substituting \( x_m = x_0 \) the stacking velocity is read as:

\[
V_{\text{stack}} = \sqrt{\frac{2v_0 R_{\text{NIP}}}{t_0 \cos^2 \alpha}}
\]

(3)

All parameters in Equation 3 is ready by applying CRS on a seismic data. In this research, the \( R_{\text{CDS}} \), which is not affected by \( R_{\text{N}} \) instead of \( R_{\text{NIP}} \) has been applied.

**IMPLEMENTATION**

In order to test the proposed method, a synthetic velocity mode with five reflectors is generated by Seismic Unix [9]. This model is shown in Fig. 1.

The stacking velocities are obtained by CRS and CDS attribute along the first reflector are shown in Fig. 2.

**CONCLUSION**

The wave field attribute of CDS stack method are not affected from each other. Hence, the velocity stacking which obtain by this method is more reliable than the CRS method. For instance, for the first reflector the true velocity is equal to 1900 m/s. The mean of stacking velocity a long
this reflector which calculated by CRS and CDS method is 1933 m/s and 1923 m/s, respectively. In addition, the standard deviation of the estimated stacking velocity along all profiles for CDS method is less than CRS method. For example, the standard deviation of velocity staking estimation along the first reflector are 30.3541 and 12.0026 for the CRS and CDS method, respectively. Finally, these results show that the stacking velocity which is obtained by the proposed method is more accurate and precise in comparison with CRS.

REFERENCES